CONSERVATION MANAGEMENT PLAN OF JIGME DORJI NATIONAL PARK JULY 2021 – JUNE 2031

(*Biodiversity Conservation in Pursuit of Gross National Happiness*)

Jigme Dorji National Park

Department of Forests and Park Services
Ministry of Agriculture and Forests
2021

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Cover Photo: View of Tenchey village (Lunana gewog) with the background of Mt. Gangchen Singye (aka Table Mountain) ©Pema Dendup

Figure 1: Raphstreng tsho (lake) in Lunana gewog ©Pema Dendup

Last Photo: View of prayer flag with the background of Jangkhulum (opposite park head office) ©Pema Dendup

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ROYAL GOVERNMENT'S ENDORSEMENT AND APPROVAL

SUBJECT: Conservation Management Plan of Jigme Dorji National Park for the period July 2021 – June 2031: *biodiversity conservation for healthy ecosystem and socio-economic wellbeing of the society while maintaining cultural integrity of the landscape.*

"In accordance with and as per the Forest and Nature Conservation Act of Bhutan, 1995"

Submitted for kind approval:

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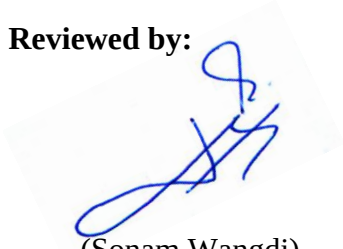
Chief Forestry Officer
Jigme Dorji National Park

Reviewed by:



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SECRETARY
Ministry of Agriculture and Forests

FOREWORD

Jigme Dorji National Park (JDNP) is truly a conservation jewel located in the north-western part of Bhutan. JDNP is a safe sanctuary to the world's many threatened wildlife species and its habitat as the park is encompassing biodiversity and ecosystem representative of the upper Himalayan region and Palearctic biogeographic realm. The globally endangered tiger, dhole, musk deer, woolly flying squirrel; vulnerable snow leopard and takin, and the critically endangered white-bellied heron, and threatened satyr tragopan is found to be thriving in the park. The park in particular is popular in the country and the region for having the largest population of the endemic Bhutan takin and the snow leopard. More than 200 species of medicinal plants are also found in the park.

The park is also a water tower of north-western Bhutan and provides critical ecosystem services to the nation. It is a watershed for Bhutan's four major rivers - *Pachu, Wangchu, Phochu,* and *Mochu* – and on the downstream of which major hydropower dams are built. The export of hydroelectricity is the highest income generator in the country. There are close to 5,100 people living inside the park who benefit tremendously from its resource. Hundreds of semi-nomadic pastoralists make their livelihood raising yaks in the alpine regions and through the sale of cordyceps, medicinal plants and incense. In the lowlands, people grow crops and raise cattle for the sustenance of their livelihood. The park residents meet all their timber demands from the park. In addition to providing habitat for wild animals, the vast swath of forest cover in the park helps in sequestering a large amount of carbon from the atmosphere. In the country, JDNP is a paradise to nature-loving tourists. Every year, hundreds of international tourists trek through the park's alpine region to relish the scenic beauties and pleasant challenges rendered by high mountain passes and snow-capped peaks.

Furthermore, JDNP has a rich cultural heritage. The park has many nationally significant religious sites, particularly the Goen Tshephug Ney, Chari Monastery, Nangsi Goenpa, and Tshechudrak. The park is famed for having the largest number of hot springs and medicinal baths. Every year, hundreds of people around the country throng to dip into the therapeutic hot springs and

medicinal baths of Gasa.

Recognizing the tremendous conservation significance of JDNP at the national as well as international setting, I am very pleased to know that the park management has revised the park's management plan. I see so much optimism in this plan because it lays out clear goals, strategies, and actions with realistic, measurable, and time-bound objectives that are all geared towards fulfilling the mission of maintaining viable ecosystems and provisioning vital ecosystem services to the Bhutanese people. Also, there is a clear alignment of the actions, strategies, and objectives to the plan's seven strategic goals. Pieces of evidence are overwhelming to prove that so much hard labour and sacrifices have been invested in preparing the plan, right from the tedious biodiversity inventories to exhaustive consultation meetings with various stakeholders. For this, I would like to congratulate the entire staff of JDNP for doing commendable jobs in securing the park's ecological integrity, and I am very much optimistic that the plan will be fully implemented within the stipulated time frame. I would like to take the opportunity to thank all the past donors most notably WWF- Bhutan Program, Bhutan Foundation, UNDP-GEF Program, Bhutan Trust Fund for Environmental Conservation, and SDS Netherlands for their generous financial supports to the park. As of today, Bhutan For Life (BFL) project is the main funding agency for all the protected areas in Bhutan and to the revised management plan of JDNP, 88% of the total fund outlay is committed by the BFL project. To this end, I also would like to sincerely thank BFL for funding the conservation works of JDNP and the protected areas of Bhutan at large.

Now that the plan is prepared and approved by the government, I would like to urge the park management to strive for full achievement of the planned objectives for which my support is assured and my best wishes are offered.

Tashi Delek!

(Lobzang Dorji**)**
DIRECTOR
Department of Forests and Park Services

ACKNOWLEDGEMENT

On behalf of the management of Jigme Dorji National Park (JDNP), I would like to sincerely thank all the park staff (both former and present) for having worked tirelessly and bringing JDNP into the limelight of conservation in Bhutan and in the region.

I would also sincerely like to thank for the strong support and cooperation rendered to the management by the Dasho Dzongdas, Dasho Dzongrabs, Dasho Dungpa and other officials of Gasa, Punakha, Thimphu and Paro Dzongkhags. With the similar note, I would also like to thank all the contributions and support made to the park management by the local government officials (Gups, Mangmis, Gewog Administrative Officers and Tshogpas) and resident communities of 14 gewogs in the park.

With the current management plan, JDNP is now into its 4th conservation management plan and without the generous funding support from all the donors (WWF – Bhutan, BTFEC, UNDP – GEF, BFL and others) for the past management plans, we would not be in a position to achieve most of the targets set for our activities. Even in the current management plan, we have forecasted about Nu. 146.658 million for 10-year plan period and I sincerely hope that more than 90% of the budget would be funded by Bhutan for Life.

I would like to thank both the past and present Hon'ble Ministers (MoAF), Secretaries (MoAF), Director Generals (DoFPS) and Directors (DoFPS) for their continued guidance and support towards the park management.

Lastly, I would like to thank the officials at NCD for their valuable comments and suggestions. It helped us immensely in fine-tuning our management plan.

(Rinzin Dorji**)**
Chief Forestry Officer

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LIST OF COMMON ACRONYMS

AAC	Annual Allowable Cut
ABTO	Association of Bhutanese Tour Operators
Ac	Acre
AKRA	Agency Key Result Area(s)
BF	Bhutan Foundation
BFL	Bhutan For Life
BMG	Biodiversity Monitoring Grid
BPC	Bhutan Power Corporation
BTC	Bhutan Tiger Center
BTFEC	Bhutan Trust Fund for Environmental Conservation
CF	Community Forest(s)
CFMG	Community Forest Member Group
CFO	Chief Forestry Officer
Cft	Cubic Feet
CGI	Corrugated Galvanized Iron
CNR	College of Natural Resources
CO	Cold Temperate
CT	Cool Temperate
CR	Critically Endangered
DGPC	Druk Green Power Corporation
DHI	Druk Holding and Investment
DIT	Department of Information Technology
DoFPS	Department of Forest and Park Services
DoL	Department of Livestock
EN	Endangered
FID	Forestry Information Database
FMU	Forest Management Unit(s)
FNCA	Forest and Nature Conservation Act of Bhutan
FPED	Forest Protection and Enforcement Division
FRMD	Forest Resource Management Division
ft	Feet
FYP	Five Year Plan
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIS	Geographic Information System
GNH	Gross National Hapiness

GPS	Global Positioning System
HH	Household(s)
ICDP	Integrated Conservation and Development Program
IBA	International Bird Areas
IUCN	International Union for Conservation of Nature
JDNP	Jigme Dorji National Park
km^2	Square kilometer
LC	Least Concerned
LFMA	Local Forest Management Area(s)
LFMP	Local Forest management Plan
LG	Local Government
LPCA	Landscape Management Production and Commercialization Approach
LPG	Liquified Petroleum Gas
m^3	Cubic meter
m.a.s.l	meter above sea level
METT+	Management Effectiveness Tracking Tools Plus
MoAF	Ministry of Agriculture and Forests
MoF	Ministry of Finance
NBC	National Biodiversity Center
NCD	Nature Conservation Division
NEC	National Environment Commission
NFI	National Forest Inventory
NLC	National Land Commission
NRED	Nature Recreation and Ecotourism Division
NT	Near Threatened
NWFPs	Non-Wood Forest Products
PA	Protected Area(s)
PES	Payment for Ecosystem Services
RBA	Rapid Biodiversity Assessment
RDC	Research and Development Center
RGoB	Royal Government of Bhutan
RS	Rhododendron Scrub
RSPN	Royal Society for Protection of Nature
SES	Socio-Economic Survey
SFED	Social Forestry and Extension Division
SMART	Spatial Monitoring and Reporting Tools

SRF	State Reserved Forest
ST	Subtropical
TCB	Tourism Council of Bhutan
UNDP	United Nations Development Programme
UWICER	Ugyen Wangchuck Institute for Conservation and Environmental Research
VIC	Visitor Information Center(s)
VU	Vulnerable
WMD	Watershed Management Divison
WT	Warm Temperate
WWF	World Wildlife Fund – Bhutan Program

GLOSSARY OF BHUTANESE TERMS

Auley	Local festival celebrated in Laya gewog
Bjops	Yak herders in the highland regions of Bhutan
Chiwog	Lowest administrative unit formed by a group of villages
Chu	River
Chugo	Hardened dried cheese
Dangchung	Poles below 1 foot in girth
Dzongkhag	District
Dzongkhag Tshogdue	The highest decision-making body of a Dzongkhag
Gewog	Sub-district or a block
Gewog Tshogchung	The highest decision-making body of a gewog
Goempa	Monastry/Temple
Goen	People of Goenshari, Khatoed and Khamoed
Gup	An elected head of the gewog
Kabjib	People of Kabesa
Layaps	People of Laya gewog
Lingzhips	People of Lingzhi gewog
Lunaps	People of Lunana gewog
Menchu	Medicinal spring
Namda	Herbs used as vegetables (*Pogostemom amaranthoides*)
Nu.	Ngultrum (Bhutanese currency)
Pangpoi	Incense (*Nardostachys jatamansi*)
Pangtse shing	Small tree (*Symplocos theaefolica*) and the seeds are used to extract oil
Putashing	Medicinal herb (*Picrorhiza scrophulariiflora*)
Reedham	Local restriction or ban on entry into the local forest
Resoop	Village forest guard
Sokshing	Forest are from where the leaf litters are collected
Tsamdro	Grazing land
Tshachu	Hot spring
Tsim	Poles with a girth of 1 – 2 feet
Tshogpa	Management group

EXECUTIVE SUMMARY

Jigme Dorji National Park (JDNP) was originally gazetted as a wildlife sanctuary in honour of The Third King Jigme Dorji Wangchuck. With a total area of 4,374.06 km^2, JDNP is the second-largest and second oldest protected area in Bhutan and it is confined to the north-western part of the country. The park is inarguably a natural jewel endowed with an incredible wealth of biodiversity comprised of 1,434 species of vascular plants (with more than 200 species of medicinal plants), 50 mammals, 407 birds, four wild bees, 184 butterflies, 15 amphibians, 22 reptiles and 17 dragonflies and damselflies. It is the only park in Bhutan and probably in the world where one can see thriving populations of the top carnivores, such as tiger, snow leopard, and dhole. The park serves as a water tower for four major rivers (*Phochu, Mochu, Pachu* and *Wangchu*) on the downstream of which mega hydropower projects are being built which will contribute tremendously to the nation's Gross Domestic Product. Besides, the park is one of the popular tourist destinations for its numerous heart-rending peaks and countless other natural attractions. The park encompasses 14 gewogs (administrative blocks) of 4 western Dzongkhags (districts) namely Gasa, Punakha, Paro and Thimphu. However, the park caters to only 10 gewogs with 975 households with an estimated population of about 5,026 people living inside the park. Most of the people living inside the park are subsistent agriculturalists and pastoralists, largely depending on its natural resources. In addition to the natural treasures, the park also has many culturally and religiously important sites that are deeply revered by the locals and pilgrims around the country.

The park since its operation in 1995 has made impressive achievements in establishing the essential infrastructure and manpower, capacity building of the technical staff, inventory and protection of floral and faunal diversity, enhancing ecotourism potentials, and educating and involving the local communities in conservation works.

Incorporating the lessons learned from the past management plans and cognizant of the prevailing conservation threats in the current management plan, the park envisions to be *"a conservation heritage of harmonious co-existence between human and nature in north-western Bhutan for a healthy ecosystem and socio-economic wellbeing of the society while maintaining the cultural*

integrity of the landscape". Through wide consultations with the key stakeholders and exhaustive discussions with the staff in series of internal coordination meetings, the park management intends to achieve its visions and missions through 7 strategic goals and 26 objectives, all geared towards protecting the keystone, umbrella and flagship species; mitigating conflicts between park residents and wild animals; scientific management of key natural resources in a participatory manner; conservation of watershed for continued ecosystem services and strengthening the institutional capacity of the park management in conservation of natural resources. The implementation of planed actions is scheduled to begin from the beginning of July 2021 till the end of June 2031.

The progress towards the achievement of strategic goals and objectives will be periodically monitored as the indicators are explicitly stated in a comprehensive logical framework. It is sincerely hoped that all key collaborators and stakeholders would render optimum support towards the fulfillment of the management goals and objectives.

CHAPTER 1: Background

1.1 History and Significance of Protected Areas in Bhutan

The Himalayan Kingdom of Bhutan, with the total area of 38,394 km^2 located in the eastern Himalayas, is outstandingly rich in natural resources. With approximately 71 percent forest cover (FRMD, 2016), consisting of 8 ecoregions, 11 major forest types, 23 important bird areas (IBA) is providing a home to more than 5,600 species of vascular plants, 411 species of ferns and their allies, 145 endemic plants, over 129 mammals (27 globally threatened species), 748 birds (47 globally threatened species), 47 species rhododendron, 469 species orchids, 410 species fungus, <100 species insect-fungi, 158 species amphibians and reptiles, 750 species butterfly, 1115 species moths, 125 species fishes and 282 species non-vascular plants (FRMD, 2020).

Bhutan's approach towards managing natural resources, as envisioned by the fourth Druk Gyalpo (4^{th} Dragon King) in his developmental philosophy, Gross National Happiness (GNH), is through conservation of the rich biodiversity and sustainable management of the natural resources. With 51.44% of the country's total area under protected areas (PAs), and with the establishment of 804 community forests (CFs), 21 forest management units (FMUs), and 49 local forest management areas (LFMAs) for sustainable harvesting of the timber and non-wood forest products (NWFPs) (FRMD, 2020), the vision of the 4^{th} King has largely been achieved.

The international community has applauded the Royal Government of Bhutan for demonstrating exemplary leaderships in the field of nature conservation and environmental protection. Being conferred the Champions of the Earth Award 2005 by the United Nations Environment Program and the prestigious J. Paul Getty Conservation Award in 2006 by the World Wildlife Fund, the country's visionary kings and leaders have always stressed that developmental activities should not undermine environmental integrity at any cost. Such a strong conviction towards environmental protection is exhibited by the country's constitutional mandate that requires the government and citizens to maintain at least 60 percent of the country under forest cover for all times to come.

As it is evident that all human activities prosper when the natural environment is

preserved, Bhutan's much-touted developmental philosophy of Gross National Happiness (GNH) that prioritizes the happiness of its citizens over Gross Domestic Products (GDP) recognizes environmental protection as the bedrock for engendering societal happiness and wellbeing. To safeguard the country's major ecosystems and watersheds, about half the size of the country has been designated as protected areas. Currently, five national parks, four wildlife sanctuaries, one strict nature reserve, one botanical park and interconnecting biological corridors constitute the extensive network of protected areas, aptly called the Bhutan Biodiversity Conservation Complex (NCD, 2004). The Article 5 of the Constitution of Bhutan (RGoB, 2009) mandates the requirement to maintain at least 60% of the total land under forest cover for all times to come. Furthermore, National Forest Policy of Bhutan 2011, reiterates the same and recognizes the creation of a network of protected areas and biological corridors as a long-term strategy to protect flora and fauna (MoAF, 2010).

1.1.1 Brief description of Jigme Dorji National Park

1.1.1.1 Historical perspectives

In 1974, Jigme Dorji National Park (JDNP) was declared initially as a wildlife sanctuary in fond memory of Third King, Jigme Dorji Wangchuck and is one of the oldest protected areas in Bhutan. Later, in 1993 the park was notified as National Park and got operationalized in 1995. JDNP was declared as one of the ten protected areas to conserve ecosystems representative of north-western Bhutan. With an initial size of 4316 km^2, it was the largest protected area until the notification of Wangchuck Centennial National Park in the year 2008 with an area of 4914 km^2. With the revised PA of Bhutan, today JDNP with an area of 4374.06 km^2 is the second-largest protected area in the country.

The park was operationalized in 1995, with funding from the Global Environment Facility (GEF) project of the United Nations Development Program (UNDP). During its initial establishment, a Park Manager was appointed and he was assisted by two Park Wardens (one for Gasa Dzongkhag and the other for Paro and Thimphu Dzongkhag), a senior Beat Officer for Lingzhi Dungkhag, six Park Guards, and seven resoops (village forest guards) (Thinley et al., 2015).

1.1.1.2 Conservation significance of Jigme Dorji National Park

JDNP is undoubtedly the conservation jewel in the eastern Himalayas. The salient feature that distinguishes JDNP from the rest of Bhutan's PAs is that it harbours three national symbols of the country viz. the national animal - takin (*Budorcas taxicolor whitei*), the national bird - raven (*Corvex corex*), and the national tree - cypress (*Cupressus corneyana*). It is also the only park where one can find thriving populations of the endangered Royal Bengal tiger (*Panthera tigris tigris*), Asiatic wild dogs (*Cuon alpinus*) and the vulnerable snow leopard (*Panthera uncia*) sharing their habitats.

The park has an incredible wealth of biodiversity comprised of 1,434 species of vascular plants (with more than 200 species of medicinal plants), 50 mammals, 407 birds, four wild bees, 184 butterflies, 15 amphibians, 22 reptiles and 17 dragonflies and damselfly (Thinley et al., 2015; Koirala & Jamtsho, 2018, Dendup et al., 2020; Jamtsho, 2020, Dendup et al., 2021c). Regarding the conservation status of the mammals and birds, the park has five endangered (EN), six vulnerable (VU) and nine near threatened (NT) species of mammals; one critically endangered (CR), two EN, three VU and seven NT species of birds (Dendup et al, 2021b; 2021c).

JDNP is also the treasure trove of medicinal plants, natural hot springs, medicinal water, and magnificent sceneries. The Chinese caterpillars, *Ophiocordyceps sinensis* (commonly known as cordyceps) that grow in the higher elevations of the park and it is one of the main sources of income for highlanders. The recent socio-economic survey revealed that the park residents earned a total income worth Nu. 477.8 million from the sale of cordyceps in 2019 (Dendup et al., 2021a). This was followed by *Nardostachys grandiflora* and *Picrorhiza kurroa* which earned income close to 40 and 15 million respectively. Besides, there are several other medicinal plants such as the *Paris polyphylla, Gentiana* sp., *Pedicularis* sp., *Meconopsis* sp., *Delphinium* sp. and *Aconitum* sp. for which there is a high demand from local, national and international markets.

Hydrologically, four major river basins namely the *Phochu, Mochu, Pachu* and *Wangchu* originates from the snow-capped mountains and other watershed of the park, thus it can be considered the water tower of western Bhutan (Fig. 1).

Several mega hydropower plants have been either built or in the process of being built downstream of these rivers. While tourism is another sector that contributes tremendously to the country's GDP. JDNP is a significant contributor to the national tourism industry, especially for nature tourism. It is the only park in Bhutan where the largest number of international tourists trek through the paradisiacal alpine meadows and snow-capped mountains. In the year 2019, JDNP received 1,266 international tourists (FRMD, 2020).

Figure 1: The turquoise blue Raphstreng tsho (lake) in Lunana gewog, Gasa which is one of the main sources of *Phochu* river. ©Pema Dendup

Culturally and spiritually, the highly revered Tibetan Saint Zhabdrung Ngawang Namgyal who ruled Bhutan for many years through a dual system of secularism and religious practice had entered Bhutan through JDNP via Wakela while coming from Kham Ralung in Tibet in the 17th century. In addition, there are many sacred religious and spiritual sites in the park. Besides, the park has many unique cultures that have demonstrated harmonious co-existence with the natural world since time immemorial. The presence of probably the largest number of hot springs and medicinal baths in the country makes JDNP one of the favourite destinations for both international and national tourists seeking spiritual and physical wellness. Therefore, from an economic perspective, the park has a crucial role in contributing to the revenue generation of the country.

In the realm of international transboundary conservation, JDNP provides crucial connectivity to the Kanchenjunga Conservation Complex in

northeast India and eastern Nepal via Jigme Khesar Strict Nature Reserve (NCD, 2008). It also provides an extension of the tiger's home ranges from India's Manas National Park via Bhutan's Royal Manas National Park and Jigme Singye Wangchuck National Park and from India's Buxa Tiger Reserve via Bhutan's Phibsoo Wildlife Sanctuary and Royal Botanical Park at Lamperi. At the landscape level, the JDNP provides connectivity to Jigme Khesar Strict Nature Reserve, Jigme Singye Wangchuck National Park and Wangchuck Centennial National Park (Fig. 2).

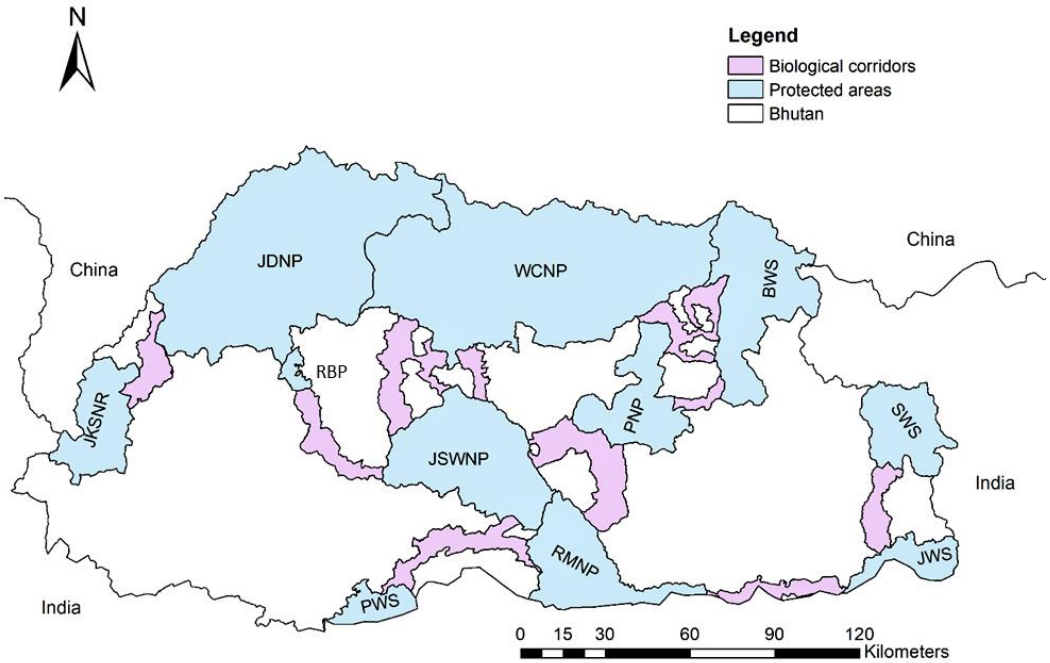

Figure 2: Protected areas (*BWS: Bomdeling Wildlife Sanctuary, JDNP: Jigme Dorji National Park, RBP: Royal Botanical Park, JKSNR: Jigme Khesar Strict Nature Reserve, JSWNP: Jigme Singye Wangchuck National Park, JWS: Jomotsangkha Wildlife Sanctuary, PWS: Phipsoo Wildlife Sanctuary, PNP: Phrumsengla National Park, RMNP: Royal Manas National Park, SWS: Sakteng Wildlife Sanctuary, WCNP: Wangchuck Centennial National Park*) and biological corridors of Bhutan.

1.2 Vision, Mission and Goal

1.2.1 Vision

"A conservation heritage of harmonious co-existence between human and nature in north-western Bhutan for a healthy ecosystem and socio-economic wellbeing of the society while maintaining the cultural integrity of the landscape".

1.2.2 Mission

"Ensure sustainable utilization of natural resources in close partnership with local governments and park communities".

1.2.3 Goals and objectives

Incorporating all the lessons learned from past management plans and prevailing conservation threats and opportunities, seven strategic goals have been identified to help achieve the mission and vision of the park. Under each strategic goal, a set of objectives are stated to fulfill the goals (*refer 5.1; Table 11*).

1.3 Salient features of the plan

This management plan has seven chapter's altogether and a brief summary of each of the chapter is presented hereunder:

1.3.1 The background

Under this chapter, the history and significance of protected areas (PA) in Bhutan with emphasis on JDNP's vision, mission, goals and zones are presented. JDNP with the area of 4374 km^2 is the second largest PA and has identified four conservation management zone such as core zone (1228.89 km^2, 28.09%), transition zone (1781.29 km^2, 40.72%), buffer zone (511.24 km^2, 11.70%), and multiple use zone (852.64 km^2, 19.49%).

1.3.2 Current status of JDNP

Landscape characteristics, conservation significance, people and livelihood, other management regimes, administrative set up, service delivery and infrastructure of the park are presented under this chapter. There are total of 975 households with 5026 people living inside the national park.

1.3.3 Summary review of the past plan

Here, the assessment of previous management plan, lessons learnt and gaps and carry over actions from previous plan are presented. Of 73 actions prescribed in the past management plan, only 30.14% is achieved, 42.47% carried forward in the present plan and 27.9% dropped as a result of non-feasibility of the activity.

1.3.4 Analysis of threats, challenges and opportunities

As per the Management Effectiveness Tracking Tools Plus (METT+), biodiversity assessment, socio-economic surveys, and other survey findings, following are the threats, challenges and opportunities; 1. Destruction and degradation of wildlife habitats, 2. Depletion of wildlife population, 3. Negative sentiments towards conservation, and 4. Increased human-wildlife interactions have been identified as conservation threats in the park. Some of the conservation challenges identified are; 1. Porous international border, 2. Human settlements inside the park, 3. Inadequate fund for conservation activities, and 4. Illegal activities. Coming to conservation opportunities, some of the opportunities JDNP can tap into are; 1. Revenue plough back from the end-users of ecosystem services, 2. Astounding wealth of biodiversity, 3. Culture and social cohesion, and 4. Strong environmental legislation.

1.3.5 Management prescription

The park management intends to achieve its visions and missions through 7 strategic goals and 26 objectives, all geared towards protecting the keystone, umbrella and flagship species; mitigating conflicts between park residents and wild animals; scientific management of key natural resources in a participatory manner; conservation of watershed for continued ecosystem services and strengthening the institutional capacity of the park management in conservation of natural resources. Most actions in this plan are aligned towards achieving the goals and objectives of DoFPS and MoAF in the 12th Five Year Plan, that contribute to the four pillars of the gross national happiness. The JDNP management plan prescriptions have taken into considerations the following three main components:

1.3.5.1 Climate-smart prescription

It is predicted that eastern Himalayas will have increasing trend of temperature and precipitation. The region will experience median increase in temperature of 2.3^{o}C by 2100 and the greatest amount of warming will take place at higher altitudes. The precipitation during the dry season will decline by 5% by 2100,

but during the rest of the year will increase by a median of 11% (RGoB, 2009a). To our best effort, we aligned our planned actions to address the climate change through plantation works, sustainable management of natural resources, and livestock intensification activities through supply of improved breeds to reduce pressure on environment and grazing competitions, and at the same time enhance production on diary products.

1.3.5.2 Gender based prescription

To boost up the role and participation of both women and men in conservation of natural resources as the plan has actions that will adequately address gender issues and bring direct benefits to women and men. Some of the major actions planned are the training of women group in skills development, especially on maintenance of solar lightings, and ensuring active participation of women in consultation and decision making during the management of community forests and NWFPs, and formation of women's group for development of various ecotourism products.

1.3.5.3 Environment and social safeguard prescription

Environmental and Social Safeguards Framework (ESSF) provides mechanisms to manage the environmental and social risks of the organization. ESSF hence helps deliver better conservation outcomes and enhances the social well-being of environment and local communities in the places where the conservation activities are planned. To provide safer work place to the communities and to avoid negative impacts to the environment, most of the prescribed actions will undergo screening processes to protect both human communities and environment from certain mishaps or destructions.

1.3.6 Implementation plan and financial outlay

In this chapter, the implementation plan and financial outlay to implement the management actions are presented. All activities are included in the action plan with specific details of locations, key collaborators and timeframe. The total amount forecasted to implement the plan stands at Nu. 146.658 million for the 10-year plan period.

1.3.7 Monitoring and evaluation

Monitoring and evaluation of the planned activities is discussed under this chapter. A mid-term review will be carried out at the end of five years and changes in the schedule and activities will be made.

1.4 Zones of the park

1.4.1 Zoning Decision

To allow the communities to benefit from the resources available within the park, following exceptions and provisions in different zones were considered.

- Collection of beneficial resources such as the cordyceps and medicinal plants (only) for a specific period in a year shall be allowed in the transition zones. This is in line with the strategic goal of the conservation management plan to bring key natural resources of the park under a sustainable management framework to enhance the income and livelihood of the park residents. This is also as per the zonation guidelines.
- All the cordyceps collection areas, other important wildlife habitats (Tsharijathang mudflat) and pasture/grazing land (within 4200 m – 5200 m) are mapped as transition zones.
- For better management, the multiple-use zone was categorized into two; a) traditional use limited to access, that is the area falling within the vicinity of settlements, 500 m radius from the fringes of the fields around settlement or traditionally used areas (e.g., firewood, timber, leaf litter, etc.) and b) traditional use not limited to access are the areas for which communities have individual or communal right especially for grazing.

1.4.2 Designation of zones

The mapping of JDNP areas into different zones (core, transition, buffer and multiple use zones) was done following the guidelines of zonation and assigning appropriate zone with priority to flora and fauna based on their habitat use. Nevertheless, every effort was put in at the time of exercise to ensure not to jeopardize the day-to-day dependence of park resident communities on forest resources. JDNP designated *four zones* with different area coverage (Table 1, Fig. 3) as legal zones for implementation of any

interventions intended both for the benefit of the flora, fauna and to the park resident communities;

Table 1: Types of zones, their area and percent of the total area.

Zone Type	Area (sq. km)	Percent Area
Core Zone	1228.89	28.09
Transition Zone	1781.29	40.72
Buffer Zone	511.24	11.70
Multiple Use Zone	852.64	19.49

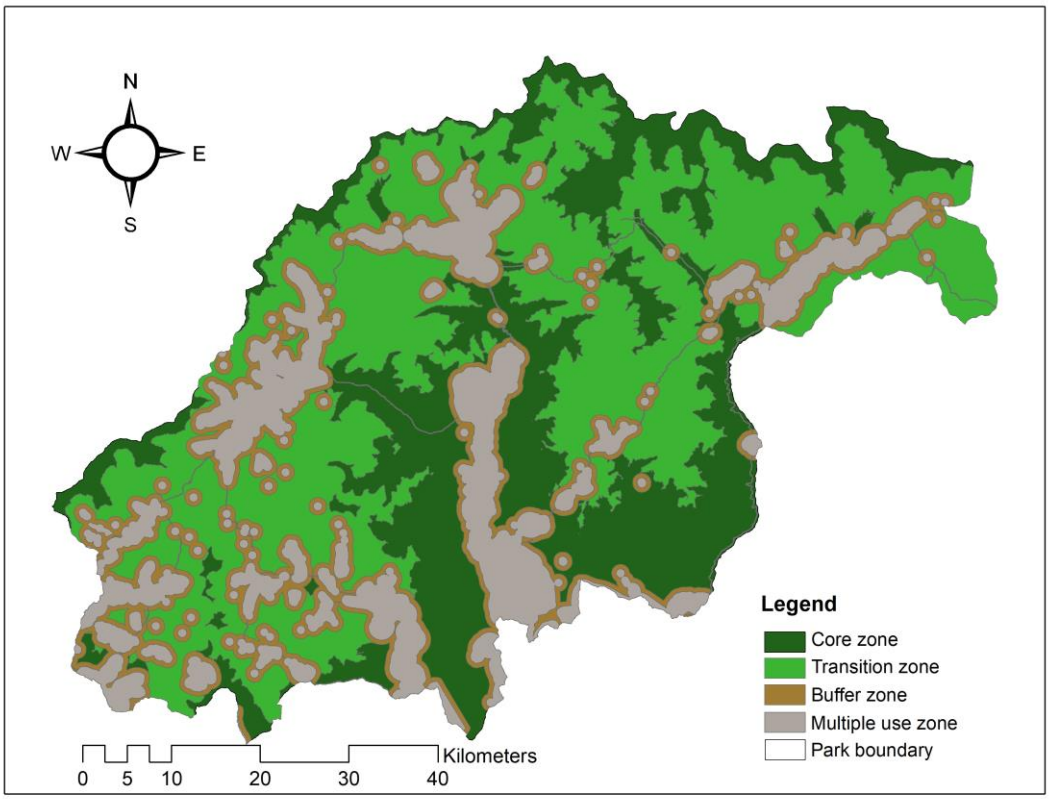

Figure 3. Management zones (zonation) in Jigme Dorji National Park.

CHAPTER 2: Current Status of the JDNP

2.1 Landscape Characteristics

2.1.1 Geophysical characteristics

JDNP spatially extending from 27º32'N – 28º14'N and 89º14'E – 90º14'E, with an area of 4,374.06 km^2, is the second-largest protected area in Bhutan. The topography of landscape features in JDNP is generally rugged with the hills rising from south to north, and likewise the elevation ranges from 1,200 meters above sea level (m.a.s.l) in the south to 7,314 m.a.s.l. in the north. The areas above 6,000 meters remain permanently covered with snow. Most of Bhutan's popular snow-capped mountain peaks, such as Mt. Jomolhari (7,314 m), Mt. Jichu Drakey (6,794 m), Mt. Tsherim Gang (6,650 m), Mt. Gangche Tag (7,000 m), Mt. Matsan Gang (7,194 m), Mt. Tsenda Gang (6,994 m), Mt. Jaikangphu Gang (7,194 m), and Mt. Gangchen Singye (a.k.a. Table Mountain; 7094 mt), are all found inside JDNP along the international border with China (Fig. 4).

All places inside the park experience four seasons (summer, autumn, winter and spring). The climate in the lower areas is generally warm and moist with a good amount of rainfall in summer and cold and dry in winter, whereas in the highlands it is cool and moist in summer and extremely cold and snowy in winter. Based on the meteorological data from the last 10 years, the park experienced an average of minimum -0.7ºC to a maximum of 20.93ºC (Fig. 5) with an average rainfall of low 0.1 millimeters (mm) to high 9.7 mm (Fig. 6).

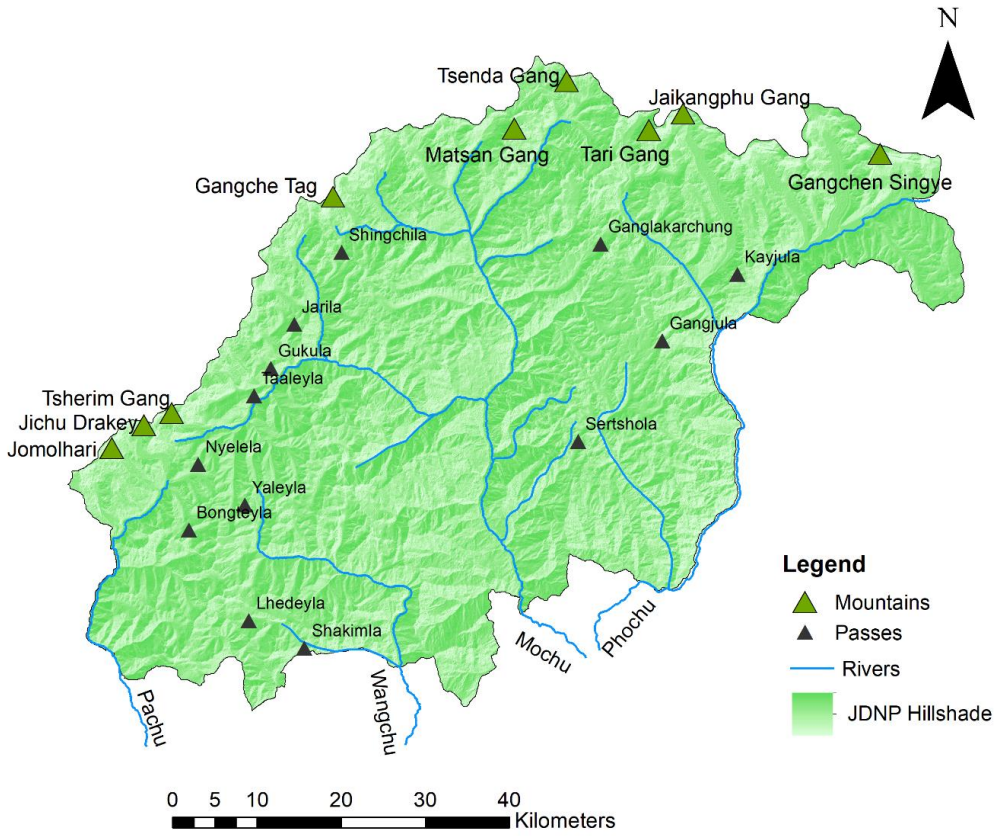

Figure 4: Mountains, passes and major rivers in Jigme Dorji National Park.

The huge variations in topography, elevations, and climate conditions have a direct influence on vegetation types and livelihood of the people, and these factors explain the existence of types of vegetative covers and livelihood patterns of people living in different vegetation zones. These geophysical features also pose serious challenges in terms of difficult working conditions for the park staff.

With many geothermal outlets in the form of hot springs (locally known as *Tshachu*) and medicinal
springs (locally known as *Menchu*), the park is a popular destination for many national and international tourists who would like to derive therapeutic benefits to heal various ailments.

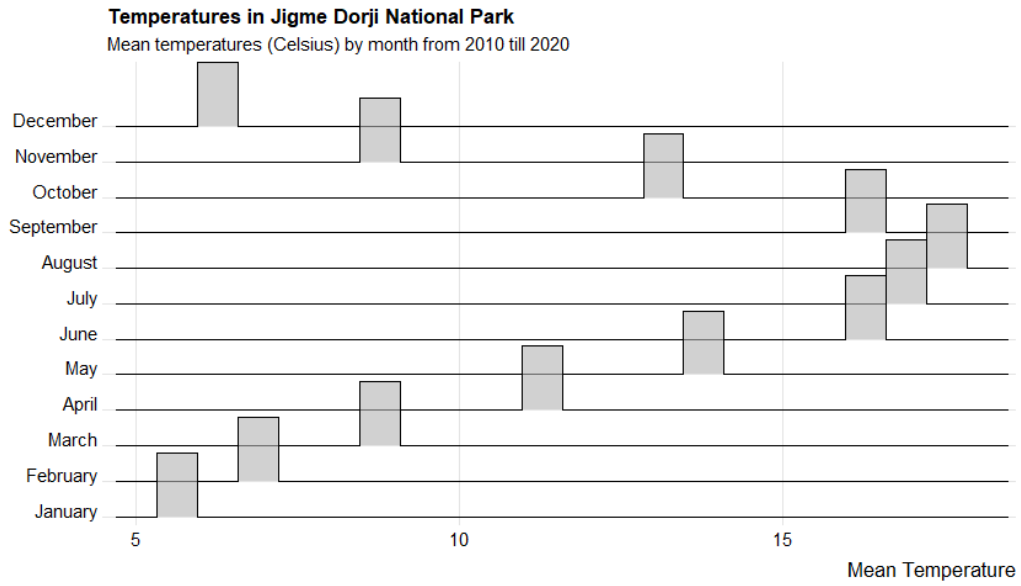

Figure 5: Mean temperatures (degree Celsius) by month from 2010 till 2020 in Jigme Dorji National Park.

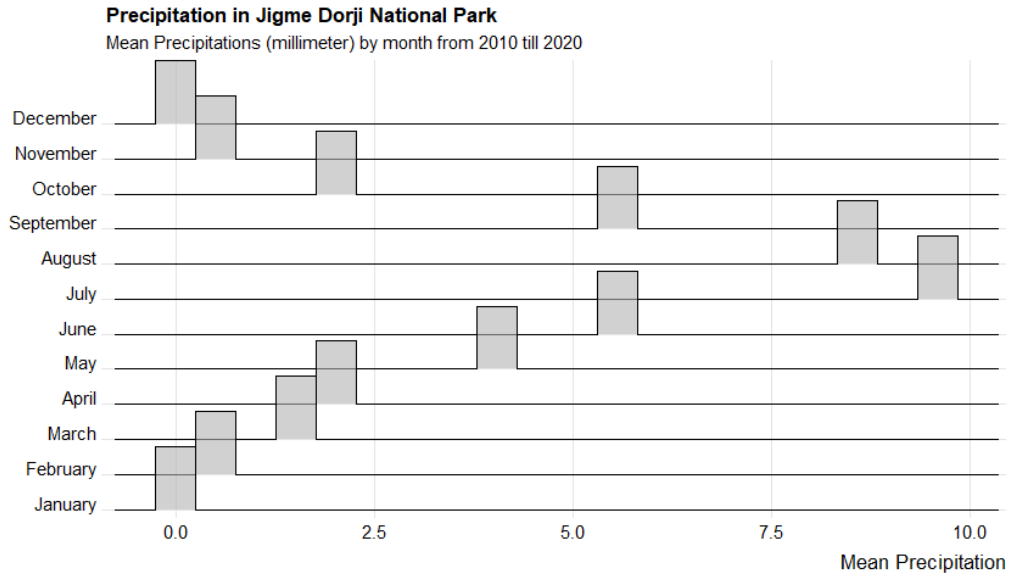

Figure 6: Mean rainfall (millimetres) by month from 2010 till 2020 in Jigme Dorji National Park.

JDNP is also famous for many alpine and glacier lakes. Most of these lakes are formed in deep valleys where huge quantities of water are impounded. The lakes serve as natural reservoirs of water for downstream valleys and as a

habitat for many alpine birds and animals.

2.2 Floral characteristics

In total, the park has 1,434 species of vascular plants belonging to 144 families and 563 genera (9 genera and 13 species of gymnosperms and 554 genera and 1,421 species of angiosperms) by using the transect survey method for the assessment (JDNP, 1996). The recent rapid biodiversity survey (RBA) revealed that the park hosts a total of 507 confirmed species of trees, shrubs and herbs belonging to 102 families and 262 genera with the survey method used by NFI grid of 4 x 4 km (referred to as "Biodiversity Monitoring Grid (BMG)), only one plot (20 x 20 m) per selected BMGs for carrying out the assessment. JDNP had 312 NFI grids conduct assessments in 121 grids which were about 39 percent of the total grids in JDNP. The detailed technical report on plant species diversity has been published (Dorji et al., 2021) and is available for further reference.

The park has five major ecosystem types in JDNP, ecosystem types classified for Bhutan (Ohsawa, 1987). These are subtropical forest (ST) (1,000 – 2,000 m.a.s.l), warm temperate forest (WT) (2,000 – 2,500 m.a.s.l), cool temperate forest (CT) (2,500 – 3,000 m.a.s.l), subarctic/cold temperate forest (CO) (3,000 – 4,000 m.a.s.l) and rhododendron scrub (RS) (>4,000 m.a.s.l), which is largely due to dramatic changes in elevation and climatic conditions (Fig. 7).

The data revealed high tree-shrub species richness (81) and diversity (3.09) in a subtropical forest in JDNP. On the contrary rhododendron, scrub had the lowest species richness (32) and diversity (2.05). Species distribution was observed to be more even in cool and warm temperate forests with an evenness value of 0.75 and 0.74 respectively (Dorji et al., 2021).

In the lowest areas of the park, one can find *temperate warm broadleaved forests that* are dominated by tall and voluminous trees with broad leaves, particularly belonging to the families of Lauraceae, Moraceae, Euphorbiaceae, Leguminosae (Fabaceae), and Combretaceae. The lower areas facing south with mostly dry conditions are dominated by *chirpine forest* that usually is fire-prone with scanty undergrowth.

Between 2,000 to 3,500 meters, one can see *temperate cool broadleaved forests* that are characterized by oaks, such as *Quercus semicarpifolia*, and *Quercus*

griffithii, and some species of rhododendrons such as *Rhododendron arboreum*. Pure stands of broadleaved and coniferous forests are hard to find, but in some areas where humans traditionally managed forests for leaf litter collection, there are pure stands of oak.

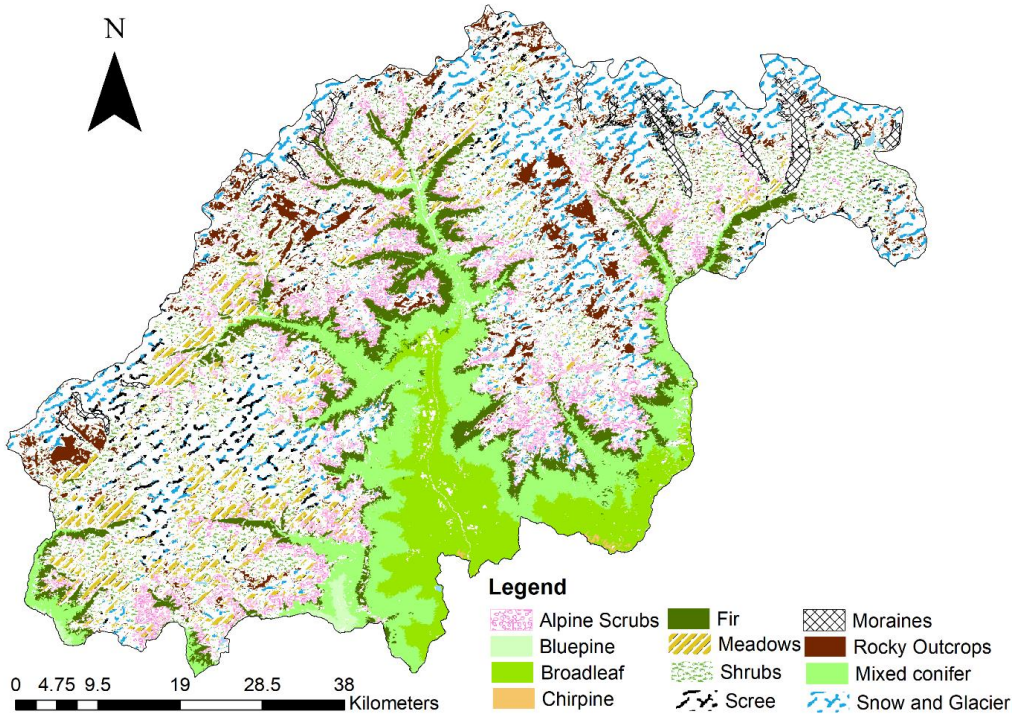

Figure 7: Land use types (excluding built-up areas and agricultural lands) in Jigme Dorji National Park.

In areas between 3,500 – 4,000 meters, the vegetation gradually transitions into *mixed conifer forest* interspersed by hemlock (*Tsuga dumosa*), fir (*Abies densa*), spruce (*Picea spinulosa*), and juniper (*Juniperus indica*). In most areas, the vegetative cover transitions from dominant stands of hemlock to fir to juniper. Also found interspersed in these forest types are Campbell's maple (*Acer campellii*), Himalayan birch (*Betula utilis*), larch (*Larix griffithii*), different species of bamboos and rhododendrons. Collectively, this eco-floristic zone is known as *sub-alpine forest.*

Ascending above 4,000 meters until 5,000 meters, one encounters thickets of stunted junipers, small-leaved rhododendrons (*Rhododendron ciliatum* and *R. setosum*) and riverine willow (*Salix sikkimensis*), and *Lyonia ovalifolia*. In areas cleared for grazing, the *alpine pastures and meadows* are dominated by species of *Potentilla, Geranum, Primula, Juncus,* and *Pedicularis*.

Areas immediately below the snow line are commonly known as *alpine screes* where dominant herb species of *Draba, Corydalis, Saxifraga*, *Androsace*, *and Geocarpus* abound. Due to the presence of generally lush undergrowth and grasses, grazing by domestic cattle is prevalent in almost all vegetation zones of the park.

Around 200 species of medicinal plants are expected to be found inside the park, mostly in the alpine region. Most valuable and widely collected are the Chinese caterpillar (*Ophiocordyceps sinensis*), *Picrorhiza kurroa*, and *Aconitum laciniatum* and *A. patulum*. In the lower areas, Himalayan yew (*Taxus baccata*) and several species of *Artemisa* (e.g., *A. dubia*, and *A. myriantha*) are believed to have chemical contents that can cure many diseases.

Many plants are used for making various household items. For instance, Daphne (*Daphne bhola*) and *Edgeworthia gardeneri* are used for producing paper, while burrs of *Acer campellii*, *Rhus simialata*, and *Rhododendron* spp. are collected for making wooden plates, bowls, and cups.

Being the only protected area closest to the nation's capital, people in the park extensively collect incense and wild vegetable not only for household consumption but also for sale in the markets in Thimphu. Incenses are made from juniper and several species of Rhododendrons. Wild vegetable species such as shoots of *Plectocomia himalayana*, flowers and fruits of wild orchids (*Cymbidium* spp.), wild mushrooms, wild ferns, and wild herbs such as *Elatostema platyphyllum, Allium* spp., etc. are collected in bulk for self-consumption and sale.

Due to the sheer number of plants that have ethno- botanical and medicinal values, JDNP offers a great potential for bioprospecting.

2.3 Faunal characteristics

Much as the floristic diversity, the faunal diversity of JDNP is astounding with

species from both the Palearctic and Indo-Malayan biogeographic realms (Wangchuk et al. 2004). So far, the park management has uncovered the presence of most vertebrates. Except for a few butterflies and a few insects, the park has yet to dive into the world of invertebrates.

JDNP has 50 species of mammals belonging to 18 families and 42 genera are confirmed to be present inside the park. Of these, 5 are EN, 6 are VU, and 8 are NT as per the International Union for Conservation of Nature's (IUCN) Red List of Threatened Species (IUCN 2021). In addition, 10 of these species are listed in Schedule I of the Forest and Nature Conservation Act (FNCA) of Bhutan, 1995. Recent camera trap studies during the Rapid Biodiversity Assessment (RBA) have revealed the presence of two new species of mammals, namely Particolored Flying Squirrel (*Hylopetes alboniger*) and Woolly Flying Squirrel (*Eupetaurus cinereus*) which is a new record to the park and the country, respectively.

Past surveys have revealed the presence of six to seven tigers in JDNP (DoFPS, 2015; Thinley et al., 2015) however, the recent camera trap activities resulted in the presence of six tigers within Punakha and Gasa areas (Jamtsho, 2020). The park has also recorded nine felid species and hence, the park is home to the highest wild felids in the country (Jamtsho et al., 2021). The park is also being recognized as the hotspot of snow leopard conservation in Bhutan (NCD, 2019). During the nationwide snow leopard survey, a total of 31 individuals have been identified in JDNP (DoFPS, 2016). With the presence of varying vegetation types, JDNP is a safe refuge to several other endangered floral, faunal and avifaunal species.

2.3.1 Avifaunal characteristics

The JDNP has a vibrant bird diversity and supports number of bird species of conservation concern (threatened species), and as of now, 407 species of birds, belonging to 71 families and 216 genera have been documented in the park. Of 407 species one species is CR, two species EN, 3 species VU, 7 species NT and 393 species least concerned (LC) (IUCN, 2021). The recent RBA survey recorded 272 bird species belonging to 143 genera and 59 families which is underrepresented by 33% of the total bird species in the park. Of 272 bird species, 57 were migratory species (Dendup et al., 2021b; 2021c). Four of the bird species are listed in Schedule I of FNCA 1995. The VU black-necked

crane (*Grus nigricolis*) is observed to make occasional visits to the park during its migration to and from China. The CR white-bellied heron has feeding and nesting sites along the Phochu river, especially in Toewang and Chubu gewogs of Punakha Dzongkhag.

2.3.2 Other faunal characteristics

The park recorded 184 species of butterflies belonging to six major families: Papilionidae (19), Nymphalidae (95), Pieridae (24), Rodinidae (7), Lycaenidae (27) and Hesperidae (12) (Dorji et al., 2021). Apart from the butterflies, there is no documentation of other invertebrates and fishes in the park. Fishes are confirmed in many rivers, tributaries and even in some of the alpine lakes.

In the case of reptiles, around 22 species belonging to five families, and 15 species of amphibians belonging to six families are recorded in the park (Koirala & Jamtsho, 2018). Apart from the butterflies, there is no documentation of other invertebrates and fishes in the park, although fishes are confirmed in many rivers, tributaries and even in some of the alpine lakes.

2.4 People and Livelihood

2.4.1 Demography

Acknowledging the importance of the community's role in conservation, JDNP has carried out a **socio-economic survey (SES)** to understand constraints and opportunities as perceived by local communities for reconciling development needs with conservation goals through the decentralization process.

As a result of SES with 100% sampling intensity, Dendup et al. (2021a) estimated population at 5026 people within 975 HHs living in 138 villages of 43 chiwogs under 10 gewogs administered by JDNP. There is a total of 2542 male and 2485 female population (Fig. 8). The mean HH are highest in Laya and Lunana. The population density is highest in Goenshari and Khamaed gewogs (Table 2) (Dendup et al., 2021a). The detailed technical report on people and livelihood in Jigme Dorji National Park has been published (Dendup et al., 2021a) and is available for further reference.

Table 2. Population estimates for resident communities of park administered gewogs 2020.

Gewog	Total Household	Mean Household	Estimated Population			Population density (per sq. km)
			Male	Female	Total	
Goenshari	100	3.4	351	377	728	8.42
Khamaed	117	4.5	382	413	795	5.33
Khatoed	73	5.2	222	189	411	1.43
Laya	262	32.8	554	540	1094	1.13
Lingzhi	95	9.5	240	200	440	1.14
Lunana	187	14.4	392	420	812	0.65
Naro	74	5.3	166	126	292	1.06
Soe	26	3.7	103	116	219	1.33
Toewang	3	1.5	4	2	6	0.02
Tsento	38	3.5	128	101	229	1.17
TOTAL	975	83.75	2542	2484	5026	21.68

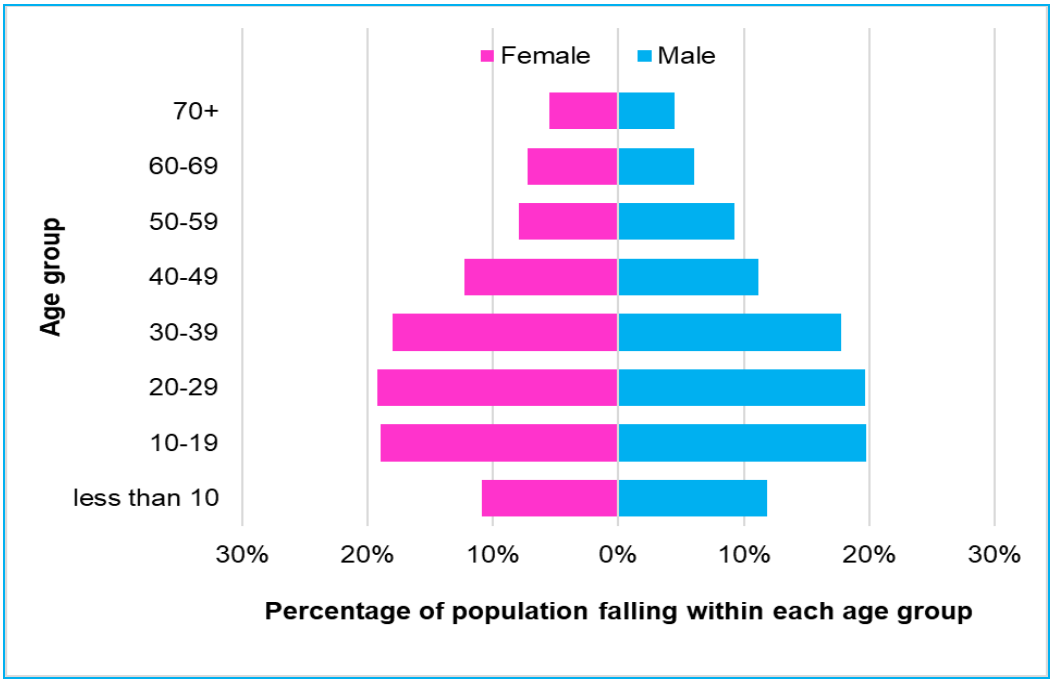

Figure 8: Distribution of population according to age group and gender in JDNP 2020.

2.4.2 Highland communities and culture

People residing in the park above 3,000 meters practice roughly a semi-nomadic pastoralist livelihood, primarily subsisting on raising yaks. Around 70 percent of the population own yaks (Dendup et al., 2021a), which are considered as the stable source of livelihood.

As opposed to the popular trademark of yak herding, some highland communities grow wheat, barley and mustard. In the year 2019-2020, Laya gewog had the highest yield of wheat with 30215 kgs and Tsento with the lowest of 1750 kgs (Dendup et al., 2021a). Few vegetables are grown in a short period to supplement their diet and as fodder for their yaks.

Sighting of many herds of yaks grazing in the alpine meadows are common while trekking through the northern belt of the park. Yak herding communities own traditional grazing rights over pasturelands locally known as *Tsamdro* that are inherited from their ancestors. Occasional disputes arise among the communities concerning use and encroachment into each other's grazing territory. To maintain the pasturelands, yak herders clear and burn the bushes and trees, often violating the forestry rules. As of now, there is no scientific management plans to guide the yak herders in sustainable management of their rangelands, although such requirements are stressed by the Land Act of Bhutan 2007. A total of 19,414.81 acres of individual and 492.15 communal *tsamdro* is owned by the highland communities (Dendup et al., 2021a).

Culturally, yak herding communities are referred to as *Bjops* by the lowland people in Bhutan. Some of the *Bjops*, especially Layaps have their unique costumes that are made from yak hair. They also have their unique songs and traditions in worshipping the local deities. For example, people in Laya celebrate *Auley* as the annual festival to forge harmonious co-existence and to achieve communal peace and prosperity. Polygamy is practiced in highland communities, mainly for pooling manpower and retaining family properties.

Energy use is central to human activity for preparing food, warming homes, powering travel, and producing goods, among many other purposes. The pressure on the fuelwood requirement has decreased over recent years due to rural electrification and the availability of alternative sources of energy such as Liquified Petroleum Gas (LPG) and biogas. Power supply has reached in all

gewogs except Lunana and Naro (electrification works are ongoing and in about a year, the Naro gewog too will be connected with electricity). For cooking, the majority of the HHs use electricity and LPG, and for heating, fuelwood is preferred (Dendup et al., 2021a).

Rice is the main staple diet of almost all highland communities. The practice of the barter system is prevalent only in Laya (*n = 105*) and Naro (*n = 1*) gewogs. In general, the highlanders used to exchange incense with rice and chilli followed by butter, cheese and *"Chugo"* (Dendup et al., 2021a). Conditioned by bitter catastrophic events in the past, most *Bjobs* stockpile their rice in multiple rice bags stacked in their houses to last for more than a year. Stockpiling of grains is normally done in winter when the temperature suddenly drops and more than half of the people migrate to the lowlands. This the time of the year when they carry out transaction of their goods to buy other necessities.

2.4.3 Lowland communities and culture

Lowland communities are those residing below 3,000 meters in the park and they subsist on a mixed farming style where agriculture is the dominant practice and domestic cattle are reared for dairy products and farmyard manure.

People in the lowlands grow a variety of crops depending on their location at specific elevations and soil types that determine differential growing conditions for different crops. Rice is the staple diet, and hence rice is predominantly grown by many lowland communities. In areas where rice cannot be grown, people grow potato and maize as supplemental diets. Lowland communities harvest nature's bounties such as wild mushrooms, fern, *namdha* (*Pogostemom amaranthoides*) and few orchid species to supplement their diet.

In the lowlands, cattle are released into the forest for grazing, either free-ranging or guided by a herder, and are brought back to the cattle pens in the evening. To collect a huge amount of leaf litter, farmers own certain patch of forest cover dominated by oaks (*Quercus griffithii*) and blue pine (*Pinus wallichiana*) near their villages, locally known as *Sokshing*.

Houses are typically wood-intensive in structure with lavish use of wood as flooring, pillars, partitions, and roofing. Annually, huge quantities of trees are

cut for new house constructions and maintenances. Nowadays, the wooden shingles are replaced by new and longer-lasting roofing materials such as the CGI (corrugated galvanized iron) sheets. In the past, the park management has supplied CGI sheets to many households in the lowlands on a subsidy basis with support from UNDP-GEF and SDS project funded by the Netherlands (Thinley et al., 2015). The park has supplied a total of 11278.8 m3 of subsidized timbers to the communities of the park from 2016 – 2020.

In the olden days only, fuelwood was the main source of energy used in daily sustenance. With electricity and LPG making their way to remote locations, the pressure on fuelwood requirement is decreasing. In the fiscal year (2020 – 2021), the park has also supported 12 biogas plants with financial support from Bhutan for Life (BFL) projects to reduce pressure on fuel wood. Despite the availability of electricity and LPG, park management allotted 6,080.28 m3 of firewood to the park communities.

Lowland communities are distinctly referred to by their ethnic groups. For instance, people of Goenshari, Khatoed, and Khamoed gewogs are collectively known as *Goen* while people of Kabesa are known as *Kabjib* and those from Tsento gewogs are called *Tsentops*. Each ethnic community has distinctive historical legends, accents, ways of celebrating festivals and folk dances and honouring their local protective deities. The famous romantic saga of Gasa Lamai Singye who was from Gasa and Changyul Galem who was from Punakha Dzongkhag is still being vividly remembered by the people of Gasa and Punakha Dzongkhag and also by many people across the country.

Some lowland communities, for example in Damji, still impose an age-old tradition of *reedham* (travel ban into a forest by locals and outsiders) during crop cultivation and harvesting periods. Such restrictions are enforced to avoid provoking the local deities which otherwise would inflict catastrophic damage to crops and domestic animals.

2.4.4 Religious sites

Aside from myriad cultures, JDNP has many religious sites of great importance. In the 8th Century, the great Indian Saint Guru Padmasambhava, had meditated in a cave at Geon Tshephug Ney which is situated in Goenshari gewog. Since

he saw the live image of Sangay Tshepagmoed (Buddha of Eternal Life) there, the site is also called the second Draphug Marutika, next to the one in Nepal. Guru was also believed to have flown from Tshephug Ney to Tshechu Drak in Khamoed geog where he meditated for several days.

History also has it that a great Tibetan Lamas Phajo Drugom Zhigpo and Drukpa Kuenley (also known as the Divine Madman) were said to have entered Bhutan via JDNP. Likewise, the highly revered Lama Zhabdrung Ngawang Namgyal came to Bhutan through JDNP. He was said to have come via the Wakeyla Pass, stayed for a couple of days in Laya and then descended via Koina to Gasa.

JDNP is also known for having the largest number of meditation retreat centres and hermitages. Many of the sacred caves and hermitages in the alpine areas are used for meditation by devout spiritual seekers who retreat in secluded caves for years after denouncing worldly affairs.

Further, the park has many other sacred monasteries and temples, such as Lheydi Goenpa in Tsento gewog; Jomolhari Neykhang at the base of Mt. Jomolhari; Chari Monastery in Kawang gewog; Nangse Goenpa in Punkaha; Sibji Goenpa and Choten Goenpa in Khamoed gewog and Zabsoel Goenpa and Phulakha Lhakhang in Khatoed gewog; Yonzo Lhakhang and Dung Goenpa in Laya gewog; Tshojong Dzong in Lunana gewog; and Lingzhi Dzong in Lingzhi gewog.

2.4.5 Economic characteristics

Communities in the alpine regions of the park depend on yaks and their products for living and most of them live a semi-nomadic life. Besides income from livestock, the highlanders collect and sell NWFPs for their livelihood (*details in 4.1.1.3*).

These invaluable medicinal plants have dramatically boosted the household income and even living standard of the highland communities. For instance, in Laya, unlike in the past most households can now afford to have more than one household and splitting of age-old large family units into several separate households has recently been a trend in the gewog.

In addition to medicinal plants and yak products, yak herders get yet additional

income from rendering porter services to tourists and government workers. Hence, it is common that some highland people rear a large herd of pack ponies and solely earn their livelihood from porter services. As of today, Laya is even halfway connected by a farm road (till Tongchu), while Naro gewog has a farm road connection to the gewog centre at Barshong.

People in the mid and lower elevations (temperate region) communities do both subsistence agriculture and livestock rearing. The communities collect and sell mushroom, ferns, wild walnuts, *Paris polyphylla*, edible orchids and some other wild vegetables. The total income earned through the sale of NWFPs (2017 – 2019) and livestock product (2019) by all the gewogs in the park was Nu. 540.58 million and Nu. 20 million, respectively (Dendup et al., 2021a).

Some of the lowland people engage in carpentry, painting, tailoring, and other craft works to supplement their income. Some engage in delivering porter services to tourists and hot spring visitors. Some receive remittances from relatives who are employed in government, corporate, and private agencies.

2.5 Other management regimes

2.5.1 Community forest management plan

In pursuance of the government's policy of decentralized management of natural resources, JDNP has eight community forests (Table 3) with a total area of 858.31 hectares (ha) benefiting 216 households. Five CFs have revised their management plan for 2nd term (10 years), The establishment of community forest has benefited rural communities in many ways, such as easy access to local resources, conservation of nearby resources, income generation, and protection from illegal exploitation and rehabilitation of degraded forest lands. Presently, eight community forest management groups (CFMG) have a total amount of Nu. 22, 42,990.94 (twenty-two lakhs forty-two thousand nine hundred ninety and ninety-four chetrum) only accumulated in their CFMG account and the per capita income of the CFMG member is Nu. 10,384.22. Nonetheless, the contribution from the community forest is immense in terms of increase in area under afforestation; watershed and water source protection. This is mainly because the sense of ownership has been entailed in the mind of

every community forest beneficiaries and their efforts to safeguard the resources from being depleted.

Table 3: Details of community forests in Jigme Dorji National Park.

Name of the CF	Dzongkhag	Gewog	Year of est.	Year of revision	Area (ha)	Member (nos)*	AAC/ AHL**	Remarks
Rangzhen Kuenphen	Gasa	Khatoed	2008	2020	206	46	20,200.19 cft	AAC
Tashi Thongmen	Gasa	Khatoed	2012	NA	27.2	11	1 number	AHL
Deychog Samdrup Gongphel	Gasa	Khamoed	2012	NA	50.3	25	23 Drashing 39 Cham 10 Tsim 4 Dangchung	AHL
Jigme Dorji Kuenphen	Gasa	Khamoed	2010	2021	193	49	12,693.23 cft	AAC
Panikong	Gasa	Khamoed	2010	2021	34.6	11	762.21 cft	AAC
Yemina	Gasa	Khamoed	2007	2021	81	25	3825.81 cft	AAC
Goendrab Chitheun	Gasa	Khamoed	2009	2020	109	23	8000.82 cft	AAC
Gadhen Drongyel	Punakha	Goen Shari	2013	NA	157	26	60 Drashing 105 Cham 68 Tsim 270 Dangchung 136 nos. firewood	AHL
*Number of households								
**AAC - Annual Allowable Cut (New method) **AHL - Annual Harvesting Limit (Old method)								

With the empowerment of the local governments in decision making, the park management participates in local planning and meetings (Dzongkhag Tsogdues and Gewog Tshogchungs) and discuss issues related to park management and the use of natural resources.

2.5.2 Non-wood forest product management plan

Non-wood forest products (NWFPs) continue to be a vital natural resource to the rural communities for their livelihood and food security in many parts of the country (Gurung, 2017). NWFPs provide food, medicine, raw materials, and income to rural communities. The contribution of NWFPs to peoples' livelihoods have been widely acknowledged in Bhutan. There are many NWFPs

in the park, however, only a few species viz. *Ophiocordyceps sinensis*, *Picrorhiza scrophulariiflora* and incense (*Nardostachys jatamansi*, *Rhododendron anthopogon, R. setusom*, *Juniperous* spp.) have been widely collected and has contributed immensely to the livelihood of the park resident, especially the highland communities.

Over the years, the collection of NWFPs has been very rampant and indiscriminate. In order to ensure the long-term sustainability of these NWFPs, the involvement of local communities in the conservation of NWFPs has been felt necessary. Their involvement will not only ensure that they reap maximum benefits in terms of enhancement of their livelihood but also sustainability of some of the rare NWFPs. As of today, JDNP has managed to form five NWFP management groups (Table 4) and the income from cordyceps alone contributed to about 88.4% (Dendup et al., 2021a).

Table 4: Details of NWFP groups in Jigme Dorji National Park.

Dzongkhag	Gewog	Year of est.	Year of revision	Member household (nos)	Total species	Annual harvesting limit (kgs)
Gasa	Laya	2020	NA	262	20	216
Thimphu	Lingzhi	2019	NA	82	36	4490
Thimphu	Naro	2019	NA	73	56	20,486
Thimphu	Soe	2012	2019	28	7	5500
Paro	Tsento	2014	2019	19	7	4750

2.5.3 Local forest management plan

Currently, considerable State Reserve Forest Land under JDNP is under tremendous pressure and the park management is having difficulties in meeting the timber demands. From 2016 – 2020, a total of 35,660.34 m^3 of timbers (both rural and commercial) were allotted. In doing so, some of the forest areas have been underutilized, while some of the areas within the proximity of access roads have been over-harvested. Except for community forests, no management plans for sustainable harvesting of timbers have been developed.

In an attempt to bring forest resources of JDNP under sustainable management regime (management and utilization) and to supply timber on a sustainable basis, the park management has proposed to develop four Local Forest Management Plan under Khatoed, Laya, Khamaed and Goenshari gewogs within the fiscal year 2022 - 2023. The details of the Local Forest Management Area (LFMA) and its results (AAC, Protection Area and Production Area) will be presented as an addendum after the LFMP works are carried out.

2.5.4 Water Source Inventory

To determine the baseline information on several water sources used for drinking, irrigation and other purposes and also to study the trend of drying water sources and their underlying causes, the park management in collaboration with Watershed Management Division (WMD) has carried out an inventory of water sources in the entire park.

The park management has recorded 256 water sources covering 12 gewogs in the park benefiting 975 HHs. All these water sources are tapped for drinking (86.3%) and irrigation purposes (13.67%). Spring (70.3%) and stream (18.75%) water are the main source of water in the park (Fig. 9). Spring water is tapped mainly for drinking purposes and streams for irrigation purposes. The assessment result indicated about 11.7% (*n = 30*) of the water sources are in drying condition, 2.34% (*n = 6*) in dried-up condition and the remaining 85.93 % (*n = 220*) are in similar condition as previous years (no changes in the status of the water sources). The reasons behind the drying up of water condition are attributed to less snowfall in the area, frequent earthquakes, intensive grazing and felling of trees in the catchment areas. In order to address the issue, the park management needs to monitor and validate the existing information and also assess the water sources that have not been inventoried. Further, there is a need to look into possible management interventions to revive the dried-up water sources.

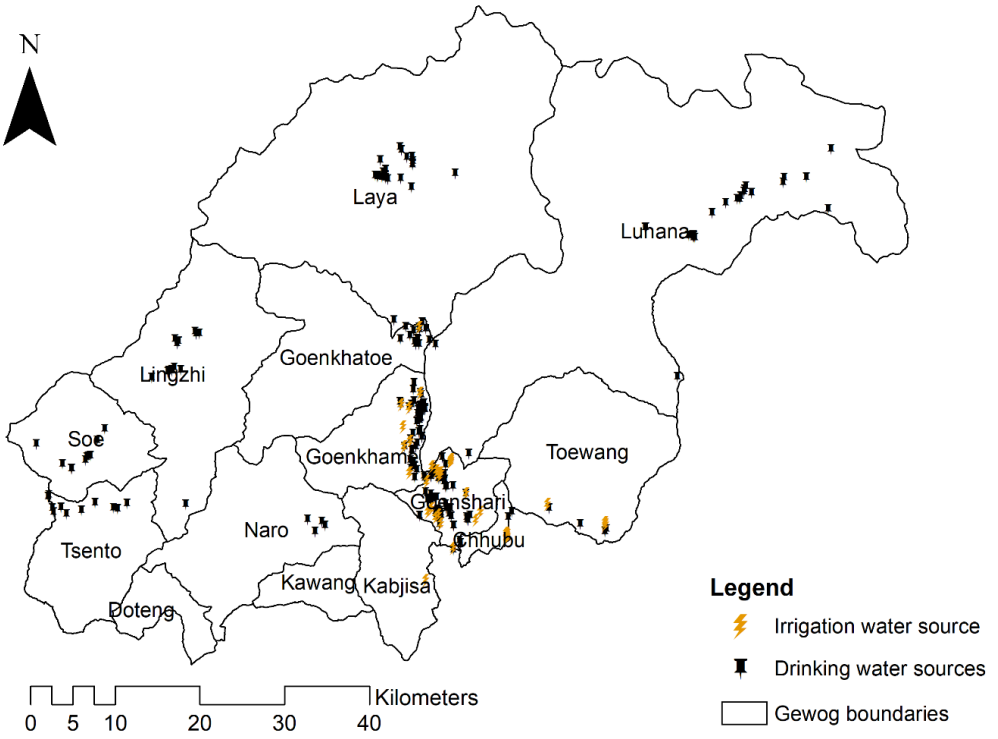

Figure 9: Location of water source for both drinking and irrigation purposes for the local communities in Jigme Dorji National Park.

2.6 Administrative, service delivery and park infrastructure

2.6.1 Current administrative settings

Administratively, the entire park area is spread over four Dzongkhags (districts); Gasa, Punakha, Thimphu and Paro, encompassing 14 gewogs (administrative blocks). The head office is located at Damji in Gasa Dzongkhag and the park is currently manned by 72 staff (Table 5, Fig. 10, Fig. 11). Services to these districts are catered by six Park Range Offices (Ranger stations) (Fig. 12).

For effective service delivery, the Soe Range Office has its field office at Ramitsekha in Tsento gewog while Lingzhi Range Office has a visitor centre and a check post at Dodena in Kawang gewog. Gasa Range Office has a beat office at Khamoed gewog and the Lunana Range Office has a field office at Tashithang.

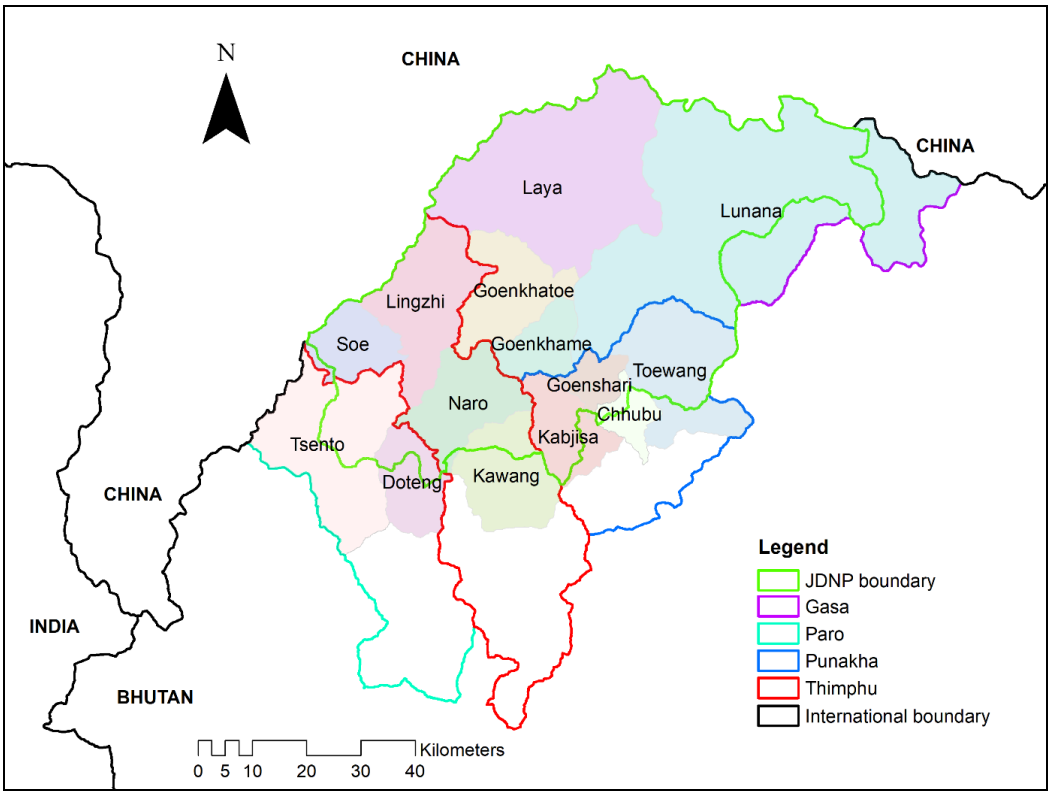

Figure 10. Map showing Jigme Dorji National Park boundary across districts and sub-districts and the international boundary.

Table 5: Staff strength of Jigme Dorji National Park (approved vs existing).

		As per approved Organizational Development Exercise		
Sl. no	**Name of office station & Location**	**Position/rank**	**No. of approved staff**	**Existing no. of staff**
1	**Park Head Office, Damji**			
	i) Administration, Accounts and Data Section	Chief Forestry Officer	1	1
		Accounts Asst.	1	1
		Adm Asst.	1	1
		Asst. Forester/Forest	1	1

		Ranger		
		Driver		1
		ESP		1
	ii) Forest Resource Management Section	Forestry Officer	1	
		Asst. Forester/Forest Ranger	1	2
	iii) Forest Protection & Enforcement Section	Forestry Officer	1	
		Asst. Forester/Forest Ranger	2	1
	iv) Nature Conservation Section	Forestry Officer	1	2
		Asst. Forester/Forest Ranger	2	
	v) Social Forestry and Extension Section	Forestry Officer	1	1
		Asst. Forester/Forest Ranger	1	1
2	Range/FMU/Beat offices/Outpost	Forestry Officer	1	
		Asst. Forester/Forest Ranger	38	
3	Soe Park Range Office, Dangojong	Park Range Officer		1
		Staff		9
		ESP		1
4	Lingzhi Park Range Office, Lingzhi	Park Range Officer		1
		Staff		10
		ESP		1
6	Ruecheyna Park Range Office, Goenshari	Park Range Officer		1
		Staff		7
		ESP		1
7	Gasa Park Range Office, Gasa	Park Range Officer		1
		Staff		10
		ESP		1
8	Laya Park Range Office, Laya	Park Range Officer		1
		Staff		5
		ESP		1
9	Lunana Park Range Office, Lhedi	Park Range Officer		1
		Staff		7
		ESP		0
	TOTAL STAFF		**53**	**72**

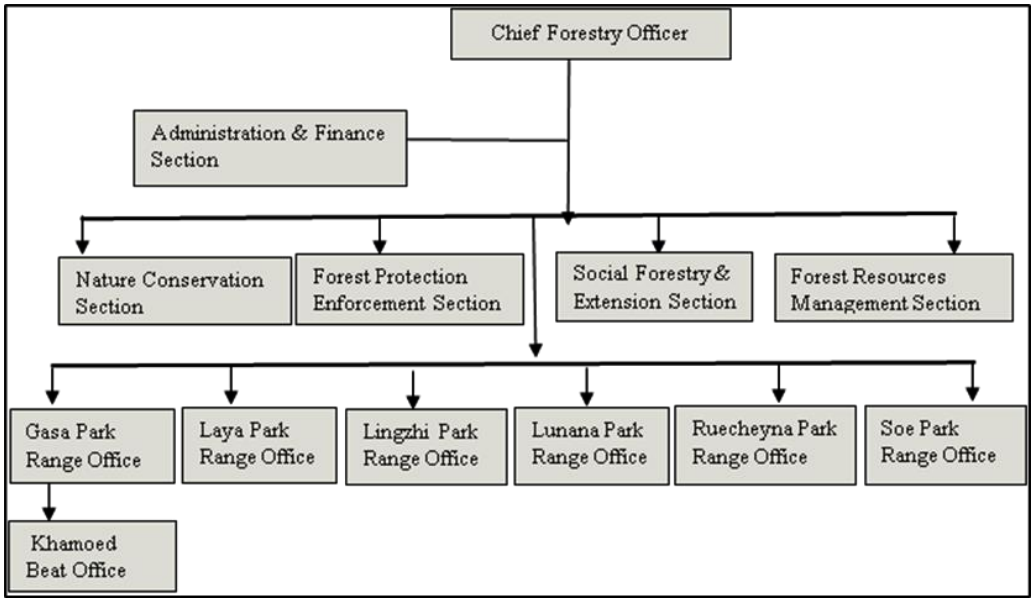

Figure 11: The current administrative organogram of Jigme Dorji National Park.

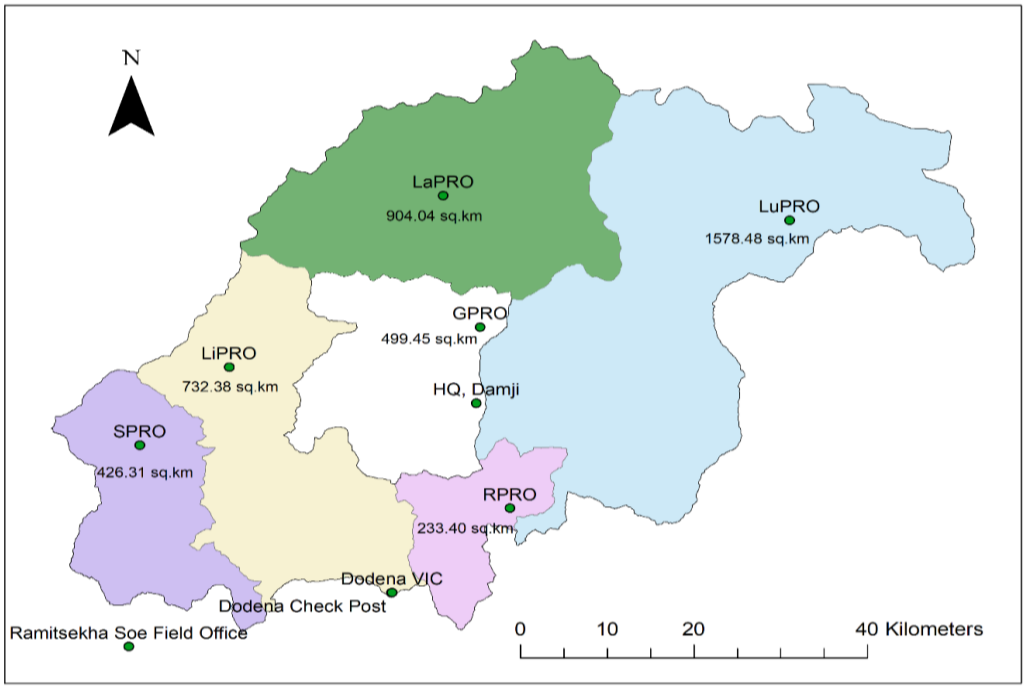

Figure 12: Map showing area of range offices under JDNP with the location of field offices, VICs and checkpoints.

CHAPTER 3: Summary Review of The Past Management Plan

3.1 Nature conservation and research

The species monitoring format was developed for key species such as blue sheep, takin, musk deer, tiger, and snow leopard. Seasonal habitat uses and diet selection of Takin was studied and documented. The disturbance to the summer breeding habitat of takin at Tsharijathang was solved with signing of an agreement with the local herders who promised not to release their yaks and horses when all takins have arrived there.

Conducted camera-trapping of snow leopard and tiger in JDNP. The highest snow leopard population was recorded in JDNP (*n = 31*) (DoFPS, 2016) and tiger population was estimated to six individuals (DoFPS, 2015).

Besides nationwide camera trap survey for tigers and snow leopards, other intensive camera trap surveys have confirmed the presence of other charismatic species like clouded leopard, marbled cat, Asiatic golden cat, and Pallas's cat. The result assured JDNP to be an important conservation area for large and small cats. The presence of 48 mammals (now 50) was confirmed and enlisted. Other studies such as seasonal habitat uses and diet selection of Takin was conducted to map and protect their critical habitat (Wangchuk et al., 2015). Tsharijathang was declared as critical summer habitat of takin. A study on winter distribution and poaching of musk deer, *Moschus chrysogaster* and *Moschus leucogaster* in Jigme Dorji National Park was conducted that helped to understand the winter habitat range of musk deer as well as poaching dynamics (Dendup et al., 2018). Similarly, a study on the current distribution and conservation status of Bhutan Takin *Budorcas taxicolor whitei* was carried out that laid baseline to adopt appropriate conservation measures (Sangay et al., 2016).

The draft park zonation was produced in 2016 and revised in 2020 according to the zonation guideline of DoPFS. The SMART patrolling was conducted every month by Range offices to curb poaching, fishing, and other illegal activities as well as to collect data on wildlife occurrence. Every year 72 SMART patrols are conducted through the financial support from Bhutan for Life.

Habitat restoration works such as improvement of five critical waterholes and two salt lick sites as part of wildlife habitat conservation was carried out. Three

hectares of alpine meadow improvement was carried out at Soe and Lingzhi gewog. Plantation works in 26.5 ha aross eight community forest and 1.8 ha in state reserved forest land was also carried out.

3.2 Ecotourism programs

A visitor campsite at Shatem eco-camp ground with toilet and kitchen facility was created and handed over to the management of Goenshari Primary School. The objective behind handing over of the eco-camp to the school was to instill ecotourism concepts to the students and to help develop the school from the rental money earned from the eco-camp.

3.3 Integrated Conservation and Development Programs (ICDPs)

Solar lighting facilities were distributed to more than 100 households in the highland regions of the park to create awareness among the yak herders about alternative energy sources and to reduce pressure on scarce wood resources. Moreover, CGI sheet was provided to 50 selected household to reduce pressure on timber demand for wooden shingles.

Other ICDP activities such as sound-alarm fencing materials were issued to the farmers of Damji to test the efficacy in warding off bears and pigs. The fencing materials were very effective against bears. To promote agroforestry and diversify the income of the farmer, machines to extract oil from Pangtse shing (*Symplocos theaefolica*) were supplied to each of Toewang, Chubu, Shenga-Bjemi, and Kabji gewog of Punakha Dzongkhag. The park management supported the establishment of eight CF and five NWFP groups. A community-based snow leopard conservation program was initiated in Soe gewog. Farmers are expected to benefit from ecotourism while supporting the conservation of snow leopards in their gewog.

The biogas installation was supported to 12 households in low land park residents to reduce pressure on fuelwood resources. Park management has supported electric fencing installation benefitting 20 households at Zhelngosa chiwog under Goenshari gewog 72 households at Khamoed gewog and 48 households at Goenshari gewog. Besides electric fencing, solar fencing benefitting 151 households in three gewogs Khatoed, Khamoed and Goenshari were also provided.

3.4 Environmental education and awareness programs

Local leaders and religious leaders were sent to the Philippines and Nepal for the awareness program. Two community schools, one each at Laya and Lingzhi, were constructed with funding support from the park and the donors to appreciate park effort by local communities.

In collaboration with the Tourism Council of Bhutan (TCB), four medicinal baths and sheds were developed for four menchus in Gasa (Tokay menchu, Jagoe menchu, Yami menchu and Mangdi menchu). Benefits to local people are accrued from fees collected by local groups. In collaboration with Punakha Dzongkhag with funding from Bhutan Trust Fund for Environmental Conservation (BTFEC), the park management built additional guest house and bathing facilities at Chubu tshachu, and improved the mule track to tshachu. In partnership with TCB, improved campsites were developed at Shana, Thangthangkha, and Jomolhari base, and the management of the campsites were handed over to the nearby communities and local entrepreneurs. Festivals such as Takin and Mountain Festival were organized in the park where the responsibility of organizing the events is shared with the local communities. Such festivals have fostered park residents' positive attitude towards the park after understanding the significance of the park while benefitting monetarily from international and national visitors.

The park also conducted massive awareness campaign and organized educational programs for the park residents on the ecological roles of wild predators. The awareness program was carried at Goenshari, Toewang, Khamoed, and Chubu communities.

3.5 Administrative set-up and capacity development

As part of capacity building, all field staffs were adequately trained in the use of GPS (Global Positioning System), camera traps, rapid biodiversity survey, and socioeconomic survey. With the rolling out of SMART patrolling, more than 63% of park staff were trained in SMART patrolling techniques. These trainings are expected to help collect reliable and accurate field data during surveys and antipoaching works. Many park staff were sent for a study tour to Thailand to understand protected areas management. Laya Guard Post and Lheydi Guard Post was upgraded into full-fledged Park Range Offices, and thus

service delivery and relationship with the people in those two gewogs immensely improved.

3.6 Infrastructure development for the park

A new Park Range Office along with staff quarters was constructed at Ruecheyna for the Ruecheyna Park Range. Service delivery to Goenshari and Kabji gewogs were immensely enhanced through the new range office. A new office cum residence was constructed at Soe Dangojong (Jomolhari base) to house patrolling team during the peak patrolling seasons, and also to provide timely service to the people of Soe gewog and upper Tsento gewog (Nubri and Yaktsa villages). Eight units staff quarter was constructed at Damji Park headquarter to provide comfortable and affordable accommodation to the headquarter staff. Most of the Park Range Offices and staff quarters in the field were carried out with major renovation works that significantly uplifted the motivation of field staff to work efficiently. Since the park field offices are located in remote areas without network outreached, handsets were provided to the field offices that enabled better communication within field staff. The park head office is provided with one number 4wd Hilux and one number motor bike for effective service delivery.

3.7 Lesson from the past management plan

The following are some of the important lessons learned from the past management plans:

- ✓ The past management plans have guided and steered the conservation success of the park. Strengthening the institutional capacity was the priority for efficient service delivery and in achieving the strategic conservation goals. The six range offices are located at strategic location to have better outreach in carrying out conservation activities. Lack of adequate infrastructure and internet facilities at range offices need to be prioritized.
- ✓ Indisputably, JDNP is a treasure trove of invaluable plants and animals that the country can be proud of. It is home to many globally threatened species of flora and fauna. The conservation strategies are aligned in conserving keystones and flagship species such as tiger, snow leopard and takin and their critical habitat. The keys species and their population status, and distribution have been well documented. Now need to focus

more on studying lesser-known flora and faunal species to develop a holistic conservation plan.

- ✓ Community participation is the most powerful tool for environmental conservation in protected areas. The awareness program was conducted on the importance of predators inside the forest and provided alternative fuel sources such as solar lighting and biogas to park residents that live adjacent to critical habitats of keystone species as an incentive. Thus, the incidence of retaliatory killing and negative attitude toward conservation was drastically reduced.
- ✓ JDNP is prone to poaching such as musk deer, bear and snow leopard. The introduction of SMART patrol in the park has greatly reduced the incidence of wildlife poaching and other illegal activities. Further, we need to increase and intensify the frequency of patrolling, monitoring, and anti-poaching efforts to ensure the protection of wildlife.
- ✓ The negative human-wildlife interaction is pressing conservation issues in the park. Park management has provided solar and electric fencing to communities to reduce crop depredation by wild herbivores. To mitigate and minimize the incidences of negative human-wildlife interactions in the park, park management should perform ecological researches on nature, extent, seasonality, and the main causes of crop depredation by wild herbivores.
- ✓ The communities within park jurisdiction depend on the collection of NWFPs as an alternative source of income. Five NWFPs groups are instituted to bring these resources under a sustainable management framework. Park management need to further frame species-specific management framework for all important NWFPs such as *Ophiocordyceps sinensis, Picrorhiza kurroa, Nardostachys jatamansi, Rhododendron setosum,* and *Rhododendron anthopogon*.
- ✓ Securing fund for financing a major part of the park management activities is the biggest challenges. As always, biodiversity conservation and park management incur a lot of expenses for safeguarding resources, training of manpower, and establishment of facilities and structures. The majority of the past plan activities was not executed due to a lack of financial support. Right now, Bhutan for Life has been financing a major part of the park management activities.

3.8 Gaps and carry over actions from the previous plan

Of 5 strategic goals and 18 objectives with 73 actions prescribed in the last management plan (January 2015 till the end of December 2019), not all the objectives have been met or achieved. One of the major barriers contributing to the non-achievements of the programs and the activities is the non-availability of funds. The carryover activities from the past management plan are presented in Table 6 below.

Table 6: Past management plan actions that are carried over in the current management plan.

Sl. #	OBJECTIVES AND ACTIONS (Plan of 2015 - 2019)	Carried Over (Plan of 2021 - 2031)
1	Objective 1.1: *Ensure protection of the critical habitats of tigers, snow leopard and takin by the end of 2019.*	
1.1	Action 1.1.1.1: Create several restrictive and non-restrictive management zones, such as core, multiple use, recreational and buffer zones in the park.	Yes
	Action 1.1.1.2: Integrate the adaptability of the target species to impending effects of climate change while defining boundaries of management zones.	Yes
	Action 1.1.1.3.: Thoroughly consult the local communities through participatory rural appraisals while planning and delineating the boundaries of restrictive zones, particularly the core zone.	Yes
	Action 1.1.1.4: Fix boundary pillars on the external boundaries at regular intervals and fix few pillars in the core and multiple-use zones.	Yes
2	Objective 1.3: *Maintain zero poaching of tiger, snow leopards, and takins in the park until December 2019*	
2.1	Action 1.4.2.1: Secure adequate funding to compensate livestock losses to tiger, snow leopard, common leopard, dholes, and Asiatic bears in the park.	Yes
	Action 1.4.2.2: Institute community-based livestock insurance schemes to offset livestock losses to tiger, snow leopard, common leopard, dholes, and Asiatic bears.	Yes
3	Objective 2.1: *Reduce the incidences of crop damages by wild herbivores in the park by 30% of 2010 baseline by December 2019.*	
3	Action 2.1.1.1: Perform ecological researches on the nature, extent, seasonality, and the main causes of crop depredation by problem wild herbivores in the park.	Yes

4	Objective 2.2: *Reduce the number of livestock damages by wild predators by 30% of 2010 baseline by the end of December 2019*	
4	Action 2.2.1.1: Study the extent of lax livestock herding practices and its underlying causes in the park	Yes
4.1	Action 2.2.1.2.: Institute communally acceptable livestock herding regulations.	Yes
	Action 2.2.2.1: Conduct surveys to estimate the population of wild prey populations and assess the adequacy of prey biomass to predators of livestock in the park.	Yes
	Action 2.2.3.1: Conduct awareness campaigns on the ecological effects of scrub cattle and the benefits to having manageable and productive herd of cattle.	Yes
	Action 2.2.3.2: Supply high yielding breeds of livestock in livestock depredation on hotspots.	Yes
	Action 2.2.4.1: Experiment and explore methods to protect juvenile yaks using proper fencing mechanisms against snow leopards.	Yes
	Action 2.2.4.2: Replicate the methods to yak herder communities.	Yes
5	Objective 2.3: *Maintain the incidences of retaliatory killing below 10 until December 2019.*	
5.1	Action 2.3.1.1: Conduct awareness campaigns to farmers and yak herders on the legal implications of retaliatory killing.	Yes
6	Objective 3.2: *Bring 8 major pasturelands under scientific management in the highland regions of the park by December 2019.*	
6.1	Action 3.2.1.1: Identity 8 major pasture lands in the highland regions of the park.	Yes
	Action 3.2.1.2.: Delineate clear boundaries of pasturelands by using GPS and GIS technologies.	Yes
	Action 3.2.3.1: Train and develop the skills of Park Range Officers in scientific management of rangelands.	Yes
	Action 3.2.3.2: Develop scientific management plans for 8 major pasturelands in the northern part of the park.	Yes
7	Objective 4.2: *Create at least 5 community-based ecotourism ventures in the park by December 2019.*	
7	Action 4.2.1.1: Create awareness among 5 communities in and around the park benefits of community-based ecotourism ventures centered around key resources such as hot springs, campsites, and flagship species.	Yes
7.1	Action 4.2.1.2: Send some enthusiastic communities on exposure trip to the nearby country where community- based ecotourism ventures are successful.	Yes

	Action 4.2.1.3: Create 5 community-based ecotourism ventures based on either one of or combination of hot spring, medicinal baths, takin, and snow leopard in the park.	Yes
	Action 4.2.2.3: Create a viable system, including reward systems, of garbage collection from garbage pits and bins and disposal to appropriate garbage landfills, dumpsites, and collection points for sale.	Yes
	Action 4.2.3.1: Renovate and construct new bridges along the popular trekking routes in the park.	Yes
	Action 4.2.3.2: Maintain the dangerous sections of mule tracks along the popular trekking and heavily travelled mule tracks	Yes
8	Objective 5.4: *Increase the number of Guard Posts to 7 by the end of December 2019.*	
8.1	Action 5.4.1.1: Secure donor funding for construction of additional field offices	Yes
	Action 5.4.1.2: Construct a Guard Post with staff quarters at Neptengkha to cover the areas of Toewang and Upper Chubu gewogs and to curb illegal activities in the region	Yes
9	Objective 5.5: *Improve communication facilities in terms of internet connectivity and mobility in all Park Range Offices and Guard Posts by December 2019.*	
9.1	Action 5.5.1.1: Secure funding from RGoB and donors for establishing broadband internet connections in all Park Range Offices and some Guard Posts.	Yes

CHAPTER 4: Analysis of Threats, Challenges and Opportunities

4.1 Analysis of conservation issues and threats

As per the Management Effectiveness Tracking Tools Plus (METT+) exercise carried out in all the range offices of JDNP and in addition to it, the data from Forestry Information Database (FID), SMART patrol, the recent SES and RBA surveys, have identified several threats to the conservation of natural resources in the park. The inevitable development activities booming in the park area is posing arguably the greatest threat through habitat loss and habitat fragmentation. We are inflicting unprecedented changes on the natural habitats on which wildlife depends, through deforestation by the construction of roads and transmission lines. The threats are discussed in the subsequent sections.

4.1.1 Destruction and degradation of wildlife habitats

4.1.1.1 Increasing developmental activities

With the booming of developmental activities in the park, habitat loss has accelerated mainly due to linear infrastructure development (road construction and transmission lines). The supply of energy is indisputably a key development priority of the RGoB. Hence, every year, the government allots large areas of SRF land for transmission lines. In the period July 2020 – June 2021, JDNP has lost 52.813 ha of forest land (Dendup et al., 2021c). Clear-cutting a swath of forest along the transmission line and road is fragmenting the habitat of wildlife. Additionally, clearing the corridor could eliminate certain native plants. The transmission line from Pangrizampa in Dechenchholing to Damji substation resulted in the loss of vast tracts of forest cover.

Due to high forest cover, road construction is inescapably resulting in substantial deforestation in the park, particularly where roads are being built in forested landscapes. Most households in Khatoed, Khamaed, Goenshari and Tsento has farm road connection which accounts for 43.04% of the total HHs in JDNP. Goenshari goweg got farm road between 2010 and 2018 and Tsento gewog between 2010 and 2013. Ramina under Lunana gewog got in 2017. Likewise, the road from Gasa to Laya is currently being built (reached Tongchu), and it cuts through several migration routes of takin. Similarly, the

farm road has reached the gewog centre at Barshong in Naro gewog from Dodena and this road too had a devastating effect on the environment.

4.1.1.2 Excessive harvesting of timber

The booming developmental activities within the park jurisdiction demand more timber supply for both rural houses building as well as other developmental activities. Within 12 years 394 HHs were allotted timber for new construction and 223 HHs were allotted for renovation/ extension of their house. For the new construction of the house, JDNP has allotted approximately 1576 thousand cubic feet (cft) of timber and 156.1 thousand cfts for renovation or extension. For other construction like kitchen, toilet, cowshed, and storehouse, rural communities are entitled to 40 tsims and 50 dangchungs once in 5 years. JDNP has allotted rural subsidized tsim and danchung for 183 HHs in 5 years that is approximately 7320 tsims and 9150 danchungs (Dendup et al., 2021a). About 69% of the household has reported that timber availability is deteriorating in their locality.

Five-year timber allotment data were analyzed from 2016 to 2020. The timber demand is increasing substantially for both rural purposes and developmental activities. 11278.8 m^3 and 6880.44 m^3 timber were allotted from SRF within five years for rural house construction and developmental activities, respectively (Fig. 13).

Fuelwood is the major source of energy for the majority of the people in rural communities. The park residents depend on firewood for cooking and heating. Monthly 725.31 m^3 of firewood is consumed by the park residents. On average each HH is consuming 0.77 m^3 firewood in a month. The average fuelwood consumption in a month by each HH in a gewog shows that fuelwood consumption is higher among the highland communities such as Soe, Tsento, and Laya gewog comparative to low land communities such as Toewang, and Goenshari. In five years 15778.14 m^3 fuelwood (both rural and other purposes) has been supplied to meet people's firewood requirement (Fig. 18). About 63% of households have observed a decrease in the availability of fuelwood resources in their locality (Dendup et al., 2021a).

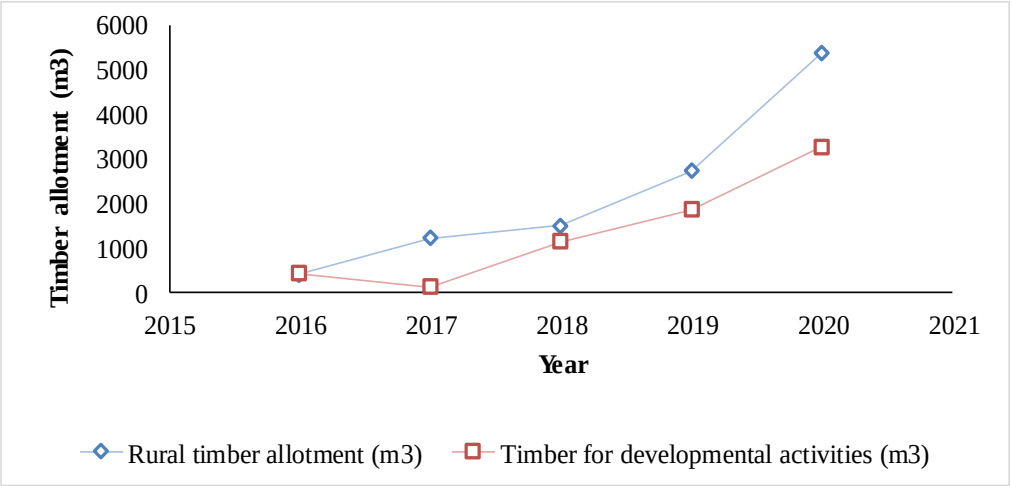

Figure 13: Timber allotment from the park area from 2016 – 2020 (source FID, JDNP).

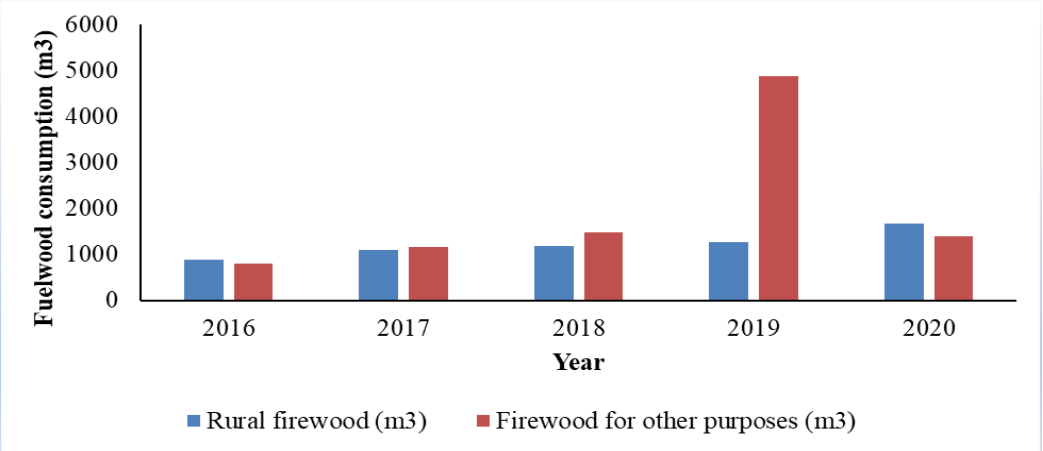

Figure 14: Firewood supply from park area from 2016 - 2020 (source FID, JDNP).

4.1.1.3 Excessive NWFP collection

The park residents depend on the collection of NWFPs as an alternative source of income. Highlanders collect and sell Cordyceps (*Ophiocordyceps sinensis*) locally known as Yartsa-Guen-Boop, Pangpoi (*Nardostachys jatamansi*), Putashing (*Picrorhiza kurroa*) and incense from aromatic plant species (essentially from *Rhododendron* and *Artemisia* species) for their livelihood. In

the mid and lower elevations areas, the communities collect and sell mushroom, ferns, wild walnuts, *Paris polyphylla*, edible orchids and some other wild vegetables.

Currently, NWFPs are collected by people on their terms without a proper scientific harvesting method. In long run, we are endangering the sustainability of the NWFPs. It is reported that the communities are experiencing a decline in NWFPs resources.

Table 7: NWFPs supplied to the communities from the park in the last 5 years (2016 – 2020) (source FID, JDNP).

Range	**NWFPs COLLECTED IN Kgs**				
	Ophiocordyceps sinensis	***Nardostachys jatamansi***	***Picrorhiza kurroa***	**Wood burrs**	**Incense**
Gasa	3.51	nil	nil	240	nil
Laya	182.76	133318	nil	nil	3930
Lingzhi	219.89	nil	nil	10	500
Lunana	181.5	nil	nil	nil	nil
Ruecheyna	nil	nil	nil	nil	nil
Soe	17.17	3190.5	349	nil	556.2
Total	**604.82**	**136508.5**	**349**	**250**	**4986.2**

4.1.1.4 Forest fire

The forest fire incidences are rare in the park area, however, the acreage of forest destroyed was enormous, particularly in the alpine areas where yak herders burn juniper, fir, and rhododendron thickets to expand their pasturelands. Forest fire in Bhutan is commonly noticed and experienced below the altitude of 2,500 m with more intensity in dry zones especially in the chirpine forest ecosystem. Thus, southern part of the park is forest fire-prone areas, especially Toewang and Goenshari areas.

4.1.1.5 Waste management

With development taking place within park jurisdiction, non-biodegradable wastes are found increasing in the park. The main challenges in waste

management within park jurisdiction is reckless disposal of waste by park residents and trekkers despite repeated awareness program. Garbage is found recklessly strewn along motor roads, mule tracks, in alpine meadows, in the deep jungle, and the water bodies. Monthly Departmental waste cleaning is conducted by the park staffs in SRF to create awareness about waste management. However, the waste collected by park officials on average is found to be increasing (Fig. 15).

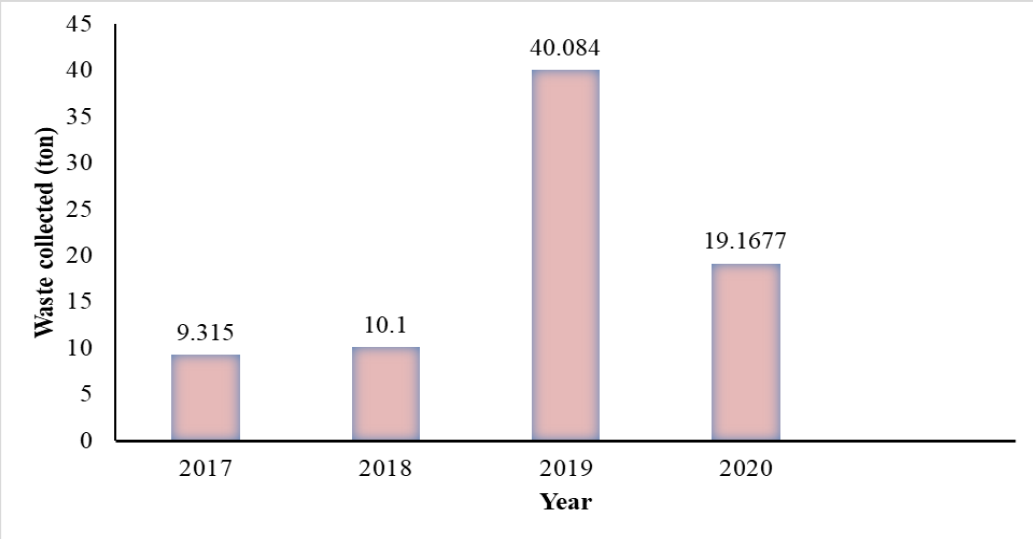

Figure 15: Waste collected by park staff from the SRF land in the park (source JDNP waste data).

4.1.1.6 Impending threats from climate change

In recent years, various form of local weather pattern change is observed by the park residents. Sixty-nine percent of respondents experience some form of a weather pattern change in their locality. The people at the lower altitude have observed erratic rainfall pattern, a rise in temperature, and drought affecting the production of crops. Highland nomadic communities have observed comparatively lesser snowfall or no snowfall, melting of snow at an alarming rate, and appearance of mosquitoes which indicates that warming of otherwise a cold alpine region. Moreover, 62.64 % of park residents have observed the erratic weather pattern in their locality. People view air pollution as a major cause followed by developmental activities and depleting forest cover (Dendup et al., 2021a).

4.1.2 Depletion of wildlife populations

4.1.2.1 Poaching of wild animals

Poaching is considered as one of the biggest threats to the conservation of high-profile wildlife species in the park, potentially causing depletion of wildlife populations such as tiger, musk deer, common leopard, and Himalayan black bear. Every year SMART patrolling team has reported dismantling the significant number of musk dear traps in the alpine and coniferous forest region of the park. A total of 75 numbers of new and old traps and snares set for musk deer was dismantled. A total of 33 traps set for pheasants in Soe range jurisdiction and 1 snare set up for snow leopard from Lunana Range area was dismantled within a year.

A total of 9 incidences of different wildlife poachers are apprehended by the park officials within a span of 5 years from 2016 to 2020. Within this period, 3 cases of musk deer poachers were arrested. Three illegal fishing case were also apprehended by park officials. In the wake of the prevailing difficult economic situation in the country and increasing demand and willingness to pay high prices for wildlife parts in the nearby international markets, more people may be forced to poach wild animals such as tiger, leopard, musk deer, and Himalayan black bear.

4.1.2.2 Human-wildlife conflicts

Human-wildlife conflict is a critical issue for the park where a majority of the population directly rely on livestock and crop production for their livelihood. Mainly the highland semi-nomadic people rely on rearing yaks for livelihood. In terms of livestock population, JDNP has a total of 22,673 livestock heads. A total of 1656 (7.3%) domestic animals are reported to be killed by predators in the last three years (Table 8).

Table 8: Types and number of livestock killed by different predators in the last three years (2018-2020)

Predators	Local	Jersey	Brown swiss	Mithun	Yak	Horse	Mule	Poultry	Total
Asiatic black bear	2	0	0	0	35	0	0	10	47
Stray dog	21	0	0	0	22	0	0	0	43
Leopard	10	0	0	0	12	3	4	0	29
Red Fox	3	1	0	0	17	0	0	0	21
Snow leopard	50	0	0	0	689	39	35	0	813
Tibetan wolf	6	0	0	0	95	0	0	0	101
Tiger	97	20	15	12	34	20	3	0	201
Wild dog	83	25	17	3	253	15	5	0	401
Total	272	46	32	15	1157	77	47	10	1656

The total loss of 1656 head of livestock in the last three years was valued at Nu. 35.78 m, of which the majority of the monetary loss was reported from Lingzhi gewog with a net loss of Nu. 10.72 m (29.9%) followed by Naro gewog with a net loss of Nu. 0.72 (20.25%).

On the other hand, the loss of crops to the wild herbivores has a huge impact on people's livelihood. A total of 160 numbers of crop damage cases were reported in the last three years. Eight wild animals (including birds) were identified for causing damage to about 532.5 acres (ac) of land (Table 9).

Table 9: Frequency of crops depredated by different wild animals and associated area damaged.

Wild animals	No. cases reported	The total area damaged (acres)
Barking deer	8	1.55
Blue sheep	1	0.03
Monkey	9	2.84
Porcupine	1	0.5
Sambar	4	1.27
Wild pig	106	420.6
Asiatic black bear	29	105.4
Birds	2	0.22
Total	160	532.5

To address these pressing issues, park management needs to come up with comprehensive and reliable preventive measures. Electric fencing, stone wall fencing, and poles fencing are tried as mitigation measure with some success. About 34% of farmers have rated electric fencing as the most effective

mitigation measures to prevent crop damages followed by stone fencing (30.5%) and pole fencing (19.4%).

4.1.2.3 Retaliatory killing of wild animals

The incidences of wild predators preying on livestock and wild herbivores rampaging into crop field are reported every year by park residents. The total loss of 1656 head of livestock and a total of 160 numbers of crop damage cases were reported in the last three years. In the past five years, nine incidences of retaliatory killing of a Himalayan black bear were reported.

4.1.2.4 Grazing competition between domestic and wild herbivores

Domestic animals, such as cattle, yaks and horses, competing for fodder with wild herbivores is also perceived as a threat that can potentially decimate wild herbivore populations. In terms of livestock population, JDNP has a total of 22,673 livestock heads of which Laya gewog has the highest population (25.72%) followed by Lunana (18.89%) and Lingzhi (18.74%) (Dendup et al., 2021a). In JDNP, most of the villages are located close to the forest edges and the villagers practice free grazing of their livestock which in turn compete with wildlife for grazing space. Everywhere in the park, there are overwhelming signs of domestic animals grazing freely in all forest types. Some of the examples are the intense grazing competition between domestic yaks and horses with blue sheep and takin in the alpine region.

4.1.3 Negative sentiment towards conservation

During the recent socio-economic survey of attitude towards wild predators and wildlife conservation in the park, the majority of respondents expressed strong positive sentiments towards wild predators and wildlife conservation in general. About 67% of respondents feel the importance of predators inside the forest. Among the four major themes set for the importance of predators, control prey population tops with 88.42% followed by religious/cultural significance with 46.32%. This is the indication of the conservation success of JDNP management. However, 33% of respondents have expressed strong negative sentiments towards wild predators (Dendup et al., 2021a). The conflict between human and bear is rated high since they not only kill the livestock but also damaged property and caused human injuries. The highland communities have a strong negative attitude toward the bear. Negative interactions between wild

animals and humans, if not dealt with sensitively and promptly, may result in poor publicity of the park.

4.1.4 Wildlife disease

Wildlife epidemics and the disease outbreak can take the lives of thousands of animals at an alarming rate. The group of animals which are rare, threatened or isolated in population are the ones that are hit hard and chances are that they might go extinct, locally. Some of the diseases can be a normal, but some can be a serious problem especially when the wildlife population has lost its resilience due to stressors such as habitat loss, genetic bottlenecks, invasive species, lack of biodiversity, failures in land management, or poor water quality and quantity (USFWS, 2019). Diseases when combined with other stressors can result in grievous conservation challenges for wildlife management agencies and requires increased species protection. In 2018, a male Bengal tiger was lost to a coenurosis, commonly known as gid, a disease of the brain and spinal cord caused by the larval stage of the tapeworm *Taenia multiceps* (Garcia & Brutto, 2021). The gid disease were mostly prevalent to yaks and it was one of the major causes of yak mortality (Wangdi & Wangchuk, 2021). The dead tiger was believed to have fed on gid infected yak and later succumbed to same diseases. In 2020, some populations of Bhutan takin and other goat-antelopes (Himalayan serow *Capricornis sumatraensis* and goral *Nemorhaedus goral*) was affected by the outbreak of Peste des Petites Ruminants (PPR) and Capripox disease in the park. A total of about 58 takins, 2 gorals and 1 serow were lost to this disease (Norbu, 2020; and takin monitoring data maintained with Forest Protection and Enforcement Section, JDNP). The wildlife disease, if not monitored in time would lead to serious loss of viable wildlife populations.

4.2. Conservation challenges

4.2.1 Porous international border

Jigme Dorji National Park shares a long stretch of international border with the Tibetan Autonomous Region of China. Due to the long stretch of a porous international border, monitoring of resource flow, trade, and poaching activities along the international border is extremely difficult. In the past, hundreds of intruders are apprehended for poaching valuable medicinal plants annually. The park officials find immense difficulties in rounding off the intruders, often

risking their lives. Due to such a porous border, JDNP is also used as a conduit for the illegal trading of timber, wildlife parts, and derivatives.

The cases of illegal intruders coming into the park area for resource collection have subsided in recent years. However, with the porous border, the intruders can be found in the park jurisdiction anytime in near future. The porous border also undermines the implementation of the Multilateral Environmental Agreements such as the Convention on International Trade of Endangered Species (CITES) of Flora and Fauna while trading the genetic resources across border.

4.2.2 Human settlements inside the park

Unlike in the national parks and protected areas elsewhere, JDNP has a large number of humans living inside the park. As of 2020, the population in the park was estimated at 5026 people living inside the park excluding migratory people and government officials working inside the park. The developmental activities are rapidly increasing putting continuous pressure on resources inside the protected areas. Furthermore, demand for agricultural land, pasturelands and encroachment into forests will keep rising. Subsequently, due to the highly scattered nature of most settlements inside the park, the issue of habitat fragmentation and degradation is expected to surface every year.

4.2.3 Inadequate fund for conservation activities

As always, biodiversity conservation and park management incur a lot of expenses for safeguarding resources, training of manpower, and establishment of facilities and structures. RGoB supports mostly recurrent expenditures and some capital works such as building offices and staff quarters. However, the park lacks consistent donor support to finance major conservation activities such as mitigating human-wildlife conflicts (compensating livestock killed by tiger, snow leopard, and dholes) and research works and innovations in crop protection measures against wildlife.

Due to meagre remuneration and allowances, the park management encounters difficulties in adequately paying the park staff and keeping them well motivated to carry out anti-poaching and wildlife surveys and monitoring in the highly rugged terrains and often inhospitable climatic conditions of the park.

4.2.4 Illegal activities

Curbing illegal activities and achieving zero poaching objectives are the biggest challenges the park management currently faces. In the past five years, the park has recorded 234 cases of forest resources related offences. The majority of offences were related to valuable timber felling for personal consumption as well as for sale. In total 9 cases are apprehended for poaching. Other offences related to NWFPs include the collection of medicinal plants like Cordyceps, *Paris polyphylla* and *Picrorhiza kurroa* and Shilajit are.

Table 10: Number of offence cases registered and settled in the park from 2016 - 2020 (source FID, JDNP).

Range	Offence Case Recorded (2016 - 2020)					
	Wildlife	**Timber**	**Firewood**	**NWFPs**	**Sand and Boulders**	**Others**
Gasa	1	41	1	14	5	1
Laya	0	4	0	20	0	0
Lingzhi	2	24	0	1	3	5
Lunana	1	19	0	3	10	0
Ruecheyna	5	39	1	6	17	9
Soe	0	0	0	1	0	1
Total	**9**	**127**	**2**	**45**	**35**	**16**

4.2.5 Prevention of wildlife diseases

Most of the wildlife diseases are unexpected and unpredictable. Once the wildlife diseases have been detected, disease contingency plans, surveillance, investigation of mortality events and appropriate disease management strategies are vital components of an effective response. All of the mentioned effective response will entail experience and huge cost. Hence, disease prevention is far more effective and less costly than disease control (USFWS, 2019). With lack of expertise in disease detection, identification and control with the park management, wildlife disease poses a serious challenge. To effectively respond and monitor wildlife diseases, a multi-agency collaboration is required (Department of Livestock, especially the Veterinary Doctors from Regional Veterinary Laboratories and the local communities to contain the spread of

wildlife disease to the livestock) to conduct wildlife autopsy and make management recommendations to prevent further spread to both wild animals and livestock. To address such unfortunate incidents, training on wildlife disease and surveillance is extremely important. Furthermore, sufficient wildlife tranquilizing gun, tranquilizer (drugs), projectiles and drug storing facilities should be readily available which at the moment, is a huge challenge.

4.3 Conservation opportunities

Despite the numerous challenges concerning biodiversity conservation in the park, JDNP also has a few opportunities that the management can tap into.

4.3.1 Revenue plough back from the end-users of ecosystem services

The Druk Green Power Corporation (DGPC) benefits tremendously from JDNP in the form of the continued flow of water into the hydropower dams for the generation of electricity. The park plays a crucial role in maintaining vegetative cover and ecological integrity in the watersheds of major rivers that flow into the dams. Likewise, the Tourism Council of Bhutan (TCB) and the Association of Bhutan Tour Operators (ABTO) benefit so much from the large number of international tourists trekking inside JDNP.

Both these two major user groups earn considerable revenue from the critical ecosystem services provided by the park. Therefore, the park management could negotiate with DGPC and TCB to plough back some revenue to finance major conservation activities in the park. Such a mechanism could be a model for sustainable financing of the park and an excellent example of Payment for Ecosystem Services (PES) if pursued successfully in collaboration with the Ministry of Finance and Ministry of Economic Affairs.

4.3.2 Astounding wealth of biodiversity

Indisputably, JDNP is a treasure trove of invaluable plants and animals that the country can be proud of. The national park has subtropical forest ecosystem to alpine ecosystem. A total of 1434 species from 144 families representing 563 genera was reported from the biodiversity assessment of 1994 - 1995. Till now 50 mammal species was recorded inside the park. Nine wild felid species belonging to seven genera were recorded from JDNP during five consecutive surveys over the last nine years (Jamtsho et al., 2021). Thus, the park can be declared as a wild felid hotspot to garner the fund support for conservation.

The JDNP has a vibrant bird diversity and recorded the presence of 407 species. The national park supports a more significant number of bird species of conservation concern. From both annotated checklist of the park and the current survey, ecosystems of the park have been inhabited by 12 protected bird species (*Ardea insignis, Grus nigricollis, Arborophila mandellii, Tragopan satyra, Gallinago nemoricola, Haliaeetus leucoryphus, Corvus corax, Harpactes wardi* and *Lophophorus impejanus*) listed in Schedule I of the Forests and Nature Conservation Act (FNCA), 1995. The park also has 13 species of the IUCN listed birds, viz. one CR species *Ardea insignis*, two EN species *Haliaeetus leucoryphus* and *Aquila nipalensis*, four VU species *Gypaetus barbatus, Grus nigricollis, Arborophila mandellii* and *Gallinago nemoricola*, six NT species *Gyps himalayensis, Vanellus duvaucelii, Tragopan satyra, Indicator xanthonotus, Grus nigricollis* and *Harpactes wardi* (Dendup et al., 2020). With such enormous birdlife of important conservation concern, JDNP can attract huge number of international and national tourists for bird watching.

4.3.3 Culture and social cohesion

Buddhism with its emphasis on the avoidance of killing, compassion towards all living things, and meditation in natural surroundings and reverence for trees, wildlife, natural landscape, rivers and lakes promote environmental protection. About 80% of park residents feel the importance of conservation. It is a good indication that the majority of park residents are aware of the importance of conservation of top predators such as tigers, dholes and leopards. About 89% indicated that the predators are important for controlling prey population which in turn would help reduce loss of crops to the wild animals (Dendup et al., 2021a).

4.3.4 Strong environmental legislation

The government has passed strong legislation to create an enabling environment for conservation. Strong government policies, especially Forest and Nature Conservation Act of Bhutan, 1995, and Forest and Nature Conservation Rules and Regulations 2017/2020, provide a powerful legal framework for protecting and managing wildlife and habitat (DoFPS, 2017). Article 5 of the Constitution of Bhutan further emphasizes the requirements to maintain at least 60% of the total land under forest cover for all times to come (RGoB, 2009b).

CHAPTER 5: The Management Prescriptions

5.1 Identification of management prescriptions

Strategies and actions (*management prescription*) are defined based on the overall goal of the plan to achieve and maintain better habitat, species conservation and enhanced social livelihood. These strategies and activities are identified based on analysis of threats, conservation challenges, and opportunities and is expected to solve problems or overcome the barriers that prevent us from achieving the objectives and subsequently the goals. Overall, the plan has 7 strategic goals and 26 objectives with 40 strategies and 94 actions for a 10-year plan period (Table 11).

Table 11: Strategies and management actions for Jigme Dorji National Park for the plan period July 2021 till June 2031.

Strategic goal 1: Conservation of species and its habitat to ensure proper functioning of ecosystem and its services
Objective 1.1: Protect habitats of key species through delineation of different management zones
Strategy 1.1.1: Delineate different management zones in consultation with local communities
Action 1.1.1.1: Fix boundary pillars along the park boundary, especially in areas where there is a resource allocation site overlap with the territorial forest divisions
Objective 1.2: Maintain viable and thriving populations of key species and its prey base
Strategies 1.2.1: Estimate population for keystone species and its prey base
Action 1.2.1.1: Conduct camera trapping to determine tiger population in the park.
Action 1.2.1.2: Conduct camera trapping to determine snow leopard population in the park.
Action 1.2.1.3: Determine Himalayan black bear population using scat survey (for genetic study) in the park.
Action 1.2.1.4: Determine Bhutan takin population using dung survey (for genetic study) in the park.
Action 1.2.1.5: Determine musk deer population using dung (pellet) survey (for genetic study) in the park.
Action 1.2.1.6: Determine blue sheep population using dung (pellet) survey or direct count in the park.
Strategies 1.2.2: Control stray dog population in the park
Action 1.2.2.1: Carry out mass sterilization of stray dogs
Strategies 1.2.3: Procure wildlife rescue equipment
Action 1.2.3.1: Purchase tranquilizing gun, tranquilizer (drugs), projectiles and drug storing equipment for rescue of sick or injured wildlife species
Objective 1.3: Document movement ecology of umbrella species

Strategy 1.3.1: Conduct radio telemetry study on Bhutan takin
Action 1.3.1.1: Conduct radio collaring of at least 4 takins in the park
Objective 1.4: Bring wildlife habitats and anthropogenic land-uses under sustainable management
Strategies 1.4.1: Restore degraded alpine meadows
Action 1.4.1.1: Mapping of pasturelands by using GPS and GIS technologies
Action 1.4.1.2: Improvement and management of alpine meadows
Action 1.4.1.3: Train and develop the skills of rangers and communities in scientific management of alpine meadows
Strategy 1.4.2: Improve salt licks, snags and water holes
Action 1.4.2.1: Inventory of salt licks, snag and waterholes using GPS and GIS technologies
Action 1.4.2.2: Improvement and management of saltlicks, snags and waterholes in the park
Action 1.4.2.3: Train and develop the skills of rangers in scientific management of salt licks and water holes
Objective 1.5: Bring lesser-known birds, mammals, macro-invertebrates, fishes and herpetofauna species under conservation spotlight
Strategy 1.5.1: Document status and distribution of lesser-known mammal and bird species
Action 1.5.1.1: Conduct camera trapping on spotted lingsang
Action 1.5.1.2: Conduct camera trapping survey on small cats to estimate the population, status and distribution in the park
Action 1.5.1.3: Conduct camera trapping on endangered Woolly flying squirrel
Action 1.5.1.4: Conduct distribution status of Northern Raven
Action 1.5.1.5: Conduct distribution status of Himalayan Monal
Action 1.5.1.6: Carry out assessment of macro-invertebrates and fishes in selected rivers and streams.
Action 1.5.1.7: Carry out assessment of herpetofauna in the park
Objective 1.6: Document extent and distribution of important plant species
Strategy 1.6.1: Document extent of endangered, endemic and economical plant species
Action 1.6.1.1: Assessment of *Nardostachys jatamansi* (Pangpoi) in the park
Action 1.6.1.2: Assessment of *Picrorhiza kurroa* (Putashing) and *Dactylorhiza hatagirea* in the park
Action 1.6.1.3: Conduct survey of *Meconopsis bhutanica* and *Paris polyphylla* in the park
Objective 1.7: Monitor risk and vulnerability of ecosystem health due to climate change
Strategy 1.7.1: Identify and control invasive alien plant and pest diseases
Action 1.7.1.1: Carry out inventory of general invasive species and implement effective mitigation measures to control its spread across the park area
Action 1.7.1.2: Carry out adelgid survey in conifer forests of the park area
Objective 1.8: Document diversity and dynamics of flora and fauna species
Strategy 1.8.1: Monitor biodiversity of the park
Action 1.8.1.1: Identify and carryout timely monitoring works in the selected Biodiversity

Monitoring Grids
Strategic Goal 2: Sustainable management of natural resources to reduce deforestation and degradation
Objective 2.1: Bring forest areas in multiple zones of the park under scientific management
Strategy 2.1.1: Prepare local forest management plans
Action 2.1.1.1: Conduct forest inventory within the multiple use zones of the park
Strategy 2.1.2: Assess National Forest Inventory grids
Action 2.1.2.1: Carry out forest inventory in the identified NFI grids of the park
Strategy 2.1.3: Revise CF and NWFP Management plans
Action 2.1.3.1: Timely revision of community forest management plans
Action 2.1.3.2: Timely revision of Non wood forest management plans
Strategy 2.1.4: Bring areas under climate smart restoration
Action 2.1.4.1: Carry out plantation monitoring and refilling works in the community forests
Action 2.1.4.2: Identify critically degraded forest and watershed areas
Action 2.1.4.3: Planting climate resilient species in the designated or identified areas
Strategic Goal 3: Protection of flora and fauna species to maintain viable population
Objective: 3.1: Strengthen SMART patrolling to prevent, combat and monitor poaching, wildlife trade and other illegal activities
Strategy 3.1.1: Enhance capacity of park rangers in "SMART Patrolling"
Action 3.1.1.1: Provide training on use and application of updated SMART versions
Strategy 3.1.2: Develop patrol plans
Action 3.1.2.1: Conduct monthly SMART patrolling
Strategy 3.1.3: Equip field offices and field staff with SMART gears, gadgets, and materials
Action 3.1.3.1: Equip all the field offices with additional patrolling and intelligence gadgets and materials, such as GPS, laptops, camera-traps, hand held radio sets and smart phones, drones and digital cameras
Action 3.1.3.2: Conduct SMART patrolling with fully equipped gears
Strategy 3.1.4: Develop intelligence network with partner agencies
Action 3.1.4.1: Develop zero poaching task force at the local level
Strategic goal 4: Increase the stewardship and participation of park residents in natural resources management.
Objective 4.1: Enhance community knowledge on sustainable resource management with special focus to women
Strategy 4.1.1: Train members of community forests and NWFP groups
Action 4.1.1.1: Provide training on effective record keeping in the CFs and NWFP groups
Action 4.1.1.2: Provide gender mainstreaming training to selected community groups
Objective 4.2: Establish ecotourism ventures and recreational facilities to enhance socio-economic status of the communities
Strategy 4.2.1: Enhance capacity of communities on enterprise development
Action 4.2.1.1: Create awareness among communities on the benefits of community-based

ecotourism ventures
Action 4.2.1.2: Train and establish women-group ecotourism ventures on incense making at Laya
Action 4.2.1.3: Train and establish women-group ecotourism ventures on conical bamboo hat at Laya and local tent (Bja) at Lingzhi
Action 4.2.1.4: Train and establish snow leopard watch group at Soe
Strategy 4.2.2: Establish recreational facilities
Action 4.2.2.1: Establish Takin viewing deck at Tsarijathang and Gathana
Action 4.2.2.2: Construct VIC and create recreational facilities at Gyepethang
Action 4.2.2.3: Create camping site at Dolamkencho
Action 4.2.2.4: Maintenance of toilet, bath tub and other facilities at Koma Tsachu and Wachey Tsachu
Action 4.2.2.5: Maintenance of toilet, drain, water supply and other camping facilities at Thangthangka campsite
Action 4.2.2.6: Create camp site at Thongdu along Jomolhari trek
Strategy 4.2.3: Create and maintain bridges, mule tracks and eco-trails
Action 4.2.3.1: Construction of bridge at Koma Tsachu
Action 4.2.3.2: Maintenance of mule trek along Laya-Lunana
Action 4.2.3.3: Maintenance of mule trek along Jomolhari trek
Action 4.2.3.4: Create biking trail at Jomolhari base
Action 4.2.3.5: Develop alternate trekking route from Shana-Thongdu Zam
Objective 4.3: Upscale advocacy on sustainable waste management practice in the park
Strategy 4.3.1: Institute effective waste management practices
Action 4.3.1.1: Raise the awareness of communities inside park on the benefits and penalties involved with improper disposal of garbage, including clean up campaigns along major trekking trails and community centres
Action 4.3.1.2: Construct garbage collection site at Shana and Tongchudra
Action 4.3.1.3: Provide waste compressing machine to the selected highland communities
Action 4.3.1.4: Conduct feasibility study of outsourcing waste management to a private party
Objective 4.4: Enhance conservation awareness and sustainable livelihood of park communities
Strategy 4.4.1: Participate in Jomolhari Mountain Festival and Royal Highland Festival celebrations
Action 4.4.1.1: Material development to disseminate conservation messages to the festival visitors
Strategy 4.4.2: Create conservation awareness in schools and monasteries
Action 4.4.2.1: Organize day trip for bird and mammal watching, and plant identification (living classroom concept)
Action 4.4.2.2: Conduct awareness on environment and wildlife conservation to students and monks
Objective 4.5: Promote green alternative energy for sustainable resource management
Strategy 4.5.1: Support alternative energy for highland communities and monasteries

Action 4.5.1.1: Train women beneficiaries on basic repair and maintenance of solar lighting system
Action 4.5.1.2: Support solar lightings to herders in snow leopard habitat to minimize the use of natural resources for lighting purposes
Action 4.5.1.3: Support solar lightings to the historically significant monasteries in remote locations of the park
Action 4.5.1.4: Install solar lighting connections to existing electric grid lines in the park HQ
Strategic goal 5: Enhancing socio-economic wellbeing of the communities and living in harmony with nature
Objective 5.1: Mitigate and minimize the incidences of crop depredation by wild herbivores
Strategy 5.1.1: Enhance scientific data on the nature, extent, and causes of crop depredation by wild herbivores
Action 5.1.1.1: Perform ecological researches on the nature, extent, seasonality and the main causes of crop depredation by problematic wild herbivores in the park
Action 5.1.1.2: Promote and supply existing effective human-wildlife mitigation technology such as electric fencing and barbed wires
Objective 5.2: Reduce incidences of livestock depredation by wild predators
Strategy 5.2.1: Analyze scientific data on the nature, extent, and causes of livestock depredation by wild predators
Action 5.2.1.1: Perform ecological researches on the nature, extent, seasonality and the main causes of livestock depredation by problematic wild predators in the park
Strategy 5.2.2: Reduce population of scrub cattle
Action 5.2.2.1: Conduct awareness campaigns on the ecological effects of scrub cattle and the benefits to having manageable and productive herd of cattle
Action 5.2.2.2: Support supplying improved breed breeding bulls or artificial insemination in collaboration with livestock sector
Strategy 5.2.3: Reduce numbers of yak predation by snow leopard
Action 5.2.3.1: Experiment and replicate effective methods to protect juvenile yaks using proper fencing mechanisms against snow leopards
Objective 5.3: Reduce incidences of retaliatory killing
Strategy 5.3.1: Initiate compensation scheme for livestock depredation
Action 5.3.1.1: Institutionalize livestock depredation compensation scheme
Objective 5.4: Contribution of cordyceps collection on the livelihoods of highland communities
Strategy 5.4.1: Assess impact of cordyceps collection to the highlander's livelihood
Action 5.4.1.1: Conduct study on ecology, economic and social aspects of cordyceps collection
Strategic goal 6: Conservation of watershed to enhance provision of ecosystem services
Objective 6.1: Provide sustained ecosystem services for socio-economic and ecological wellbeing
Strategy 6.1.1: Develop knowledge base for watershed and spring shed conservation planning and management
Action 6.1.1.1: Conduct watershed assessment and classification in the park

Action 6.1.1.2: Identification of recharge areas and mapping, and spring revival interventions in the park
Action 6.1.1.3: Conduct feasibility study on PES under Naro gewog
Objective 6.2: Identify wetlands of national and international importance for the conservation and management purposes
Strategy 6.2.1: Survey wetland areas
Action 6.2.1.1: Conduct wetland inventory on spatial extent and distribution
Strategic goal 7: Institutional and resource capacity strengthened for effective management of the park
Objective 7.1: Enhance knowledge of park staff for effective service delivery and sustainable resource management
Strategy 7.1.1: Provide trainings on protected area management
Action 7.1.1.1: Organize in-house trainings on protected area management system (wildlife monitoring, study design, data analysis)
Objective 7.2: Enhance public knowledge on conservation
Strategies 7.2.1: Develop communication materials
Action 7.2.1.1: Develop information posters at Ruecheyna Range Office
Objective 7.3: Enhance public service delivery
Strategy 7.3.1: Provide adequate field offices, staff quarters and other facilities
Action 7.3.1.1: Construction of Soe Park Range Office.
Action 7.3.1.2: Construction of staff quarter at Gasa, Ruecheyna and Park HQ.
Action 7.3.1.3: Construction of guard post (Tsharijathang and Ramina)
Action 7.3.1.4: Construction of Rangers Transit Camp at Park HQ, Damji.
Action 7.3.1.5: Construction of Visitor Information Centre at Gasa Tshachu.
Action 7.3.1.6: Maintenance of approach road and side drains leading to Park HQ.
Action 7.3.1.7: Timely maintenance of existing offices and staff quarter (Tashithang, Gasa, Lunana)
Action 7.3.1.8: Maintenance of existing street lights.
Action 7.3.1.9: Installation of internet connection in the field offices.
Objective 7.4: Measure effectiveness of protected area management
Strategies 7.4.1: Evaluate protected area management effectiveness
Action 7.4.1.1: Evaluate protected area management effectiveness in each range office under the park using Bhutan METT+
Objective 7.5: Review and revise management plan to address impending conservation threats and challenges
Strategies 7.5.1: Develop climate smart conservation management plan
Action 7.5.1.1: Mid-term review of the management plan
Action 7.5.1.2: Revise past management plan
Action 7.5.1.3: Conduct socio-economic survey

CHAPTER 6: The Implementation Plan and Financial Outlay

6.1 A brief overview

In this chapter, the implementation plan and financial outlay to implement the management actions are presented. All activities are included in the action plan with specific details of locations, key collaborators, timeframe and potential donor. To properly implement the scheduled activities of the plan, funding needs to be sought from RGoB, BFL and other potential donors. For the key collaborators to be available during the implementation of activities, the park management shall inform the collaborators much in advance, preferable during the start of the financial year. If activities are not implemented in a scheduled plan year, the park management shall attempt to implement them in the succeeding plan year to be able to guarantee the maximum implementation of planned activities. Since a poor plan well executed is much better than a good plan poorly executed (Colgate & Danaher, 2000), the park management shall strive to implement if possible, all activities listed in the plan.

Majority of the proposed amounts are committed by BFL Project as our plan is aligned with BFL project document (Year 3-Year 12) and the 12th Five Year Plan of the DoFPS. The park management needs to secure funding for other activities that are not committed by BFL project.

6.2 The detailed budget outlay

The detailed budget outlay is presented in Table 12 in millions of Ngultrums (the currency of Bhutan).

The total amount required to fully implement the plan stands at Nu. 146.658 million for the 10-year plan period and majority (91.97 %) of the plan is aligned to BFL project.

Table 12: Budget outlay against each action.

Objectives	Strategies	Action	Year along with budget (in million Ngultrums)									
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Objective 1.1: Protect habitats of key species through delineation of different management zones	Strategy 1.1.1: Delineate different management zones in consultation with local communities	Action 1.1.1.1: Fix boundary pillars along the park boundary, especially in areas where there is a resource allocation site overlap with the territorial forest divisions		0.25								
Objective 1.2: Maintain viable and thriving populations of key species and its prey base	Strategy 1.2.1: Estimate population for keystone species and its prey base	Action 1.2.1.1: Conduct camera trapping to determine tiger population in the park	1.008									
		Action 1.2.1.2: Conduct camera trapping to determine snow leopard population in the park		2.4								
		Action 1.2.1.3: Determine	0.7									

		Himalayan black bear population using scat survey (for genetic study) in the park										
		Action 1.2.1.4: Determine Bhutan takin population using dung survey (for genetic study) in the park			0.7							
		Action 1.2.1.5: Determine musk deer population using dung (pellet) survey (for genetic study) in the park			0.7							
		Action 1.2.1.6: Determine blue sheep population using dung (pellet) survey or direct count in the park.			0.7							
	Strategy 1.2.2: Control stray dog population in the park	Action 1.2.2.1: Carry out mass sterilization of stray dogs		0.2								

	Strategy 1.2.3: Procure wildlife rescue equipment	Action 1.2.3.1: Purchase tranquilizing gun, tranquilizer (drugs), projectiles and drug storing equipment for rescue of sick or injured wildlife species		0.7								
Objective 1.3: Document movement ecology of umbrella species	Strategy 1.3.1: Conduct radio telemetry study on Bhutan takin	Action 1.3.1.1: Conduct radio collaring of at least 4 takins in the park				1.2						
Objective 1.4: Bring wildlife habitats and anthropogenic land-uses under sustainable management	Strategy 1.4.1: Restore degraded alpine meadows	Action 1.4.1.1: Mapping of pasturelands by using GPS and GIS technologies			0.215							
		Action 1.4.1.2: Improvement and management of alpine meadows			0.423		0.423				0.423	
		Action 1.4.1.3: Train and develop the skills of rangers and communities in				0.15	0.3					

		scientific management of alpine meadows										
	Strategy 1.4.2: Improve salt licks, snags and water holes	Action 1.4.2.1: Inventory of salt licks, snag and waterholes using GPS and GIS technologies			0.423							
		Action 1.4.2.2: Improvement and management of saltlicks, snags and waterholes in the park	0.15						0.423			
		Action 1.4.2.3: Train and develop the skills of rangers in scientific management of salt licks and water holes						0.215				
Objective 1.5: Bring lesser-known birds, mammals, macro-	Strategy 1.5.1: Document status and distribution of lesser-known	Action 1.5.1.1: Conduct camera trapping on spotted lingsang				0.3						

invertebrates, fishes and herpetofauna species under conservation spotlight	mammal and bird species	Action 1.5.1.2: Conduct camera trapping survey on small cats to estimate the population, status and distribution in the park		0.5	0.5						
		Action 1.5.1.3: Conduct camera trapping on endangered Woolly flying squirrel			0.35						
		Action 1.5.1.4: Conduct distribution status of Northern Raven		0.3							
		Action 1.5.1.5: Conduct distribution status of Himalayan Monal							0.3		
		Action 1.5.1.6: Carry out assessment of macro-invertebrates and fishes in selected		0.4							

		rivers and streams										
		Action 1.5.1.7: Carry out assessment of herpetofauna in the park			0.3							
Objective 1.6: Document extent and distribution of important plant species	Strategy 1.6.1: Document extent of endangered, endemic and economical plant species	Action 1.6.1.1: Assessment of *Nardostachys jatamansi* (Pangpoi) in the park	0.7									
		Action 1.6.1.2: Assessment of *Picrorhiza kurroa* (Putashing) and *Dactylorhiza hatagirea* in the park		0.4			0.4					
		Action 1.6.1.3: Conduct survey of *Meconopsis bhutanica* and *Paris polyphylla* in the park			0.25				0.5			

Objective 1.7: Monitor risk and vulnerability of ecosystem health due to climate change	Strategy 1.7.1: Identify and control invasive alien plant and pest diseases	Action 1.7.1.1: Carry out inventory of general invasive species and implement measures to control its spread across the park area			0.5						
		Action 1.7.1.2: Carry out adelgid survey in conifer forests of the park area	0.07								
Objective 1.8: Document diversity and dynamics of flora and fauna species	Strategy 1.8.1: Monitor biodiversity of the park	Action 1.8.1.1: Identify and carryout timely monitoring works in the selected Biodiversity Monitoring Grids		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Objective 2.1: Bring forest areas in multiple zones of the park under scientific management	Strategy 2.1.1: Prepare local forest management plans	Action 2.1.1.1: Conduct forest inventory within the multiple use zones of the park		1.2	0.6	0.6					
		Action 2.1.2.1: Carry out forest	11.2								

		inventory in the identified NFI grids of the park									
		Action 2.1.3.1: Timely revision of community forest management plans	0.12		0.06					0.12	0.18
		Action 2.1.3.2: Timely revision of Non wood forest management plans				0.12	0.06	0.12		0.12	0.06
		Action 2.1.4.1: Carry out plantation monitoring and refilling works in the community forests		0.15	0.15	0.15					
		Action 2.1.4.2: Management of degraded watershed areas	0.3					0.6	0.6	0.6		
		Action 2.1.4.3: Planting climate resilient species in the designated or identified areas								0.5	0.5	
Objective: 3.1: Strengthen		Action 3.1.1.1: Provide training on		0.5			0.5				0.5	

SMART patrolling to prevent, combat and monitor poaching, wildlife trade and other illegal activities		use and application of updated SMART versions										
	Strategy 3.1.2: Develop patrol plans	Action 3.1.2.1: Conduct monthly SMART patrolling		4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
	Strategy 3.1.3: Equip field offices and field staff with SMART gears, gadgets, and materials	Action 3.1.3.1: Equip all the field offices with additional patrolling and intelligence gadgets and materials, such as GPS, laptops, camera-traps, hand held radio sets and smart phones, drones and digital cameras		1.5			1.5					
		Action 3.1.3.2: Conduct SMART patrolling with fully equipped gears	1.2					1.2				
	Strategy 3.1.4: Develop intelligence network with partner	Action 3.1.4.1: Develop zero poaching task force at the local		0.3				0.3				

	agencies	level										
Objective 4.1: Enhance community knowledge on sustainable resource management with special focus to women	Strategy 4.1.1: Train members of community forests and NWFP groups	Action 4.1.1.1: Provide training on effective record keeping in the CFs and NWFP groups	0.35				0.5					
		Action 4.1.1.2: Provide gender mainstreaming training to selected community groups	0.35						0.5			
Objective 4.2: Establish ecotourism ventures and recreational facilities to enhance socio-economic status of the communities	Strategy 4.2.1: Enhance capacity of communities on enterprise development	Action 4.2.1.1: Create awareness among communities on the benefits of community-based ecotourism ventures		0.5								
		Action 4.2.1.2: Train and establish women-group ecotourism ventures on incense making at Laya		2.5								

		Action 4.2.1.3: Train and establish women-group ecotourism ventures on conical bamboo hat at Laya and local tent (Bja) at Lingzhi			0.5	0.5						
		Action 4.2.1.4: Train and establish snow leopard watch group at Soe							1			
	Strategy 4.2.2: Establish recreational facilities	Action 4.2.2.1: Establish Takin viewing deck at Tsarijathang and Gathana					1					
		Action 4.2.2.2: Construct VIC and create recreational facilities at Gyepethang				2.5						
		Action 4.2.2.3: Create camping site at Dolamkencho								0.7		
		Action 4.2.2.4: Maintenace of		1.0		1.2						

		toilet, bath tub and other facilities at Koma Tsachu and Wachey Tsachu										
		Action 4.2.2.5: Maintenance of toilet, drain, water supply and other camping facilities at Thangthangka campsite	2.0									
		Action 4.2.2.6: Create camp site at Thongdu along Jomolhari trek			2							
	Strategy 4.2.3: Create and maintain bridges, mule tracks and eco-trails	Action 4.2.3.1: Construction of bridge at Koma Tsachu		1.0								
		Action 4.2.3.2: Maintenance of mule trek along Laya-Lunana			0.86					1.2		
		Action 4.2.3.3: Maintenance of mule trek along Jomolhari trek				1.2						
		Action 4.2.3.4: Create biking trail			0.75							0.7

		at Jomolhari base									
		Action 4.2.3.5: Develop alternate trekking route from Shana-Thongdu Zam		8.8							
Objective 4.3: Upscale advocacy on sustainable waste management practice in the park	Strategy 4.3.1: Institute effective waste management practices	Action 4.3.1.1: Raise the awareness of communities inside park on the benefits and penalties involved with improper disposal of garbage, including clean up campaigns along major trekking trails and community centres			0.067		0.067		0.067		0.067	
		Action 4.3.1.2: Construct garbage collection site at Shana and Tongchudra				0.8						
		Action 4.3.1.3: Provide waste		0.15	0.45							

		compressing machine to the selected highland communities									
		Action 4.3.1.4: Conduct feasibility study of outsourcing waste management to a private party		0.2							
Objective 4.4: Enhance conservation awareness and sustainable livelihood of park communities	Strategy 4.4.1: Participate in Jomolhari Mountain Festival and Royal Highland Festival celebrations	Action 4.4.1.1: Material development to disseminate conservation messages to the festival visitors		0.5	0.05	0.05	0.05	0.05	0.05	0.05	
	Strategy 4.4.2: Create conservation awareness in schools and monasteries	Action 4.4.2.1: Organize day trip for bird and mammal watching, and plant identification (living classroom concept)		0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
		Action 4.4.2.2: Conduct awareness on environment and		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

		wildlife conservation to students and monks										
Objective 4.5: Promote green alternative energy for sustainable resource management	Strategy 4.5.1: Support alternative energy for highland communities and monasteries	Action 4.5.1.1: Train women beneficiaries on basic repair and maintenance of solar lighting system		1								
		Action 4.5.1.2: Support solar lightings to herders in snow leopard habitat to minimize the use of natural resources for lighting purposes			3.8							
		Action 4.5.1.3: Support solar lightings to the historically significant monasteries in remote locations of the park			0.4							

		Action 4.5.1.4: Install solar lighting connections to existing electric grid lines in the park HQ				1.5					
Objective 5.1: Mitigate and minimize the incidences of crop depredation by wild herbivores	Strategy 5.1.1: Enhance scientific data on the nature, extent, and causes of crop depredation by wild herbivores	Action 5.1.1.1: Perform ecological researches on the nature, extent, seasonality and the main causes of crop depredation by problematic wild herbivores in the park			0.45				0.45			
		Action 5.1.1.2: Promote and supply existing effective human-wildlife mitigation technology such as electric fencing and barbed wires	1.9			1.5		1.5		1.5		1.5
Objective 5.2: Reduce incidences of livestock depredation by	Strategy 5.2.1: Analyze scientific data on the nature, extent, and causes of livestock	Action 5.2.1.1: Perform ecological researches on the nature, extent, seasonality and the			0.35							

wild predators	depredation by wild predators	main causes of livestock depredation by problematic wild predators in the park										
	Strategy 5.2.2: Reduce population of scrub cattle	Action 5.2.2.1: Conduct awareness campaigns on the ecological effects of scrub cattle and the benefits to having manageable and productive herd of cattle					0.15					
		Action 5.2.2.2: Support supplying improved breed breeding bulls or artificial insemination in collaboration with livestock sector					0.5	0.5				
	Strategy 5.2.3: Reduce numbers of yak predation by snow leopard	Action 5.2.3.1: Experiment and replicate effective methods to protect juvenile yaks using			0.5			0.5			0.5	

		proper fencing mechanisms against snow leopards										
Objective 5.3: Reduce incidences of retaliatory killing	Strategy 5.3.1: Initiate compensation scheme for livestock depredation	Action 5.3.1.1: Institutionalize livestock depredation compensation scheme	0.5		1.0							
Objective 5.4: Contribution of cordyceps collection on the livelihoods of highland communities	Strategy 5.4.1: Assess impact of cordyceps collection to the highlander's livelihood	Action 5.4.1.1: Conduct study on ecology, economic and social aspects of cordyceps collection		0.7								
Objective 6.1: Provide sustained ecosystem services for socio-economic and ecological wellbeing	Strategy 6.1.1: Develop knowledge base for watershed and spring shed conservation planning and management	Action 6.1.1.1: Conduct watershed assessment and classification in the park	0.3								0.5	
		Action 6.1.1.2: Identification of recharge areas and mapping, and spring revival interventions in the park					0.1					

		Action 6.1.1.3: Conduct feasibility study on PES under Naro gewog	0.5								
Objective 6.2: Identify wetlands of national and international importance for the conservation and management purposes	Strategy 6.2.1: Survey wetland areas	Action 6.2.1.1: Conduct wetland inventory on spatial extent and distribution		1.5							
Objective 7.1: Enhance knowledge of park staff for effective service delivery and sustainable resource management	Strategy 7.1.1: Provide trainings on protected area management	Action 7.1.1.1: Organize in-house trainings on protected area management system (wildlife monitoring, study design, data analysis)		0.3		0.3		0.3		0.3		0.3
Objective 7.2: Enhance public knowledge on conservation	Strategy 7.2.1: Develop communication materials	Action 7.2.1.1: Develop information posters at Ruecheyna and Lingzhi Range Office	0.2						0.2			

Objective 7.3: Enhance public service delivery	Strategy 7.3.1: Provide adequate field offices, staff quarters and other facilities	Action 7.3.1.1: Construction of Soe Park Range Office						5.5				
		Action 7.3.1.2: Construction of staff quarter at Gasa, Ruecheyna and Park HQ			4.5		4.5					
		Action 7.3.1.3: Construction of guard post (Tsharijathang and Ramina)		3.5	3.5							
		Action 7.3.1.4: Construction of Rangers Transit Camp at Park HQ, Damji		5.01								
		Action 7.3.1.5: Construction of Visitor Information Centre at Gasa Tshachu				6.7						
		Action 7.3.1.6: Maintenance of approach road and side drains leading to Park HQ	1.5									

		Action 7.3.1.7: Timely maintenance of existing offices and staff quarter (Tashithang, Gasa, Lunana)	0.4	1.1	0.4				0.35			
		Action 7.3.1.8: Maintenance of existing street lights	0.03							0.15		
		Action 7.3.1.9: Installation of internet connection in the field offices		0.25								
Objective 7.4: Measure effectiveness of protected area management	Strategy 7.4.1: Evaluate protected area management effectiveness	Action 7.4.1.1: Evaluate protected area management effectiveness in each range office under the park using Bhutan METT+	0.1									
Objective 7.5: Review and revise management plan to address impending	Strategy 7.5.1: Develop climate smart conservation management plan	Action 7.5.1.1: Mid-term review of the management plan					0.1					
		Action 7.5.1.2: Revise past										0.5

conservation threats and challenges		management plan										
		Action 7.5.1.3: Conduct socio-economic survey										1.4
		TOTAL	**17.098**	**28.37**	**27.22**	**20.88**	**13.76**	**11.33**	**7.7**	**6.26**	**6.34**	**7.7**

6.3 Key collaborators

The important collaborators for the successful implementation of this management are grouped into governmental organizations, non-governmental organizations, and funding agencies.

6.3.1 Governmental organizations

a) Department of Forests and Park Services: As the immediate controlling agency of all protected areas and territorial forest divisions, support and guidance from the department is key to the successful accomplishments of all planned activities. Technical, manpower and financial support and guidance from all functional divisions within the department (NCD, SFED, FPED, FRMD, WMD, and UWICER) are indispensable for the implementation of the planned activities. Likewise, all parks and territorial forest divisions adjacent to the park are instrumental in joint patrolling and share of manpower for conservation activities.

b) Tourism Council of Bhutan: TCB is an important working partner concerning boosting ecotourism potentials in the park in terms of providing funds and manpower for organizing ecotourism events (Royal Highland Festival and Jomolhari Mountain Festival) and maintenance of eco campsites and trekking routes.

c) National Environment Commission: NEC is an important working partner in managing waste in the national park. With the support from NEC, park management will create waste management awareness among communities residing in the park, construct garbage disposal bins along popular trekking routes and create viable systems including reward and supply of waste compressing machines to highland communities.

d) National Land Commission: NLC is the main government agency to look after the land matter of the country. The commission is very important when collecting data on gewog boundary for boundary pillar fixation and delineation and mapping of pasture lands of the park communities in the park.

e) Dzongkhag and Gewog Administration: The dzongkhag administration composed of dzongdags, dzongrabs, and various sector heads, are very important for collaborative implementation of plan activities, sharing of manpower, and co-financing of some of the activities that are of mutual

interests. For similar supports, the gewog administrations spearheaded by Gups are equally important. The Engineering Sector of the Dzongkhag Administration is very supportive of designing and supervising the construction works in the park.

f) District Court: The district courts and the judges (drangpons) are important figure in the district and are important in providing verdicts to the wildlife poachers and offenders.

g) Royal Bhutan Police: The police personnel are important for apprehending and detaining poachers and offenders of other major wildlife crimes.

h) Department of Information Technology: Is an important department to provide necessary internet connections to all the range offices of the park.

i) Department of Livestock: DoL is indispensable in managing the stray dog populations which is a direct threat to the wildlife. The department will also help in providing necessary support in livestock intensification and management within the park.

j) Thimphu Thromde: Thimphu Thromde is one of the largest municipalities of the country. The thromde has been facing drinking water shortages and currently one of the drinking water sources for the Thimphu Thromde is from Dodenachun which originates from JDNP. The Thromde can be a potential client for initiating PES.

6.3.2 Non-governmental organizations

a) Monastic institutions: Various monastic institutions inside the park help the park officials in informing suspicious activities and movement of offenders within the vicinities of retreat centres, monasteries, and hermitages.

b) College of Natural Resources: CNR has a wide range of expertise in the field of invertebrates, fishes and other herpetofauna. For surveying the lesser-known fauna of the park especially invertebrates, fishes and herpetofauna, CNR will be an important collaborator.

6.3.3 Funding agencies

a) Bhutan for Life Fund Secretariat: The Project Coordination Unit under Bhutan for Life Fund Secretariat is the key partner in terms of both financial

and technical capacity building of the park. Since 2019, most all conservation works in the park are supported by the project. The park management looks forward to similar magnanimous support for the implementation of this management plan.

b) The World Wildlife Fund: WWF Bhutan has been funding many conservation activities in the park since 2005. Therefore, WWF is one of the important funding agencies for the park. The park expects that the WWF will provide funding support for activities not supported by Bhutan for Life project in this management plan.

c) Bhutan Trust Fund for Environmental Conservation: The BTFEC has been an equally important funding agency for the park since its operationalization. The agency has supported numerous conservation activities in the park aside from supporting staff salaries at the beginning of its inception. The park management looks forward to similar support for the implementation of this management plan.

d) The United Nations Development Program/Global Environmental Facility: The UNDP-GEF has graciously supported most of the conservation activities in the first management plan (1996 – 2001). The park management would like to solicit similar support for implementing some of the activities of this management plan.

e) Bhutan Foundation: Bhutan foundation is another important funding agency that supports many conservation activities in the country. For JDNP, Bhutan Foundation is one of the key partners' in-terms of both financial and technical capacity building. The Park expects BF to continue its support.

Table 13: Activity location and lists of possible key collaborators.

Objectives	Action	Location	Key Collaborators
Strategic goal 1: Conservation of species and its habitat to ensure proper functioning of ecosystem and its services			
Objective 1.1: Protect habitats of key species through delineation of different management zones	Action 1.1.1.1: Fix boundary pillars along the park boundary, especially in areas where there is a resource allocation site overlap with the territorial forest divisions	6 gewogs (Kawang, Kabesa, Toewang, Chubu, Doteng, Tsento)	NLC/NCD
Objective 1.2: Maintain viable and thriving populations of key species and its prey base	Action 1.2.1.1: Conduct camera trapping to determine tiger population in the park	Areas below 4300 m in the park	BTC
	Action 1.2.1.2: Conduct camera trapping to determine snow leopard population in the park	Areas above 3500 m in the park	NCD
	Action 1.2.1.3: Determine Himalayan black bear population using scat survey (for genetic study) in the park	All parts of the park	UWICER
	Action 1.2.1.4: Determine Bhutan takin population using dung survey (for genetic study) in the park	All parts of the park	
	Action 1.2.1.5: Determine musk deer population using dung (pellet) survey (for genetic study) in the park	All parts of the park	
	Action 1.2.1.6: Determine blue sheep population using dung (pellet) survey or direct count in the park	All parts of the park	

	Action 1.2.2.1: Carry out mass sterilization of stray dogs	All parts of the park	Livestock sector
	Action 1.2.3.1: Purchase tranquilizing gun, tranquilizer (drugs), projectiles and drug storing equipment for rescue of sick or injured wildlife species	Park HQ	NCD
Objective 1.3: Document movement ecology of umbrella species	Action 1.3.1.1: Conduct radio collaring of at least 4 takins in the park	Lingzhi/Laya/ Khatoed/Khamaed/Soe/Lunana	NCD
Objective 1.4: Bring wildlife habitats and anthropogenic land-uses under sustainable management	Action 1.4.1.1: Mapping of pasturelands by using GPS and GIS technologies	Lingzhi/Laya/ Lunana/ Soe	Livestock sector
	Action 1.4.1.2: Improvement and management of alpine meadows	Lingzhi/Laya/ Lunana/ Soe	Livestock sector
	Action 1.4.1.3: Train and develop the skills of rangers and communities in scientific management of alpine meadows	Lingzhi/Laya/ Lunana/ Soe	NCD/Livestock sector
	Action 1.4.2.1: Inventory of salt licks, snag and waterholes using GPS and GIS technologies	All parts of the park	
	Action 1.4.2.2: Improvement and management of saltlicks, snags and waterholes in the park	All parts of the park	
	Action 1.4.2.3: Train and develop the skills of rangers in scientific management of salt licks and water holes	All staff	NCD
Objective 1.5: Bring lesser-known	Action 1.5.1.1: Conduct camera trapping on	Areas below 2000 m	

birds, mammals, macro-invertebrates, fishes and herpetofauna species under conservation spotlight	spotted lingsang		
	Action 1.5.1.2: Conduct camera trapping survey on small cats to estimate the population, status and distribution in the park	All parts of the park	
	Action 1.5.1.3: Conduct camera trapping on endangered Woolly flying squirrel	Lunana	
	Action 1.5.1.4: Conduct distribution status of Northern Raven	Lingzhi/Laya/ Lunana/ Soe	
	Action 1.5.1.5: Conduct distribution status of Himalayan Monal	Lingzhi/Laya/ Khatoed/Kha maed/Soe/Lun ana	
	Action 1.5.1.6: Carry out assessment of macro-invertebrates and fishes in selected rivers and streams	All parts of the park	UWICER/CNR
	Action 1.5.1.7: Carry out assessment of herpetofauna in the park	Khatoed/ Khamaed/ Rimchu	UWICER/CNR
Objective 1.6: Document extent and distribution of important plant species	Action 1.6.1.1: Assessment of Nardostachys jatamansi (Pangpoi) in the park	Lingzhi/Laya/ Lunana/ Soe	SFED
	Action 1.6.1.2: Assessment of Picrorhiza kurroa (Putashing) in the park	Lingzhi/Laya/ Lunana/ Soe	SFED
	Action 1.6.1.3: Conduct survey of Meconopsis bhutanica and Paris polyphylla in the park	Lingzhi/Laya/ Lunana/ Soe	SFED
Objective 1.7: Monitor risk and vulnerability of ecosystem health due to climate	Action 1.7.1.1: Carry out inventory of general invasive species and recommend mitigation measures to control its	All parts of the park	NCD/NBC

change	spread across the park area		
	Action 1.7.1.2: Carry out adelgid survey in conifer forests of the park area	Lingzhi/Laya/ Lunana/ Soe/Khatoed	UWICER/FPED
Objective 1.8: Document diversity and dynamics of flora and fauna species	Action 1.8.1.1: Identify and carryout timely monitoring works in the selected Biodiversity Monitoring Grids	All parts of the park	NCD
Strategic goal 2: Sustainable management of natural resources to reduce deforestation and degradation			
Objective 2.1: Bring forest areas in multiple zones of the park under scientific management	Action 2.1.1.1: Conduct forest inventory within the multiple use zones of the park	All parts of the park	FRMD
	Action 2.1.2.1: Carry out forest inventory in the identified NFI grids of the park	All parts of the park	FRMD/Thimphu Forest Division/Pema Gatshel Forest Division
	Action 2.1.3.1: Timely revision of community forest management plans	Khatoed/ Khamaed/ Goenshari	SFED
	Action 2.1.3.2: Timely revision of Non wood forest management plans	Laya/Soe/ Lingzhi/Naro	SFED
	Action 2.1.4.1: Carry out plantation monitoring and refilling works in the community forests	Khatoed/ Khamaed/ Goenshari	SFED
	Action 2.1.4.2: Identify critically degraded forest and watershed areas	All parts of the park	SFED

	Action 2.1.4.3: Planting climate resilient species in the designated or identified areas	All parts of the park	SFED
Strategies goal 3: Protection of flora and fauna species to maintain viable population			
Objective: 3.1: Strengthen SMART patrolling to prevent, combat and monitor poaching, wildlife trade and other illegal activities	Action 3.1.1.1: Provide training on use and application of updated SMART versions	All Range Offices	FPED
	Action 3.1.2.1: Conduct monthly SMART patrolling	All parts of the park	FPED
	Action 3.1.3.1: Equip all the field offices with additional patrolling and intelligence gadgets and materials, such as GPS, laptops, camera-traps, hand held radio sets and smart phones, drones and digital cameras	Park HQ and All Range Offices	NCD
	Action 3.1.3.2: Conduct SMART patrolling with fully equipped gears	All parts of the park	FPED
	Action 3.1.4.1: Develop zero poaching task force at the local level	Gasa/Punakha/ Paro/ Thimphu	Drangpons/RBP
Strategic goal 4: Increase the stewardship and participation of park residents in natural resource management			
Objective 4.1: Enhance community knowledge on sustainable resource management with special focus to women	Action 4.1.1.1: Provide training on effective record keeping in the CFs and NWFP groups	Khatoed/ Khamaed/ Goenshari/ Laya/ Soe/ Lingzhi/Naro	SFED
	Action 4.1.1.2: Provide gender mainstreaming training to selected community groups	Khatoed/ Khamaed/ Goenshari /Laya/ Soe/ Lingzhi/Naro	SFED/NCD
Objective 4.2: Establish ecotourism ventures and	Action 4.2.1.1: Create awareness among communities on the benefits of community-	All parts of the park	NCD/TCB

recreational facilities to enhance socio-economic status of the communities	based ecotourism ventures		
	Action 4.2.1.2: Train and establish women-group ecotourism ventures on incense making at Laya	Laya	NCD/TCB
	Action 4.2.1.3: Train and establish women-group ecotourism ventures on conical bamboo hat at Laya and local tent (Bja) at Lingzhi	Laya/Lingzhi	NCD/TCB
	Action 4.2.1.4: Train and establish snow leopard watch group at Soe	Soe	NCD/TCB
	Action 4.2.2.1: Establish Takin viewing deck at Tsarijathang and Gathana	Khamaed	NCD/TCB
	Action 4.2.2.2: Construct VIC and create recreational facilities at Gyepethang	Kawang	NCD/TCB
	Action 4.2.2.3: Create camping site at Dolamkencho	Naro	NCD/TCB
	Action 4.2.2.4: Maintenace of toilet, bath tub and other facilities at Koma Tsachu	Goenshari and Lunana	NCD/TCB
	Action 4.2.2.5: Maintenance of toilet, drain, water supply and other camping facilities at Thangthangka campsite	Tsento	NCD/TCB

	Action 4.2.2.6: Create camp site at Thongdu along Jomolhari trek	Soe	NCD/TCB
	Action 4.2.3.1: Construction of bridge at Koma Tsachu	Goenshari	NCD/TCB
	Action 4.2.3.2: Maintenance of mule trek along Laya-Lunana	Laya/Lunana	NCD/TCB
	Action 4.2.3.3: Maintenance of mule trek along Jomolhari trek	Tsento/Soe	NCD/TCB
	Action 4.2.3.4: Create biking trail at Jomolhari base	Soe	NCD/TCB
	Action 4.2.3.5: Develop alternate trekking route from Shana-Thongdu Zam	Tsento/Soe	NCD/TCB
Objective 4.3: Upscale advocacy on sustainable waste management practice in the park	Action 4.3.1.1: Raise the awareness of communities inside park on the benefits and penalties involved with improper disposal of garbage, including clean up campaigns along major trekking trails and community centres	All parts of the park	NCD/TCB/FPED/NEC
	Action 4.3.1.2: Construct garbage collection site at Shana and Tongchudra	Tsento/Laya	NCD/TCB/FPED/NEC
	Action 4.3.1.3: Provide waste compressing machine to the selected highland communities	Soe/Laya/Lunana/ Lingzhi	NCD/TCB/NEC
	Action 4.3.1.4: Conduct feasibility study of outsourcing waste management to a private party	All parts of the park	TCB/Dzongkhag

Objective 4.4: Enhance conservation awareness and sustainable livelihood of park communities	Action 4.4.1.1: Material development to disseminate conservation messages to the festival visitors	All parts of the park	NCD
	Action 4.4.2.1: Organize day trip for bird and mammal watching, and plant identification (living classroom concept)	All schools in the park	NCD
	Action 4.4.2.2: Conduct awareness on environment and wildlife conservation to students and monks	All schools and monasteries in the park	NCD
Objective 4.5: Promote green alternative energy for sustainable resource management	Action 4.5.1.1: Train women beneficiaries on basic repair and maintenance of solar lighting system	Soe/Laya/ Lunana/ Lingzhi	NCD
	Action 4.5.1.2: Support solar lightings to herders in snow leopard habitat to minimize the use of natural resources for lighting purposes	Soe/Laya/ Lunana/ Lingzhi	NCD
	Action 4.5.1.3: Support solar lightings to the historically significant monasteries in remote locations of the park	Soe/Laya/ Lunana/ Lingzhi	NCD
	Action 4.5.1.4: Install solar lighting connections to existing electric grid lines in the park HQ	Park HQ	NCD

Strategic goal 5: Enhancing socio-economic wellbeing of the communities and living in harmony with nature			
Objective 5.1: Mitigate and minimize the incidences of crop depredation by wild herbivores	Action 5.1.1.1: Perform ecological researches on the nature, extent, seasonality and the main causes of crop depredation by problematic wild herbivores in the park	Khatoed/ Khamaed/ Goenshari	NCD
	Action 5.1.1.2: Promote and supply existing effective human-wildlife mitigation technology such as electric fencing and barbed wires	All parts of the park	NCD
Objective 5.2: Reduce incidences of livestock depredation by wild predators	Action 5.2.1.1: Perform ecological researches on the nature, extent, seasonality and the main causes of livestock depredation by problematic wild predators in the park	All parts of the park	NCD
	Action 5.2.2.1: Conduct awareness campaigns on the ecological effects of scrub cattle and the benefits to having manageable and productive herd of cattle	All parts of the park	NCD/Livestock sector
	Action 5.2.2.2: Support supplying improved breed breeding bulls or artificial insemination in collaboration with livestock sector	All parts of the park	NCD/Livestock sector
	Action 5.2.3.1: Experiment and replicate effective methods to protect juvenile yaks using proper fencing mechanisms against snow leopards	Laya/Lunana/ Soe/ Lingzhi/Naro	NCD/Livestock sector

Objective 5.3: Reduce incidences of retaliatory killing	Action 5.3.1.1: Institutionalize livestock depredation compensation scheme	All parts of the park	NCD/Livestock sector
Objective 5.4: Contribution of cordyceps collection on the livelihoods of highland communities	Action 5.4.1.1: Conduct study on ecology, economic and social aspects of cordyceps collection	Laya/Lunana/ Soe/ Lingzhi/Naro/ Khatoed /Khamaed	NCD
Strategic goal 6: Conservation of watershed to enhance provision of ecosystem services			
Objective 6.1: Provide sustained ecosystem services for socio-economic and ecological wellbeing	Action 6.1.1.1: Conduct watershed assessment and classification in the park	All parts of the park	WMD
	Action 6.1.1.2: Identification of recharge areas and mapping, and spring revival interventions in the park	All parts of the park	WMD
	Action 6.1.1.3: Conduct feasibility study on PES under Naro gewog	Naro gewog	WMD/Dzongkhag/ Thimphu Thromde
Objective 6.2: Identify wetlands of national and international importance for the conservation and management purposes	Action 6.2.1.1: Conduct wetland inventory on spatial extent and distribution	All parts of the park	WMD
Strategic goal 7: Institutional and resource capacity strengthened for effective management of the park			
Objective 7.1: Enhance knowledge of park staff for effective service delivery and sustainable resource management	Action 7.1.1.1: Organize in-house trainings on protected area management system (wildlife monitoring, study design, data analysis)	All Range Offices	WMD/UWICER/ FPED/NCD/SFED /CNR

Objective 7.2: Enhance public knowledge on conservation	Action 7.2.1.1: Develop information posters at Ruecheyna and Lingzhi Range Office	Ruecheyna and Dodena VIC	NCD
Objective 7.3: Enhance public service delivery	Action 7.3.1.1: Construction of Soe Park Range Office	Soe	NCD/Dzongkhag/ LG
	Action 7.3.1.2: Construction of staff quarter at Gasa, Ruecheyna and Park HQ	Gasa/ Ruecheyna/ Damji	NCD/Dzongkhag/ LG
	Action 7.3.1.3: Construction of guard post (Tsharijathang and Ramina)	Laya/Lunana	NCD/Dzongkhag/ LG
	Action 7.3.1.4: Construction of Rangers Transit Camp at Park HQ, Damji	Park HQ	NCD/Dzongkhag
	Action 7.3.1.5: Construction of Visitor Information Centre at Gasa Tshachu	Gasa	NCD/Dzongkhag
	Action 7.3.1.6: Maintenance of approach road and side drains leading to Park HQ	Park HQ	NCD/Dzongkhag
	Action 7.3.1.7: Timely maintenance of existing offices and staff quarter (Tashithang, Gasa, Lunana)	Khamaed/ Gasa/ Lunana	NCD/Dzongkhag
	Action 7.3.1.8: Maintenance of existing street lights	Park HQ/ Ruecheyna	Dzongkhag
	Action 7.3.1.9: Installation of internet connection in the field offices	All Range Offices	DIT

Objective 7.4: Measure effectiveness of protected area management	Action 7.4.1.1: Evaluate protected area management effectiveness in each range office under the park using Bhutan METT+	All Range Offices	NCD
Objective 7.5: Review and revise management plan to address impending conservation threats and challenges	Action 7.5.1.1: Mid-term review of the management plan	Park HQ	NCD
	Action 7.5.1.2: Revise past management plan	Park HQ	NCD
	Action 7.5.1.3: Conduct socio-economic survey	All the gewogs of the park	NCD

CHAPTER 7: Monitoring and Evaluation

7.1 Monitoring and evaluation plan

The Park management will regularly monitor the implementation of PA management interventions using the PA Monitoring Framework in collaboration with Nature Conservation Division.

To evaluate the management effectiveness of the Protected Areas, the evaluation will be carried out once in five years using the Bhutan METT+ (Management Effectiveness Tracking Tool Plus).

7.2 The logical framework

All progress in the implementation of planned actions and achievement of the plan's strategies goals and objectives will be monitored and evaluated based on a comprehensive logical framework which is presented on the next page.

Table 14: Monitoring and evaluation indicators.

Objectives	Action	Output indicator	Baseline	Unit	Yearly target									
					Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Strategic goal 1: Conservation of species and its habitat to ensure proper functioning of ecosystem and its services														
Objective 1.1: Protect habitats of key species through delineation of different management zones	Action 1.1.1.1: Fix boundary pillars along the park boundary, especially in areas where there is a resource allocation site overlap with the territorial forest divisions	Number of boundary pillars fixed	0	Numbers (Pillars)		50								
Objective 1.2: Maintain viable and thriving populations of key species and its prey base	Action 1.2.1.1: Conduct camera trapping to determine tiger population in the park	Tiger population estimated in the park	0	Camera stations	56									
	Action 1.2.1.2: Conduct camera trapping to determine snow	Snow leopard population estimated in the park	0	Camera stations		102								

	leopard population in the park													
	Action 1.2.1.3: Determine Himalayan black bear population using scat survey (for genetic study) in the park	Himalayan black bear population estimated in the park	0	Survey reports	1									
	Action 1.2.1.4: Determine Bhutan takin population using dung survey (for genetic study) in the park	Bhutan takin population estimated in the park	0	Survey reports			1							
	Action 1.2.1.5: Determine musk deer population using dung (pellet) survey (for genetic study) in the park	Musk deer population estimated in the park	0	Survey reports			1							

	Action 1.2.1.6: Determine blue sheep population using dung (pellet) survey or direct count in the park	Musk deer population estimated in the park	0	Survey reports			1							
	Action 1.2.2.1: Carry out mass sterilization of stray dogs	Mass sterilization of stray dogs carried out	0	Reports		1								
	Action 1.2.3.1: Purchase tranquilizing gun, tranquilizer (drugs), projectiles and drug storing equipment for rescue of sick or injured wildlife species.	Animal rescue equipment purchased	2	Set		1								
Objective 1.3: Document movement ecology of umbrella species	Action 1.3.1.1: Conduct radio collaring of at least 4 takins in the park	Bhutan takin radio-collared	0	Numbers				4						

Objective 1.4: Bring wildlife habitats and anthropogenic land-uses under sustainable management	Action 1.4.1.1: Mapping of pasturelands by using GPS and GIS technologies	Pasture land areas mapped	0	Maps and reports			1						
	Action 1.4.1.2: Improvement and management of alpine meadows	Areas under alpine meadows improved and managed	12	Ha			20		20				20	
	Action 1.4.1.3: Train and develop the skills of rangers and communities in scientific management of alpine meadows	Park staff (30) and local people (100) trained on alpine meadow management	0	Numbers				30	100					
	Action 1.4.2.1: Inventory of salt licks, snag and waterholes using GPS and GIS technologies	Areas with salt licks, snags and waterholes surveyed	1	Survey reports			1							

	Action 1.4.2.2: Improvement and management of saltlicks, snags and waterholes in the park	Saltlicks, waterhole and snags managed and improved	1 Saltlick & 4 waterholes	Survey reports	1						1			
	Action 1.4.2.3: Train and develop the skills of rangers in scientific management of salt licks and water holes	Park staffs trained on scientific management of salt licks and waterholes	0	Numbers						30				
Objective 1.5: Bring lesser-known birds, mammals, macro-invertebrates, fishes and herpeto-fauna species under conservation spotlight	Action 1.5.1.1: Conduct camera trapping on spotted lingsang	Camera trap on spotted lingsang conducted	0	Survey reports				1						
	Action 1.5.1.2: Conduct camera trapping survey on small cats to estimate the population, status and distribution in the park	Survey on small cats conducted	0	Survey report		1	1							

	Action 1.5.1.3: Conduct camera trapping on endangered Woolly flying squirrel	Survey on endangered woolly flying squirrel conducted	0	Survey report			1							
	Action 1.5.1.4: Conduct distribution status of Northern Raven	Survey on distribution status on Northern Raven conducted	0	Survey reports		1								
	Action 1.5.1.5: Conduct distribution status of Himalayan Monal	Survey on distribution on Himalayan Monal conducted	0	Survey reports							1			
	Action 1.5.1.6: Carry out assessment of macro-invertebrates and fishes in selected rivers and streams	Assessment on micro-invertebrates and fishes carried out	0	Survey reports		1								
	Action 1.5.1.7: Carry out assessment of herpetofauna in	Assessment on herpetofauna carried out	1	Survey reports			1							

	the park													
Objective 1.6: Document the extent and distribution of important plant species	Action 1.6.1.1: Assessment of *Nardostachys jatamansi* (Pangpoi) in the park.	Assessment of *Nardostachys jatamansi* (Pangpoi) carried out	0	Survey reports	1									
	Action 1.6.1.2: Assessment of *Picrorhiza kurroa* (Putashing) and *Dactylorhiza hatagirea* in the park	Assessment of *Picrorhiza kurroa* (Putashing) and Dactylorhiza hatagirea carried out	0	Survey reports		1			1					
	Action 1.6.1.3: Conduct survey of *Meconopsis bhutanica* and *Paris polyphylla* in the park	Survey of *Meconopsis bhutanica* and *Paris polyphylla* conducted	0	Survey reports			1				1			
Objective 1.7: Monitor risk and vulnerability of ecosystem health due to climate change	Action 1.7.1.1: Carry out inventory of general invasive species and implement measures to control its	Survey and control of invasive species carried out	0	Survey reports			1							

	spread across the park area													
	Action 1.7.1.2: Carry out adelgid survey in conifer forests of the park area	Adelgid survey in Conifer Forests conducted	0	Survey reports	1									
Objective 1.8: Document diversity and dynamics of flora and fauna species	Action 1.8.1.1: Identify and carryout timely monitoring works in the selected Biodiversity Monitoring Grids	BMGs identified, assessed and reported	0	NFI Grids		2	2	2	2	2	2	2	2	2
Strategic goal 2: Sustainable management of natural resources to reduce deforestation and degradation														
Objective 2.1: Bring forest areas in multiple zones of the park under scientific management	Action 2.1.1.1: Conduct forest inventory within the multiple use zones of the park	LFM plan developed for the entire park	0	Numbers		4	2	2	2					

	Action 2.1.2.1: Carry out forest inventory in the identified NFI grids of the park	NFI cluster plots inventoried	280	NFI Cluster plots	280									
	Action 2.1.3.1: Timely revision of community forest management plans	CF management plan revised	8	CF plans	2		1						1	1
	Action 2.1.3.2: Timely revision of Non wood forest management plans	NWFP management plan revised	5	NWF plans				1	1	1			1	1
	Action 2.1.4.1: Carry out plantation monitoring and refilling works in the community forests	Areas brought under climate smart restoration	25	ha		25	25	25						
	Action 2.1.4.2: Classification of watershed areas in JDNP	Management of degraded watershed areas	42 (23 normal, 13 pristine, 6 degraded)	Numbers	1					2	2	2		

	Action 2.1.4.3: Planting climate resilient species in the designated or identified areas	Plantations carried out in degraded areas	16	Ha							2.5	2.5		
Strategic goal 3: Protection of flora and fauna species to maintain viable population														
Objective: 3.1: Strengthen SMART patrolling to prevent, combat and monitor poaching, wildlife trade and other illegal activities	Action 3.1.1.1: Provide training on use and application of updated SMART versions	Park staff trained in updated SMART versions	15	Numbers		30			30				30	
	Action 3.1.2.1: Conduct monthly SMART patrolling	SMART patrolling conducted in all range offices	8640	Days		360	360	360	360	360	360	360	360	360
	Action 3.1.3.1: Equip all the field offices with additional patrolling and intelligence gadgets and materials, such as GPS, laptops, camera-traps,	Range offices well equipped with patrolling equipment	6	Field offices		6			6					

	hand held radio sets and smart phones, drones and digital cameras													
	Action 3.1.3.2: Conduct SMART patrolling with fully equipped gears	Park staff fully equipped with SMART patrolling gears	63	Numbers		63				63				
	Action 3.1.4.1: Develop zero poaching task force at the local level	Local level task force for zero poaching established	0	Numbers		1				1				
Strategic goal 4: Increase the stewardship and participation of park residents in natural resource management														
Objective 4.1: Enhance community knowledge on sustainable resource	Action 4.1.1.1: Provide training on effective record keeping in the CFs and NWFP groups	Record keeping trainings provided	39	CF and NWFP members	55				36					

management with special focus to women	Action 4.1.1.2: Provide gender mainstreaming training to selected community groups	Women group trained in gender mainstreaming	0	Women group (Number)	12					12				
Objective 4.2: Establish ecotourism ventures and recreational facilities to enhance socio-economic status of the communities	Action 4.2.1.1: Create awareness among communities on the benefits of community-based ecotourism ventures	Awareness on benefits of community-based ecotourism ventures conducted	1	Communities (numbers)	1	1								
	Action 4.2.1.2: Train and establish women-group ecotourism ventures on incense making at Laya	Women/youth/farmers group established and trained on incense making	0	Group		1								

	Action 4.2.1.3: Train and establish women-group ecotourism ventures on conical bamboo hat at Laya and local tent (Bja) at Lingzhi	Women group established and trained on conical bamboo hat making	0	Group			1	1						
	Action 4.2.1.4: Train and establish snow leopard watch group at Soe	Snow leopard watch group established	0	Group							2			
	Action 4.2.2.1: Establish Takin viewing deck at Tsarijathang and Gathana	Takin viewing deck constructed	0	Numbers					1					
	Action 4.2.2.2: Construct VIC and create recreational facilities at Gyepethang	VIC and recreational facilities created	0	Number				1						
	Action 4.2.2.3: Create camping site at	Campsite created	0	Number								1		

	Dolamkencho													
	Action 4.2.2.4: Maintenance of toilet, bath tub and other facilities at Koma Tsachu and Wachey Tshachu	Facilities at Koma Tsachu and Wachey Tshachu maintained	1	Number		1		1						
	Action 4.2.2.5: Maintenance of toilet, drain, water supply and other camping facilities at Thangthangka campsite	Campsite at Thangthangka maintained	1	Number	1									
	Action 4.2.2.6: Create camp site at Thongdu along Jomolhari trek	Thongdu campsite developed	0	Number			1							
	Action 4.2.3.1: Construction of bridge at Koma Tsachu	Bridge constructed at Koma Tsachu	1	Number		1								

	Action 4.2.3.2: Maintenance of mule trek along Laya-Lunana	Mule trek maintained	1	kilometers			1.2					2		
	Action 4.2.3.3: Maintenance of mule trek along Jomolhari trek	Mule trek maintained	1	kilometers				27						
	Action 4.2.3.4: Create biking trail at Jomolhari base	Biking trail established	0	kilometers			13							
	Action 4.2.3.5: Develop alternate trekking route from Shana-Thongdu Zam	Alternate trekking route from Shana-Thongdu Zam developed	0	kilometers		8.6								
Objective 4.3: Upscale advocacy on sustainable waste management practice in the park	Action 4.3.1.1: Raise the awareness of communities inside park on the benefits and penalties involved with improper disposal of garbage,	Awareness camping carried out	1	Occasions			1		1		1		1	

	including clean up campaigns along major trekking trails and community centres													
	Action 4.3.1.2: Construct garbage collection site at Shana and Tongchudra	Garbage collection site constructed	0	Numbers				2						
	Action 4.3.1.3: Provide waste compressing machine to the selected highland communities	Waste compressing machine provided	0	Numbers		1	3							
	Action 4.3.1.4: Conduct feasibility study on outsourcing waste management to a private party	Feasibility study on outsourcing waste management study conducted	0	Study report			1							

Objective 4.4: Enhance conservation awareness and sustainable livelihood of park communities	Action 4.4.1.1: Material development to disseminate conservation messages to the festival visitors	Conservation awareness materials developed	0	Sets of conservation awareness materials			1	1	1	1	1	1		
	Action 4.4.2.1: Organize day trip for bird and mammal watching, and plant identification (living classroom concept)	Number of schools introduced with the concept of living class room	0	Schools			1	1	1	1	1	1		
	Action 4.4.2.2: Conduct awareness on environment and wildlife conservation to students and monks	Number of school and monasteries made aware on environment and wildlife conservation	0	Schools and Monasteries		1	1	1	1	1	1	1	1	1

Objective 4.5: Promote green alternative energy for sustainable resource management.	Action 4.5.1.1: Train women beneficiaries on basic repair and maintenance of solar lighting system	Women trained on basic solar lighting system maintenance	0	Women (2 per highland gewogs)		1								
	Action 4.5.1.2: Support solar lightings to herders in snow leopard habitat to minimize the use of natural resources for lighting purposes	Herders supported with solar lighting	102	Households			258							
	Action 4.5.1.3: Support solar lightings to the historically significant monasteries in remote locations of the park	Monasteries supported with solar lighting	1	Monasteries			13							

	Action 4.5.1.4: Install solar lighting connections to existing electric grid lines in the park HQ	Solar lighting connected to existing electric grid lines in the park HQ	0	Solar lighting system				1						
Strategic goal 5: Enhancing socio-economic wellbeing of the communities and living in harmony with nature														
Objective 5.1: Mitigate and minimize the incidences of crop depredation by wild herbivores	Action 5.1.1.1: Perform ecological researches on the nature, extent, seasonality and the main causes of crop depredation by problematic wild herbivores in the park	Main causes of crop depredation by problematic wild herbivores in the park studied	1	Survey reports			1				1			
	Action 5.1.1.2: Promote and supply existing effective human-wildlife mitigation technology such as electric	Length of electric fence and barbed wire installed	25.50	Kilometers	8.9			10		10		10		10

	fencing and barbed wires													
Objective 5.2: Reduce Incidences of livestock depredation by wild predators.	Action 5.2.1.1: Perform ecological researches on the nature, extent, seasonality and the main causes of livestock depredation by problematic wild predators in the park	Main causes of livestock depredation by problematic wild predators in the park studied	1	Survey reports			1							
	Action 5.2.2.1: Conduct awareness campaigns on the ecological effects of scrub cattle and the benefits to having manageable and productive herd of cattle	Awareness campaign conducted	1	Numbers					1					

	Action 5.2.2.2: Support supplying improved breed breeding bulls or artificial insemination in collaboration with livestock sector	Households supported with supply of BB or AI	0	Households supplied with BB or AI					25	25				
	Action 5.2.3.1: Experiment and replicate effective methods to protect juvenile yaks using proper fencing mechanisms against snow leopards	Effective protection measure piloted	0	Numbers			1			1			1	
Objective 5.3: Reduce incidences of retaliatory killing	Action 5.3.1.1: Institutionalize livestock depredation compensation scheme	Livestock conservation schemes established	8	Number of livestock conservation schemes	2		2							

Objective 5.4: Contribution of cordyceps collection on the livelihoods of highland communities	Action 5.4.1.1: Conduct study on ecology, economic and social aspects of cordyceps collection	Report on ecology, economic and social aspects of cordyceps collection produced	0	Survey report		1								
Strategic goal 6: Conservation of watershed to enhance provision of ecosystem services														
Objective 6.1: Provide sustained ecosystem services for socio-economic and ecological wellbeing	Action 6.1.1.1: Conduct watershed assessment and classification in the park	Watershed assessment and classification in the park conducted	0	Survey report	1								1	
	Action 6.1.1.2: Identification of recharge areas and mapping, and spring revival interventions in the park	Identification and mapping of recharge area carried out	1	Maps and reports					1					
	Action 6.1.1.3: Conduct feasibility study on PES under Naro gewog	PES feasibility study conducted	0	Survey report	1									

Objective 6.2: Identify wetlands of national and international importance for the conservation and management purposes	Action 6.2.1.1: Conduct wetland inventory on spatial extent and distribution	Wetland inventory conducted	0	Maps and reports		1							
Strategic goal 7: Institutional and resource capacity strengthened for effective management of the park													
Objective 7.1: Enhance knowledge of park staff for effective service delivery and sustainable resource management	Action 7.1.1.1: Organize in-house trainings on protected area management system (wildlife monitoring, study design, data analysis)	Park staff trained on PA management	10	Numbers		53		53		53		53		53
Objective 7.2: Enhance public knowledge on conservation	Action 7.2.1.1: Develop information posters at Ruecheyna and Lingzhi Range Office	Information posters developed at Ruecheyna and Lingzhi Range Office	0	Set	1						1			
Objective 7.3: Enhance public service delivery	Action 7.3.1.1: Construction of Soe Park Range	Range Office at Soe constructed	1	Number						1				

	Office													
	Action 7.3.1.2: Construction of staff quarter at Gasa, Ruecheyna and Park HQ	Staff quarter constructed	2	Numbers			1		1					
	Action 7.3.1.3: Construction of guard post (Tsharijathang and Ramina)	Guard post constructed	0	Numbers			1	1						
	Action 7.3.1.4: Construction of Rangers Transit Camp at Park HQ, Damji	Rangers Transit Camp constructed	0	Number				1						
	Action 7.3.1.5: Construction of Visitor Information Centre at Gasa Tshachu	VIC constructed	0	Number				1						
	Action 7.3.1.6: Maintenance of approach road and side drains leading to Park HQ	Approach road and side drain maintained	1	Meters	411									

	Action 7.3.1.7: Timely maintenance of existing offices and staff quarter (Tashithang, Gasa, Lunana)	Existing offices and staff quarter maintained	3	Numbers	1	1	2				1			
	Action 7.3.1.8: Maintenance of existing street lights	Street lights maintained	1	Numbers	1							1		
	Action 7.3.1.9: Installation of internet connection in the field offices	Field office connected with internet	3	Field offices		6								
Objective 7.4: Measure the effectiveness of protected area management	Action 7.4.1.1: Evaluate protected area management effectiveness in each range office under the park using Bhutan METT+	Management effectiveness evaluated	1	Numbers	1				1					1
Objective 7.5: Review and revise management	Action 7.5.1.1: Mid-term review of the management	Mid-term review of the management plan carried out	0	Numbers					1					

plan to address impending conservation threats and challenges	plan													
	Action 7.5.1.2: Revise past management plan	Park management plan revised	3	Numbers										1
	Action 7.5.1.3: Conduct socio-economic survey	Conduct socio-economic survey carried out	1	Numbers										1

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Take Nothing, But Memories; Leave Nothing, But Footprints

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