



Ministry of Environment, Forest  
and Climate Change



## Report

# Participatory Integrated Landscape Level Management Strategy and Plans in the Changthang Landscape

SUBMITTED TO

**THE CHIEF WILDLIFE WARDEN,  
DEPARTMENT OF WILDLIFE PROTECTION,  
LADAKH  
AND  
UNDP INDIA  
NEW DELHI**

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# **Participatory Integrated Landscape Level Management Strategy and Plans in the Changthang Landscape**

**This publication has been developed by IORA Ecological Solutions Pvt. Ltd. under the assignment, Preparation of participatory integrated landscape level management strategy and plans by defining extent of landscape (alpine & sub-alpine) and evaluating existing landscape level strategies, UT of Ladakh, under the GEF-GoI-UNDP SECURE Himalaya Project**

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## Acronyms

BDC	Block Development Committee
CBD	Convention on Biological Diversity
CCDWLS	Changthang Cold Desert Wildlife Sanctuary
DIHAR	Defence Institute of High Altitude Research
EDC	Eco-Development Committee
ES	Ecosystem Services
GEF	Global Environment Facility
GIS	Geographic Information System
GLSEP	Global Snow Leopard and Ecosystem Protection Program
GPS	Global Positioning System
GSDP	Gross State Domestic Product
HCVA	High Conservation Value Area
ICIMOD	International Centre for Integrated Mountain Development
IFS	Indian Forest Service
IGCMC	Indira Gandhi Conservation Monitoring Centre
ILM	Integrated Landscape Management
IT	Information Technology
ITBP	Indo Tibetan Border Police
ITI	Industrial Training Institutes
IUCN	International Union for Conservation of Nature
LMP	Replace
LPMU	Landscape Management Plan Unit
LULC	Land Use Land Cover
MT	Metric Tonnes
NRISR	National Research Institute for Sowa-Rigpa
NTFP	Non-Timber Forest Product
PA	Protected Area
RCC	Reinforced Cement Concrete
RET	Rare Endangered Threatened
RFO	Range Forest Officer
SBSAP	State Biodiversity Strategy and Action Plan
SC	Scheduled Caste
ST	Scheduled Tribe
TR	Tibetan Refugee
UNDP	United Nations Development Programme
UT	Union Territory
WII	Wildlife Institute of India
WLS	Wildlife Sanctuary
WWF	World Wide Fund for Nature

# Contents

<b>Executive Summary .....</b>	<b>10</b>
<b>Part I .....</b>	<b>3</b>
<b>Chapter 1 Overview of the Overall Approach .....</b>	<b>3</b>
1.1 Background.....	3
1.2 SECURE Himalaya Project .....	4
1.3 Landscape Level Approach to Management of the Changthang Landscape .....	5
<b>Chapter 2 Introduction to Changthang Landscape and Background Information.....</b>	<b>8</b>
2.1 Extent of the Landscape.....	8
2.1.1 Statement of Significance .....	8
2.1.2 Location, Physical Boundaries and Extent .....	9
2.1.3 Approach and Access .....	11
2.2 Attributes of the Landscape .....	12
2.2.1 Geology, Rock and Soil.....	12
2.2.2 Terrain Characteristics.....	12
2.2.3 Climate.....	13
2.2.4 Land Use Land Cover of Changthang Landscape .....	15
2.2.5 Water Resources .....	17
2.2.6 Biogeographic Information.....	26
i. Tibetan Wolf.....	29
ii. Eurasian Lynx.....	30
iii. Tibetan Sand Fox.....	30
iv. Wild Yak .....	31
v. Tibetan Argali.....	31
vi. Tibetan Gazelle.....	31
vii. Tibetan Wild Ass .....	32
viii. Palla’s Cat .....	33
i. Black Necked Crane .....	34
ii. Saker Falcon .....	34
iii. Bearded Vulture/ Lammergeier .....	35
2.2.7 High Conservation Value Areas .....	35



2.2.7.5 HCV 4- Areas that are critical for Regulating Ecosystem Services like Groundwater Recharge (4.1) and Prevention of Soil Erosion (4.2) .....	44
2.2.7.6 HCV 5- Areas that are Critical in meeting the Basic Needs of the Local Community .....	45
2.2.7.7 HCV 6- Areas that are Critical in maintaining the Cultural Identity of the Local Community .....	47
2.2.8 Ecosystem Services in Changthang Landscape .....	48
2.2.9 Socio-Economic Profile of the landscape .....	51
2.2.10 Agriculture.....	57
2.2.11 Animal Husbandry.....	61
2.2.12 Tourism.....	63
2.2.13 Stakeholder and Institutional Analysis .....	67
2.3 Review of Existing Schemes and Policies .....	73
<b>Chapter 3 Threats and Opportunities.....</b>	<b>87</b>
3.1 Sector-wise Threats Identified .....	87
3.2 Details of Issues and Threats of Changthang Landscape.....	89
3.2.1 Lack of Awareness/Information on PA Boundary.....	89
3.2.2 Feral Dogs.....	89
3.2.3 Human Wildlife Conflict .....	90
3.2.4 Unregulated and Unsustainable Tourism.....	91
3.2.5 Habitat Degradation.....	92
3.2.6 Lack of Convergence between Departments .....	93
3.2.7 Solid Waste Management .....	93
3.2.8 Value Addition of Animal Husbandry Products .....	93
3.2.9 Lack of Capacity Building and Skill Development .....	94
3.2.10 Research Gap—Lack of Information on Wildlife and Vegetation .....	94
3.2.11 Loss of Traditional Practices/Outmigration.....	94
3.2.12 Illegal Wildlife Trade .....	95
<b>Part II.....</b>	<b>96</b>
<b>Chapter 4 Management, Vision and Objectives for the Landscape.....</b>	<b>96</b>
4.1 Vision .....	96
4.2 Goal and Objectives.....	96
<b>Chapter 5 Strategies, Zonation, Ranges and Theme Plans .....</b>	<b>98</b>

5.1 Strategies .....	98
5.2 Zonation.....	99
5.3 Ranges .....	101
5.4 Theme Plans .....	101
5.4.1 High Conservation Value Areas Protection Plan.....	101
5.4.2 Grassland Management Plan .....	101
5.4.3 Wetlands, Marshes, Moist Sedges and Wet meadows Conservation Plan.....	101
5.4.4 Habitat Restoration Plan .....	102
5.4.5 Tourism Management Plan .....	102
5.4.6 Development of Master Zonal Plans for the Eco Sensitive Zones.....	102
5.4.7 Plan for Sustainable Collection of NTFP.....	103
5.4.8 Mitigating Human-Wildlife Conflict Plan .....	103
5.4.9 Encroachment Minimising Plan.....	103
5.5 Priority Areas for Conservation.....	104
<b>Chapter 6 Proposed Management Interventions .....</b>	<b>106</b>
6.1 Protection of High Conservation Value Areas.....	106
6.2 Grassland Management .....	108
6.3 Conservation of Wetlands, Marshes, Moist Sedges and Wet Meadows .....	110
6.4 Habitat Restoration .....	112
6.5 Tourism Management .....	114
6.5.1 Dry Waste Management .....	119
6.6 Eco Sensitive Zone .....	121
6.7 Sustainable Collection of NTFP .....	123
6.8 Mitigating Human-Wildlife Conflict.....	124
6.8.1 Feral Dogs.....	124
6.8.2 Livestock Depredation.....	125
6.8.3 Crop Depredation.....	128
6.9 Encroachment Minimising.....	130
<b>Chapter 7 Research, Monitoring and Training.....</b>	<b>132</b>
7.1 Research.....	132
7.1.1 Research Wing.....	132

7.1.2 Research Issues .....	133
7.2 Monitoring .....	137
7.2.1 Monitoring Areas .....	137
7.2.2 Monitoring Indicators .....	137
<b>References .....</b>	<b>141</b>
<b>Annexure .....</b>	<b>149</b>

## List of Figures

Figure 1 Villages where the consultations and interviews were conducted.....	6
Figure 2 Delineated Boundary for Changthang Landscape .....	10
Figure 3 Mean Temperature in the landscape (2009 - 2019) (World Weather Online, n.d.) .....	13
Figure 4 Mean Rainfall in the landscape (2009 - 2019) (World Weather Online, n.d.).....	14
Figure 5 Mean snowfall in the landscape (2009 - 2019) (World Weather Online, n.d.).....	14
Figure 6 Mean wind speed in the landscape (2009 - 2019) (World Weather Online, n.d.) .....	15
Figure 7 Land Use Land Cover Map of Changthang Landscape (IGIS, 2020).....	16
Figure 8 Area under each Land Use Class (%).....	17
Figure 9 Wetlands, Catchments and Streams of Changthang Landscape (Source: IGCMC and Rivers, Wetlands and Water Policy Team, WWF-India).....	18
Figure 10 Zone of Influence and Drainage Map of Hanle Complex (Source: IGCMC and Rivers, Wetlands and Water Policy Team, WWF-India).....	21
Figure 11 Zone of Influence and Drainage Map of Tso Moriri (Source: IGCMC and Rivers, Wetlands and Water Policy Team, WWF-India) .....	22
Figure 12 Zone of Influence and Drainage Map of Tsokar (Source: IGCMC and Rivers, Wetlands and Water Policy Team, WWF-India) .....	23
Figure 13 Zone of Influence and Drainage Map (Source: IGCMC and Rivers, Wetlands and Water Policy Team, WWF-India) .....	24
Figure 14 Zone of Influence and Drainage Map of Chushul Complex (Source: IGCMC and Rivers, Wetlands and Water Policy Team, WWF-India).....	25
Figure 15 A: Marshes at Tsokar B: Grasslands at Tsokar C: Apline Meadow at Sumdo D: Rangelands at Hanle .....	28
Figure 16 Map showing HCV 1.1 areas in Changthang landscape (WWF, 2020). .....	38
Figure 17 Map showing potential HCV areas for faunal species.....	39
Figure 18 Map showing potential HCV areas for floral species. ....	39
Figure 19 Map showing potential HCV 2 Areas for Intact Ecosystems .....	40
Figure 20 Map showing HCV 2.1 Areas for Ecotones in Changthang .....	40
Figure 21 HCV 3 Degraded Ecosystems in Changthang Landscape .....	43
Figure 22 HCV 3 Moist Sedges and Seasonal Springs in Changthang Landscape.....	43

Figure 23 HCV 4 Areas in Changthang Landscape.....	44
Figure 24 HCV 4.1 Areas in Changthang Landscape.....	44
Figure 25 HCV 4.2 Areas in Changthang Landscape.....	45
Figure 26 HCV 5 Pasturelands in Changthang Landscape.....	46
Figure 27 HCV 5 Community Resource Areas of Changthang Landscape.....	46
Figure 28 HCV 6 Cultural Sites in Changthang Landscape.....	48
Figure 29 Village-wise Fodder Production (Source: Agriculture Department, Ladakh).....	58
Figure 30 Area under Vegetable Production in Changthang Landscape (Agriculture Department, Ladakh).....	59
Figure 31 Production Details of Vegetables (Source: Agriculture Department, Ladakh).....	60
Figure 32 Chemical Fertiliser Use in Changthang (Source: Agriculture Department, Ladakh).....	60
Figure 33 Village-wise Population of Goat (Source: Animal Husbandry Department).....	61
Figure 34 Animal Husbandry Productivity (Source: Animal Husbandry Department).....	61
Figure 35 Presence of Pashmina and Non-Pashmina Goat (Source: Animal Husbandry Department).....	62
Figure 36 Major Tourism Sites in Changthang.....	64
Figure 37 Total Arrival of Tourists to Leh (Source: Statistical Handbook Leh, 2018-19).....	65
Figure 38 Percentage of Tourist Arrival from 2009-2018 (Source: Statistical Handbook Leh, 2018-19).....	66
Figure 39 Stakeholder Categorisation.....	68
Figure 40 Stakeholder Map.....	71
Figure 41 Spatial Representation of Human Wildlife Conflict in Changthang Landscape (WWF-India, 2020)..	91
Figure 42 Proposed Zonation Map for the Changthang Landscape.....	100
Figure 43 High Priority High Conservation Value Areas in Changthang landscape.....	104
Figure 44 Threats and opportunities, HCV 5 and 6 with High Priority HCVAs.....	105

## List of Tables

Table 1 Villages lying within the Changthang Landscape Boundary.....	10
Table 2 Area under each Land Use Class in Changthang Landscape (Source: IGIS).....	15
Table 3. Area estimates of Wetlands in Leh district (National Wetland Atlas: Jammu and Kashmir, 2010).....	19
Table 4 List of identified wetlands in Changthang Landscape (WWF, 2020).....	19
Table 5 Summary of HCV categories and interpretation for Changthang (WWF-India, 2020).....	36
Table 6 Areas in Ladakh that Support Biodiversity Conservation.....	37
Table 7 Perennial / Seasonal and Hot Springs Identified as HCV 3.....	41
Table 8 Moist Sedge Meadow and Springs identified as HCVA 3.....	42
Table 9 HCVAs for Historical Sites in Changthang.....	47
Table 10 Ecosystem Services and the Services Utilised in Changthang (Murali et. al.2017).....	49
Table 11 Ecosystem Services Use between Nomadic and Agro-pastoral Population (Murali et al. 2017).....	49
Table 12 Demographic Profile of Changthang Landscape (Census of India, 2011).....	51
Table 13 Area under Crops in Changthang (Source: Agriculture Department, Ladakh).....	58
Table 14 Vegetable Production Details (Source: Agriculture Department, Ladakh).....	59

Table 15 Block-wise Sheep and Goat Population for the Delineated Landscape (Source: Statistical Handbook Leh, 2018-19) .....	62
Table 16 Targets and Achievement of Sheep Husbandry Department (Source: Statistical Handbook Leh, 2018-19).....	62
Table 17 Villages located in the tourist hotspots of Changthang landscape .....	65
Table 18 Percentage of Tourist Arrival from 2009-2018 (Source: Statistical Handbook Leh, 2018-19).....	66
Table 19 Overall Arrival of Tourists in 2018 (Source: Statistical Handbook Leh, 2018-19).....	66
Table 20 Stakeholders—Government Line Departments .....	69
Table 21 Stakeholders— Local NGOs, Private Organisations and Other Government Institutions .....	70
Table 22 Agencies Working on SECURE Himalaya Project .....	72
Table 23 Sector-wise Threats Identified .....	87
Table 24 Ranking of Threats (Margoluis & Salafsky, 2001).....	88
Table 25 Statement showing amount of compensation paid and number of livestock deaths due to wildlife depredation in CCDWLS.....	98
Table 26 High Priority HCVAs of Changthang landscape (WWF-India, 2020) .....	104
Table 27 Research activities proposed in CCDWLS during the tenure of the management plan.....	133
Table 28 Performance indicator against management objectives for monitoring of biological/ecological/socioeconomic parameters in CCDWLS.....	137
Table 29 Performance indicator against management objectives for monitoring of wetlands in CCDWLS.....	138

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## **Executive Summary**

The Changthang landscape comprises of the eastern half of the Leh district in Ladakh, which borders with Tibet in the east and the Northeast, Nubra valley in the North, the Zaskar, Ladakh and Karakorum mountain ranges in the West and Himachal Pradesh in the South. This landscape is one of the largest cold deserts in India, spanning about 27,000 sq. km. area, characterised by a dry plateau of rolling plains, the average altitude of Changthang being 4500 meters. A unique ecosystem, Changthang is at the crossroad of rapid socio-economic changes and age-old pastoral practices. Up to this point, moderate populations of herders and their livestock have co-existed with wildlife in the landscape. However, with the steady increase in the number of livestock and with limited areas for livestock grazing, rapid increase in the tourism and other related developmental activities, there is an increased pressure on the land, which has resulted in cases of conflict between herders, wildlife managers and development agencies in the area.

The management plan of the Changthang landscape focuses on key biodiversity areas for conservation of flora and fauna and ensures wellbeing of the local communities. The SECURE Himalaya project provides a landscape approach for the management of Changthang Cold Desert Wildlife Sanctuary and the adjacent ecosensitive zone for ensuring the conservation of snow leopard, associated carnivores, wild prey and their habitat along with improving the livelihoods of the local people by prescribing a balance between conservation and development of the Trans-Himalayan region of Ladakh.

In the Changthang landscape, the Integrated Landscape Management (ILM) approach aims for a long-term collaboration between diverse stakeholders to achieve the objectives of biodiversity conservation, sustainable resource use and participative engagement of rural populations. It supports integration across the various sectors promoting coordination and ensuring harmony between planning, implementation and monitoring processes at the landscape among the various stakeholders involved. By coordinating the strategies and policies in addition to encouraging interactions between different levels of Government and communities, ILM will also be used to generate cost efficiencies at several levels in the landscape.

For the preparation of the Integrated Landscape Level Management Strategy and Plans for the Changthang landscape secondary literature was thoroughly reviewed and a detailed policy document for the UT of Ladakh was prepared. Once this was completed, a report on the extent of landscape was prepared which defined the landscape extent in terms of its physical boundaries, biodiversity values, land use land cover and social and economic profiles of the local communities. This was succeeded by series of consultations with relevant stakeholders in Leh city and in the landscape for identifying critical issues in the landscape and their mitigation strategies that culminated into a stakeholder workshop.

In the following document, Part 1 of the management plan presents the landscape's significance, location, the land use, biophysical and climatic characteristics. It provides an in depth knowledge of the faunal and floral species that exist in the landscape and highlights the major scientifically important areas for conservation- "HCVAs" along with the socio-economic profile of the local communities inhabiting the landscape. Sector-wise threats and issues pertinent to the landscape are discussed and ranked in the succeeding chapters. The key issues of human-wildlife interface, feral dogs, waste disposal, pastureland scarcity, habitat degradation and unregulated tourism along with others have been discussed in detail and threats and issues have been ranked.

Part 2 of the management plan focuses on the management aspect wherein the vision, goals and objectives have been defined in the first section. The vision of the management plan highlights the importance of biodiverse areas, sustainable resource use and upliftment of the local communities. It discusses in detail the management interventions and mitigation strategies to address the identified issues and also highlights the role of each stakeholder in it. The succeeding chapters introduce the research, monitoring and capacity development needs in the landscape along with the administration setup of the nodal agency for the management plan and the overall plan budget.



# Part I

## Chapter 1 Overview of the Overall Approach

### 1.1 Background

Changthang, locally meaning the Eastern Flat Land, is located on the East of Leh on the China border. Changthang falls in India's Trans-Himalaya region and is inhabited by the Changpas, a semi-nomadic community comprising of several clans. The landscape is home to several endangered wildlife species, including many rare and migratory birds that make it their home during the summers (Department of Wildlife Protection, 2012). The flagship species in the landscape is the black necked crane *Grus nigricollis* while other endangered species such snow leopards *Panthera uncia*, Pallas's Cat *Otocolobus manul*, Tibetan wolf *Canis himalayensis*, their prey and associated species occupy the habitats in the landscape. Additionally, due to its location along the international boundary, the landscape is strategically important from the perspective of national security.



Siddharth P. Nair

Changthang is a unique high altitude, multi-use landscape that requires special conservation efforts beyond the boundaries of the protected area. To achieve the conservation goals, identification of critical areas utilised by the wildlife and its prey is of vital importance. Furthermore, it is also essential that the anthropogenic footprint in these core areas that is spread across the landscape be reduced through the practice of sustainable resource use.

Protected areas in other parts of the country are more manageable with some local support and can easily have focused conservation actions and outputs. However, landscapes such as that of Changthang depends upon scientific and participatory conservation and conflict management strategies, for which there is a requirement to make consultative and knowledge-based management plans. The plan will hold all integrated conservation efforts that are to be implemented across the landscape (Bhatnagar, 2011).

A landscape approach to conservation is one that integrates policy and practices for multiple land uses, within a given area, to ensure the equitable and sustainable use of land while strengthening measures to mitigate and adapt to climate change (Scherr & McNeely, 2008; Milder et al. 2014; Sayer et al. 2013; Harvey et al. 2014). The approach includes not only the physical features of the landscape, but the internal and external socio-economic drivers that affect land use, those that are predominantly related to conservation, forestry and agriculture (Sayer, et al, 2013). The approach being primarily rooted in conservation and the science of landscape ecology (Lindenmayer et al. 2008; Reed et al. 2016). It ensures a balance between the competing demands on the land through implementation of adaptive and integrated management systems (Reed et al. 2016).

In the Changthang landscape, the Integrated Landscape Management (ILM) approach aims for a long-term collaboration between diverse stakeholders to achieve the objectives of biodiversity conservation, sustainable resource use and participative engagement of the local communities. It supports integration across the various sectors promoting coordination and ensuring harmonisation in planning, implementation and monitoring processes at the landscape involving the various stakeholders. By coordinating the strategies and policies in addition to encouraging interactions between different levels of Government and communities, ILM tends to catalyse cost efficiencies across the landscape at several levels.

Although protected areas have significantly increased in number and their extent, to fulfil their purpose, it is not possible for them to “exist in isolation in islands” (Secretariat of the CBD, 2004). A participatory landscape approach is all the more critical in the high altitudes areas like that in Changthang since wildlife populations are not restricted within the boundary of the protected area.

## **1.2 SECURE Himalaya Project**

In October 2013, India became a signatory of the Bishkek declaration, which was adopted by all 12 snow leopard range countries. This declaration led to the formation of the Global Snow Leopard and Ecosystem Protection Program (GSLEP) and pledged to “ensure that snow leopards and the people who live among them thrive in healthy ecosystems that contribute to the prosperity and well-being of our (sic) countries and the planet”. The GSLEP functions at the country scale by establishing National Snow Leopard and Ecosystems Priorities (NSLEPs). In India, the NSLEPs are consistent with the goals and activities of Project Snow Leopard and help strengthen it further.

The United Nations Development Fund (UNDP) and the Global Environment Facility (GEF) help to provide financial and technical support for the implementation of GSLEP. Securing Livelihoods, Conservation, Sustainable Use and Restoration of High Range Himalayan Ecosystems (SECURE-Himalayas) is one of the 9 GEF-financed and UNDP-implemented projects within the GSLEP framework. It is a seven year programme launched by the MoEFCC and UNDP in 2017. It targets four main high-altitude landscapes in India - the Changthang Plateau in Ladakh, Lahul-Pangi in Himachal Pradesh, Gangotri Govind in Uttarakhand and Khangchenjunga-Upper Teesta-Tso Lhamu in Sikkim. The project SECURE-Himalaya aims at the implementation of four main inter-related components (UNDP, 2017):

- i. Conservation of key biodiversity areas and their effective management
- ii. Securing sustainable community livelihoods and natural resource management
- iii. Enhancing enforcement, monitoring and cooperation to reduce wildlife crime and related threats

iv. Gender mainstreaming, monitoring, evaluation and knowledge management

Activities of the SECURE-Himalayas project that align with those of Project Snow Leopard include promoting sustainable management practices, introducing snow leopard-herder conflicts resolution practices, developing of participatory snow leopard monitoring system and conducting conservation awareness programs in the targeted regions of India's snow leopard landscape. The NSLEP and Project Snow Leopard had identified a number of interventions focused on addressing the issues of unsustainable natural resource use, limited livelihood options, inadequate protection measures outside PA networks and limited wildlife monitoring in India's high altitude habitats. Activities of SECURE-Himalaya, in accordance with the GSLEP framework, have contributed significantly to the implementation of the prescribed interventions across the landscape.

At the regional level, the project's aims are to reduce the dependence of local communities on snow leopard range ecosystems by adopting a three-pronged approach listed as follows (Paxton et al., 2016):

- i. To enhance existing livelihoods through improved accessibility to technical services and better practices, such as on-farm agro-biodiversity management, integrated pest management and improved seed, as well as encouraging the revival of traditional pastoral practices, such as rotational grazing.
- ii. To secure alternate and new livelihood options through diversification of the agricultural economy, introduction of improved business models that eliminate intermediaries and the incorporation of novel technologies, such as green energy.
- iii. To support skill-based employment opportunities by strengthening non-farming sectors such as the tourism or local handicrafts sectors

### **1.3 Landscape Level Approach to Management of the Changthang Landscape**

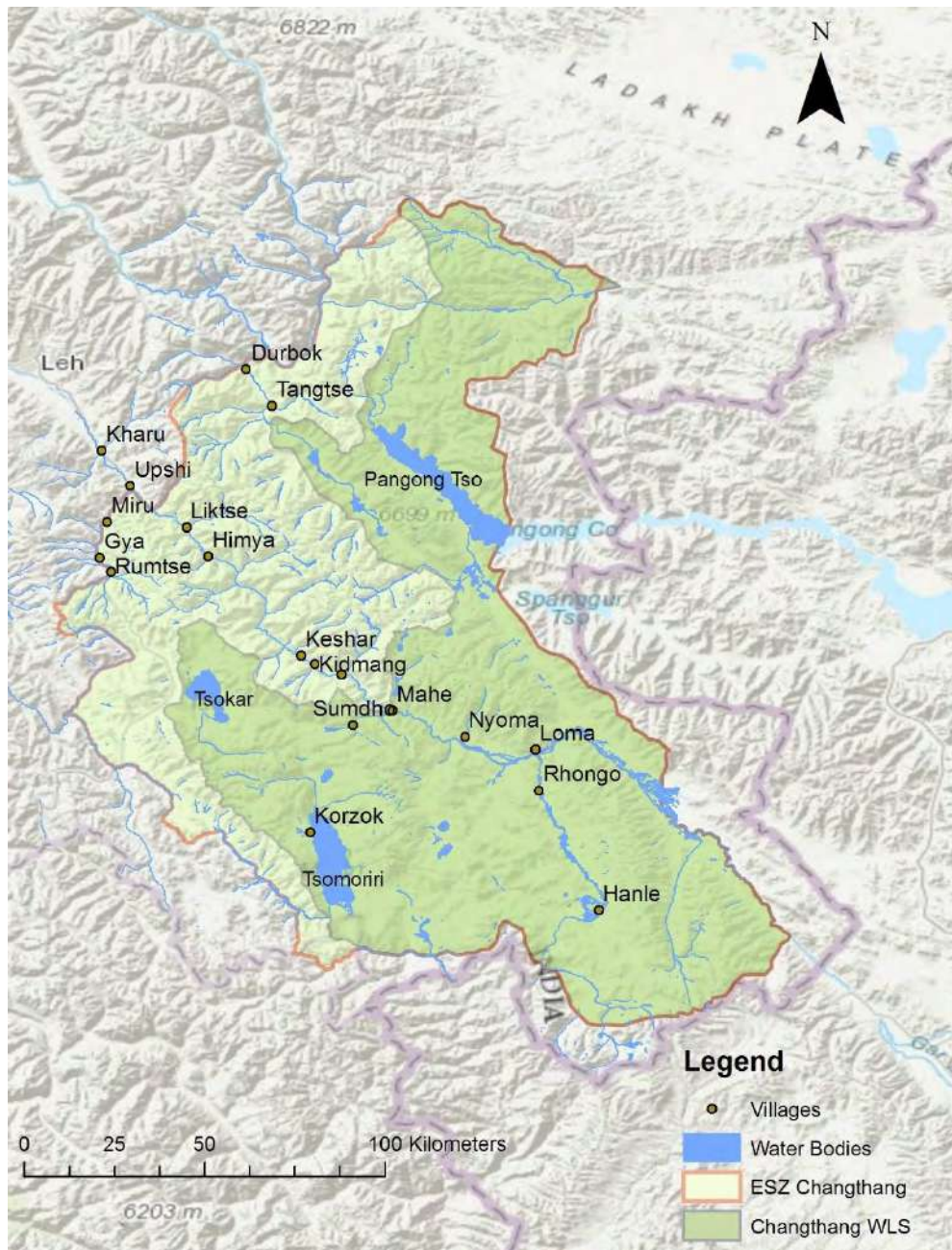
Given the above context, IORA Ecological Solutions Pvt. Ltd. was commissioned the task for the preparation of the Participatory Integrated Management Plan under the UNDP Secure Himalaya Project. This was done to ensure that the team brings in and integrates all the studies conducted by all the other agencies in the landscape, research policies, assess threats and issues in the landscape and prepare the participatory integrated landscape management plan through consultations. This is done with the support of the Wildlife Protection Department, Ladakh and the landscape-planning unit of UNDP-India.

On receiving the assignment, team from IORA carried out thorough secondary literature review and prepared a preliminary inception report. This was followed by the research and preparation of a detailed policy document for the UT of Ladakh. Once this was complete, a report on the extent of landscape was prepared.

Institutional information from relevant government and non-government agencies operation in the landscape such as mandates, key activities and relevant data- demography, department specific data, etc. were collected (Section 2). IORA coordinated and gathered information from multiples agencies working in the landscape such as their mandates, key activities, their results, maps, spatial data, etc. IORA referred to official web based resources and government records and to the old management plan for Changthang Wildlife Sanctuary, for identifying gaps and failures.

In order to better understand the issues in the landscape, stakeholder consultations were held in Changthang and Leh. Two different approaches were used for this purpose as discussed in the following paragraphs.

Teams of researchers travelled through the landscape covering 19 villages (Figure 1). In these villages, key informant interviews were conducted using a structured questionnaire to understand the threats and issues in the landscape across multiple sectors and to understand local aspirations.



*Figure 1 Villages where the consultations and interviews were conducted*

With the key informant interviews, three stakeholder’s consultations workshops were held in the villages of Sumdo, Nyoma and Chumathang to discuss the issues and potential intervention strategies. The consultations were attended by village sarpanchs’, Gobas’, community members, lamas’ and Tibetan refugees. The minutes of the consultations are attached as Annexure 1.

In Leh, a multi-stakeholder consultation workshop with representation from different government departments, national institutes, NGOs, and elected Panchayati Raj Institution members was conducted. The vision and

objectives of the landscape management were discussed and their inputs were noted. After this an interactive exercise was held to identify sector specific issues in the landscape, after which, issue specific mitigation strategies were identified and discussed in detail in consonance to the understanding that was captured during the stakeholders consultations workshops conducted at the landscape to be incorporated in the management plan. The pictures of the consultations held are presented in Annexure 2.



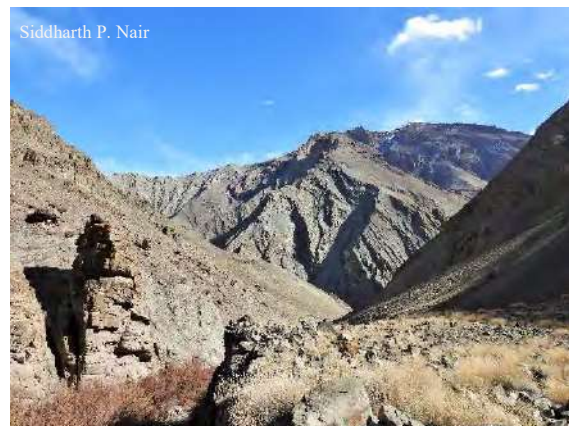
## Chapter 2 Introduction to Changthang Landscape and Background Information

### 2.1 Extent of the Landscape

#### 2.1.1 Statement of Significance

The Changthang landscape is the largest cold desert region of the Indian trans-Himalaya (biogeographic zone 1B) (Rodgers & Panwar, 1988). The climate in the region is severe but the landscape has unique biodiversity. The Changthang region represents the western extension of the Tibetan Plateau, an important highland grazing ecosystem (Goldstein & Beall, 1990) with the people largely dependent on local resources for their sustenance (Namgail et al. 2007). Historically, the region has been used as rangelands by the nomadic pastoral community who rear yaks and pashmina goats. Contiguous with the Tibetan plateau the area includes high conservation value areas with key faunal assemblages comprising of the black necked crane, pallas's cat, snow leopard, blue sheep, Tibetan argali, Tibetan gazelle, and Tibetan wolf.

The landscape forms an important wildlife corridor between the Changthang Cold Desert WLS and Hemis High Altitude NP. Rong Valley, at the fringe (buffer zone) of Changthang Cold Desert WLS, is home to a cluster of agro-pastoral villages rich in agrobiodiversity and wintering areas of high-altitude ungulates



Changthang is home to high altitude wetlands that are an oasis of productivity in an otherwise arid steppe environment, having significant conservation value, particularly as breeding grounds for the bar-headed goose and the globally threatened black-necked crane. Ladakh is the only known breeding ground of black necked crane in India (Chandan et al. 2008). It is also the breeding site of bar headed goose *Anser indicus*, brown headed gull *Chroicocephalus brunnicephalus*, common merganser *Mergus merganser*, common redshank *Tringa totanus*, common tern *Sterna hirundo*, great crested grebe *Sterna bergii* and the lesser sand plover *Charadrius mongolus* (Prins and Wieren 2004, Chandan et al. 2008; Hussain et al 2008; Humbert-Droz 2011; Jamwal et al. 2020). Additionally, the wetlands provide to the livelihoods of the communities and play a significant role in the socioeconomic status of local communities. The lake basins are grazing grounds for both domestic livestock and wild ungulates such as the Kiang (Hussain & Singh 2001). The wetlands are part of the local culture and the unusual and serene landscape of the Changthang region is a popular tourist destination.

The Changthang landscape is additionally significant from the perspective of environmental services related to biodiversity, energy, water, climate change owing to the presence of wetlands, pastures, glaciers and snow covered areas. The relatively remote and inaccessible nature of the landscape as well as the direct dependency of the local folk on natural resources for their basic needs makes the landscape significant. There is therefore a need to study, map and manage the interplay between different components of conservation significance like species, habitats, ecological services and human presence and livelihood.



## **2.1.2 Location, Physical Boundaries and Extent**

### **2.1.2.1 Extent**

The Changthang landscape is located in the northeast of Leh and constitutes the eastern part of the Union Territory of Ladakh. The landscape includes the Changthang Cold Desert Wildlife Sanctuary and the proposed eco-sensitive zone that lies towards the west of the sanctuary and falls between 32°29'4.67" N–34°32'56.07" N and 77°37'27.85" E–79°27'38.6" E. The western most boundary of the landscape is demarcated by the villages—Gya, Meru and Rumtse and extends to the eastern part of the Ladakh towards the China border and includes the villages of Chushul and Tsaga. The northern side of the landscape is flanked by the villages of Shyok and Phobrang and the Pangong Tso Lake while the southern part of the landscape consists of the villages of Korzok, Hanle, Chumur and the Tsomoriri Lake.

### **2.1.2.2 Delineation of Landscape**

The Changthang Cold Desert Wildlife Sanctuary was notified in 1987 enforced by Section 17 of the Jammu and Kashmir Wildlife (Protection) Act, 1978 (Annexure 3).

The boundaries of the sanctuary as per the notification are-  
North- Chilam and Lukoong

South - Kaigar- Tso and Hanley

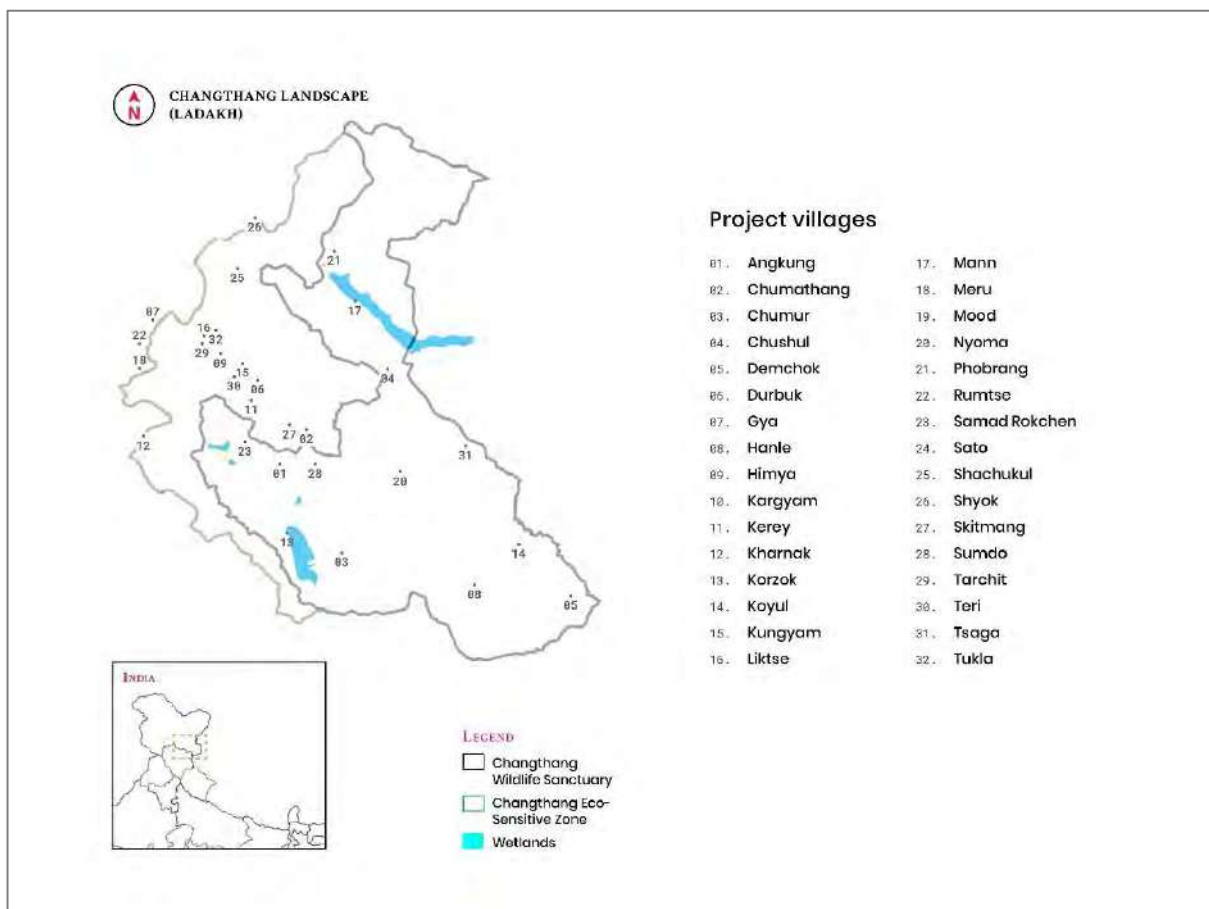
East- International boundary of China

West- Spanger Tso and Spangong Tso

In 1978, the area of the proposed wildlife sanctuary was proposed at 4,000 sq km including the water catchment of Indus valley Hanley up to Pangong Tso enrooting southeastern catchment uptown China border.

The proposed high altitude wildlife sanctuary harbours unique and endangered fauna such as the Tibetan wild ass, the great Tibetan Sheep, the lynx, the Himalayan mouse hare, the black-necked crane, the Tibetan sand grouse, the Tibetan partridge, the bar-headed geese, the Brahminy duck, the Tiben sand cock.

The landscape boundary also includes the proposed eco sensitive zone that lies on the western part of the sanctuary.



**Figure 2 Delineated Boundary for Changthang Landscape**

As per the delineated boundary, the following villages fall within the boundary. The villages are spread across five blocks—Durbuk, Rong, Rupshu, Rong and Nyoma.

**Table 1 Villages lying within the Changthang Landscape Boundary**

Block	Village/Hamlet	Block	Village/Hamlet
Durbuk	Durbuk	Nyoma	Hanle
	Mann		Koyul



Block	Village/Hamlet	Block	Village/Hamlet
	Shachukul		Demchok
	Chushul		Nyoma
	Kargyam		Mood
	Sato		Tsaga
	Shyok		Kharnak
Rong	Chumathang	Rupsho-Puga	Samad Rokchen
	Himya		Korzok
	Tarchit		Sumdo
	Kungyam		Chumur
	Teri		Angkung
	Liktse	Kharu	Gya
	Tukla		Meru
	Kerey		Rumtse
	Skitmang		

### 2.1.3 Approach and Access

The Changthang landscape lies in the eastern part of Ladakh and is approachable via road from the main city of Leh. The Changthang Cold Desert Wildlife Sanctuary lies around 130 km from Leh while the western most boundary of the landscape (Rumtse Village) is about 70 km from Leh. The nearest airport to the landscape is the Kushok Bakula Rimpochee Airport in Leh.

There are three main routes to enter the landscape. The first two routes have their road common upto Upshi from where one way goes towards Gya, Meru and Rumtse and crosses the Taglang la pass to enter the Tsokar region of landscape. This is a part of the Leh-Manali Highway (National Highway No. 3). From Upshi, the other road leads directly to Chumathang, Nyoma and straight to Hanle. The third route of the landscape is through the north that crosses the Chang la pass to enter Durbok and goes to the Pangong Tso Lake and further to the eastern international boundary with China.

Both the Taglang la pass and Chang la pass are one of the highest passes in world with their altitudes being 5359 metres and 5360 metres above sea level respectively and have breath-taking views along the routes.

The taxi union at Leh provides tours to the landscape at fixed rates, as there is no means of local transport. Many villages inside the landscape provide the facility of homestays and guesthouses. The most popular places for stay include Chumathang, Nyoma, Hanle, Korzok (Tsomoriri Lake) and Pangong Tso. Network connectivity inside the landscape is only present at very few places with just one network provider, BSNL.

## **2.2 Attributes of the Landscape**

### **2.2.1 Geology, Rock and Soil**

The landscape highlights the area as mostly consisting of bare crags, granite dust and rocks of sandstones, shale and conglomerates. The primary types of rocks in the region are gneisses, limestone, slates and schist (Cunningham, 1998; Negi, 2002). The valley areas are underlain by glacio-fluviatile deposits that are composed of sand, gravel and glacial boulders, the plain areas by moraine deposits of boulders, cobbles and pebbles in an arenaceous matrix and the lake areas by clays, sand and silt. The prominent litho-tectonic units that arose after magmatic cycles from the Pre-Cambrian to the Eocene period are, the Saltoro ophiolites in the late Paleozoic, the Khalsar Formations of the late Paleozoic, Khardung volcanics and Ladakh granitic complex of the late Cretaceous (Srimal, 1986).

Changthang is a part of the cold arid eco-region, which is characterised by shallow skeletal soils (Murthy & Pandey, 1978). The soils of Changthang are fine sandy-to-sandy loam in nature with low water holding capacity. It is deficient in organic matter and low in phosphorus and potash. However, due to the calcareous nature of parental rocks, such as limestone and shale, there is comparatively high content of free calcium carbonate in the newly formed soil. The pH of the soil ranges between 7.6 – 8.8, depending on the slope and texture of the area (Gupta & Arora, 2017). The factors of a cold desert climate such as limited rainfall, extreme aridity, low temperatures, scarce natural vegetation, steep topography and resistance of rocks to chemical weathering leads to a poorly developed soil profile, resulting in a skeletal type of soil. The fluctuation of diurnal and seasonal temperatures weakens the rock surfaces due to contraction and expansion, resulting in the physical weathering of rocks and an abundance of loose debris. The soil has low carbon levels because of scarce vegetation, and vice versa. This limits microbial activity, which would otherwise convert debris to soil mass and create finer soil texture. Wind erosion occurs due to extremely strong winds and removes fine particles, such as humus and silt, leaving behind a soil surface that has an increased concentration of gravel and pebbles. Therefore, the presence of regoliths, which is a form of mantle rock resulting from the build-up of unleached or uneroded rock fragments on the soil surface, is common in the region.

### **2.2.2 Terrain Characteristics**

The Changthang region of eastern Ladakh represents the southwestern portion of the Tibetan plateau, part of the trans-Himalayan landscape. It is a high-altitude cold desert with an area of 2700000 ha. constituting vast plains, hills, mountain ranges, valleys, brackish lakes and sand marshes. The region is mostly barren rock and soil and vegetation is sparse, limited to alpine grazing meadows (Namgail et al., 2007; Rawat & Adhikari, 2005; Shrotriya et al., 2015).

The major mountain ranges in the region are the Eastern Ladakh, Pangong, Karzok and Rong ranges. The Pangong range, along the southern shore of Pangong Lake, is at the north of Changthang. It has an overall high altitude and a glaciated area of 16%. The highest peak is at 6700m. The Karzok range is situated in the southwest of Changthang along the TsoMoriri Lake. It is northwest oriented range with a 21% of glacier cover, some covering over 1 km<sup>2</sup>. The highest peak is at 6670m. The Rong range is north of the Karzok range and has lower altitudes and only 2% glacier cover. The Eastern Ladakh range runs through the centre of Changthang between Rong and Pangong. Glaciers in the mountains are primarily on the northwest-northeast facing slopes, while steep and non-glaciated regions are primarily on the southern facing slopes (Schmidt & Nüsser, 2017).

The major valley present in Changthang is the Hanle valley, at the south of the region. The Hanle valley is a plateau with altitudes ranging from 4400-5200m. The plateau is characterised by undulating terrain with outcrops, and has riverine, saline marsh meadow, alluvium fan and rocky/scree slope habitats. It is used as winter grazing land. The Indus river cuts through Changthang from the northwest to southeast (Hussain et al., 2010).

### 2.2.3 Climate

Changthang is a cold desert biotope with semi-arid climate, characterised by extreme coldness, aridness, strong winds and high radiation. The climate in the region is caused due to the joint effect of elevation and the rain shadow effect of the Karakoram and Himalayan ranges. The region experiences a short summer (June–August) and seven to eight months of arctic-like winter in a year (Jamwal et al., 2020; Raghuvanshi et al., 2020). Meteorological data presented in this section is the average value of Durbok, Korzok and Leh district values.

Temperatures in the region vary from 0°C to 25°C in summer and -10°C to -40°C in winter. Figure 3 shows the mean temperatures from 2009 - 2019.

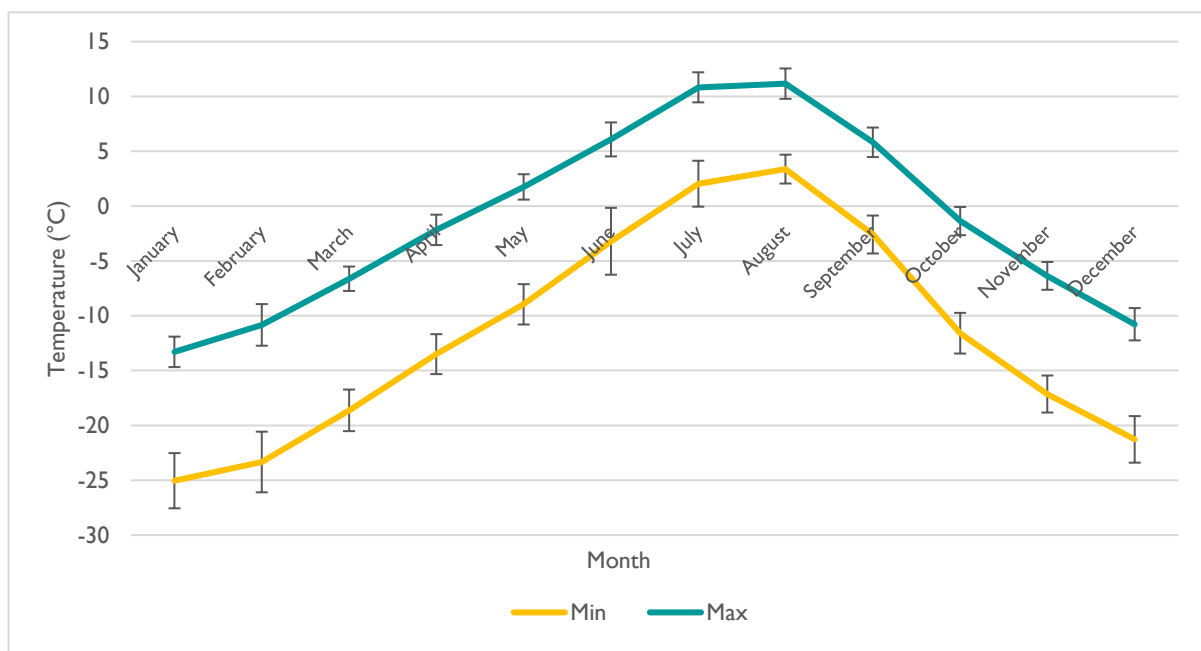
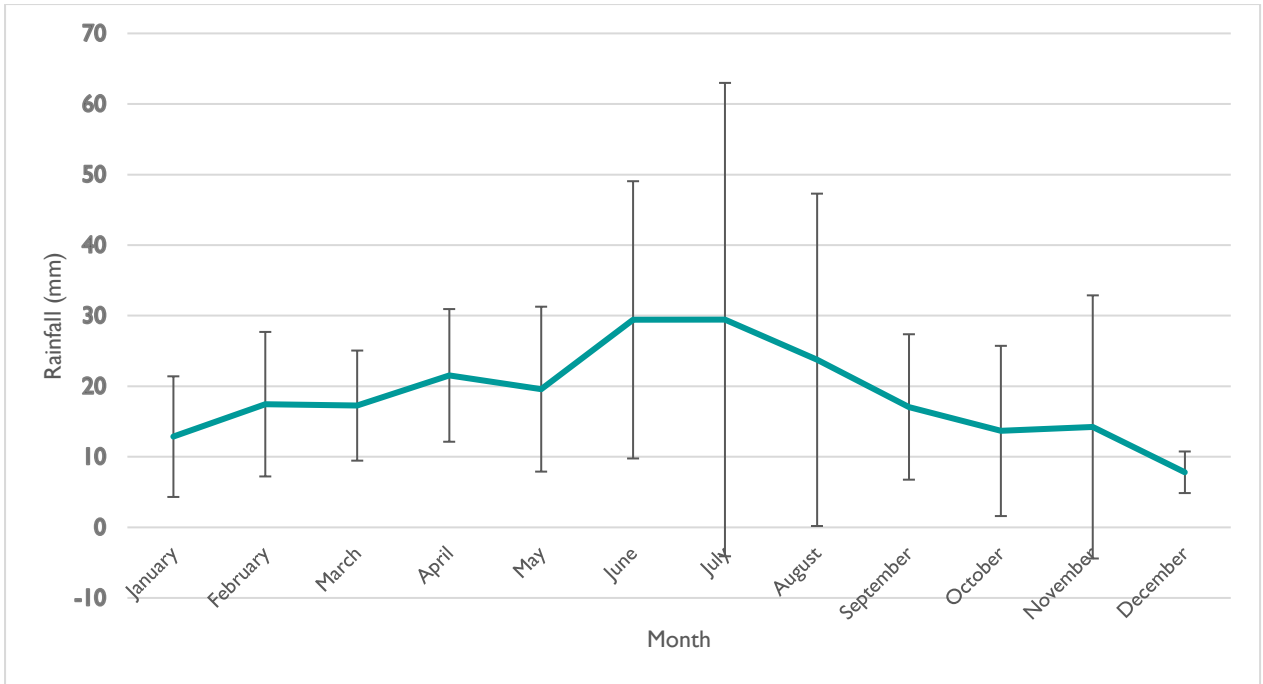
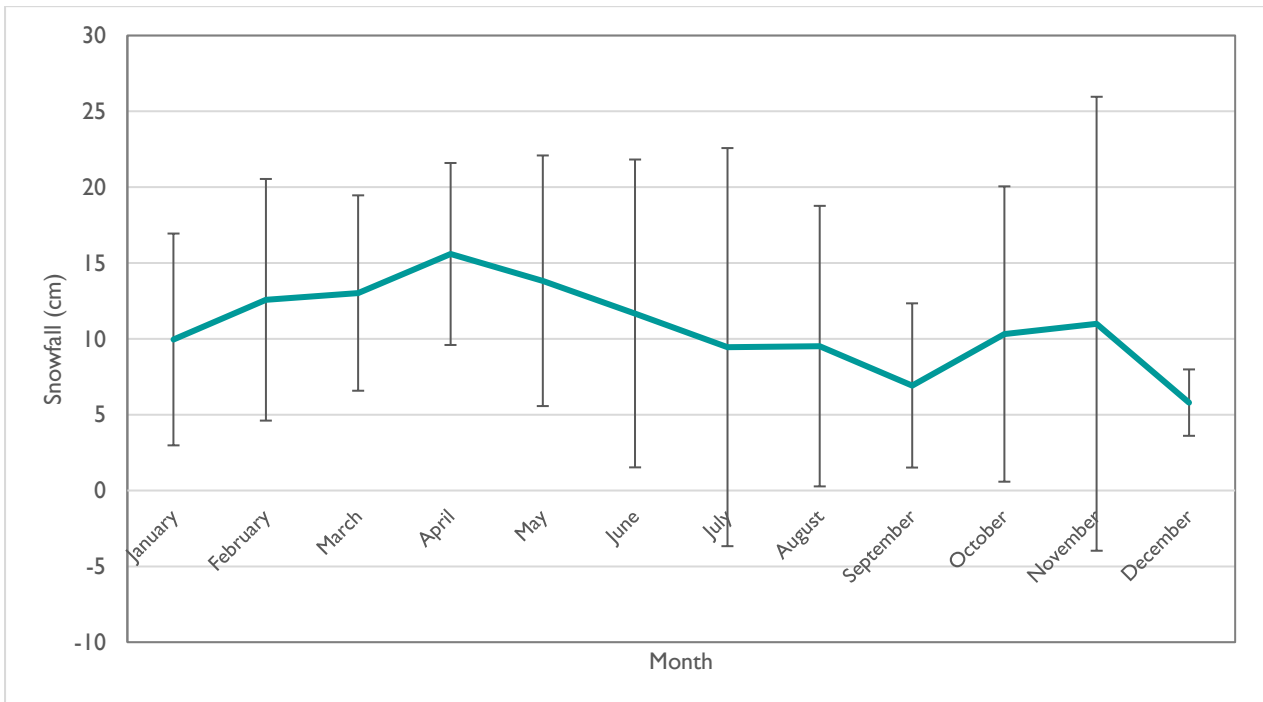


Figure 3 Mean Temperature in the landscape (2009 - 2019) (World Weather Online, n.d.)

Westerly disturbances occurring between December and February cause around one-third of the precipitation in the region. There is a vertical gradient of precipitation that occurs, with precipitation decreasing from west to east and south to north. Snowfall is seasonal to winter in lower latitudes, but in altitudes higher than 5000 m, snow falls throughout the year causing an increase in surface albedo and reducing ablation of snow and ice. Figures 4 and 5 present the mean rainfall and snowfall from 2009 – 2019 respectively (Schmidt & Nüsser, 2017).



**Figure 4 Mean Rainfall in the landscape (2009 - 2019) (World Weather Online, n.d.)**



**Figure 5 Mean snowfall in the landscape (2009 - 2019) (World Weather Online, n.d.)**

The Changthang region is also characterised by powerful and unpredictable winds influenced by the presence of mountain slopes. Figure 6 shows the mean wind speed from 2009 – 2019.

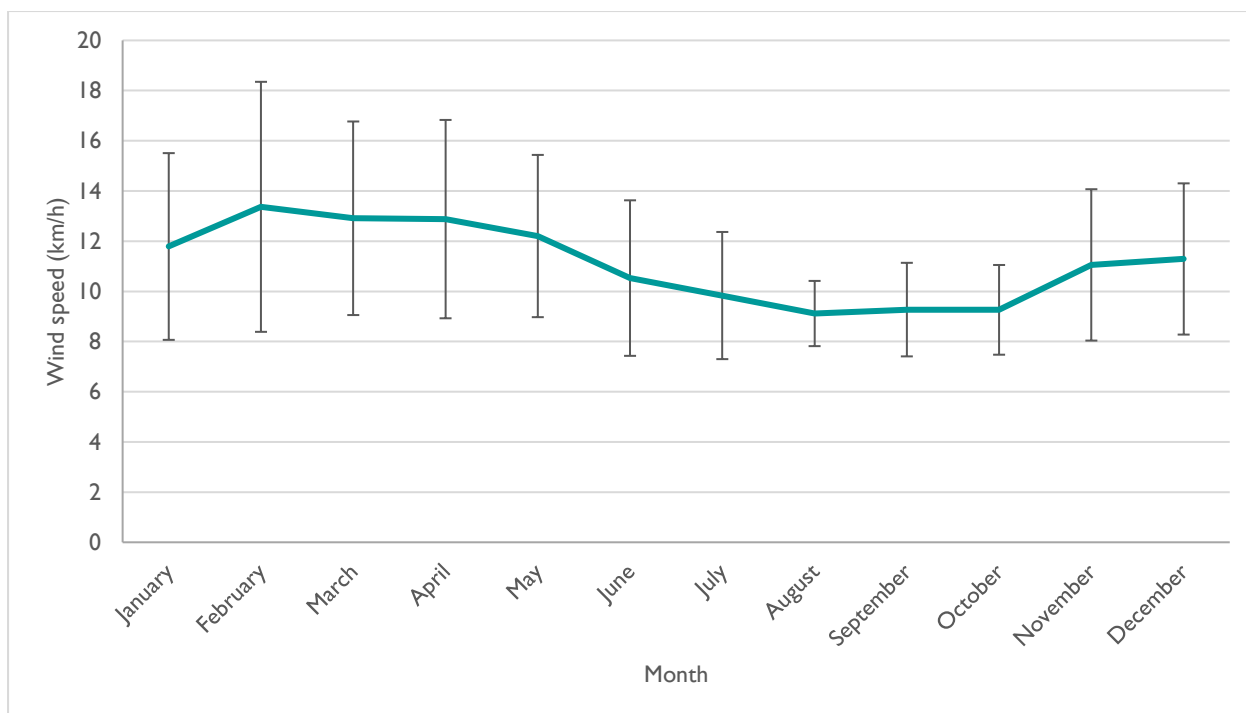


Figure 6 Mean wind speed in the landscape (2009 - 2019) (World Weather Online, n.d.)

#### 2.2.4 Land Use Land Cover of Changthang Landscape

IGIS, 2020 conducted a study to map the land use land cover of the Changthang landscape. The total geographical area of the Changthang landscape is recorded to be 2674176 hectares, in which 17 LULC classes have been identified. The majority of the landscape is reported to be non-vegetative as about 88.74% of the total geographical area falls in the glacier, moraine, dry river and lake bed, colluvium material and barren land (IGIS, 2020).

Table 2 Area under each Land Use Class in Changthang Landscape (Source: IGIS)

No.	Land use & Land cover	Area (Ha.)
1	Barren	19,45,706
2	Grassland	1,99,917
3	Snow/Glaciers	1,67,594
4	Colluvium Material	1,34,877
5	Dry River Bed	1,03,883
6	Waterbody	39,680
7	Marsh	20,074
8	Moraine	17,526
9	River Perennial	7,528
10	Agriculture	4,407
11	Dry Lake Bed	3,847
12	Scrub	3,275
13	Plantation	1,714
14	Habitation	769
15	Waterbody (Dry)	63
16	Canal	30
17	No Data	23286
<b>Total</b>		<b>26,74,176</b>

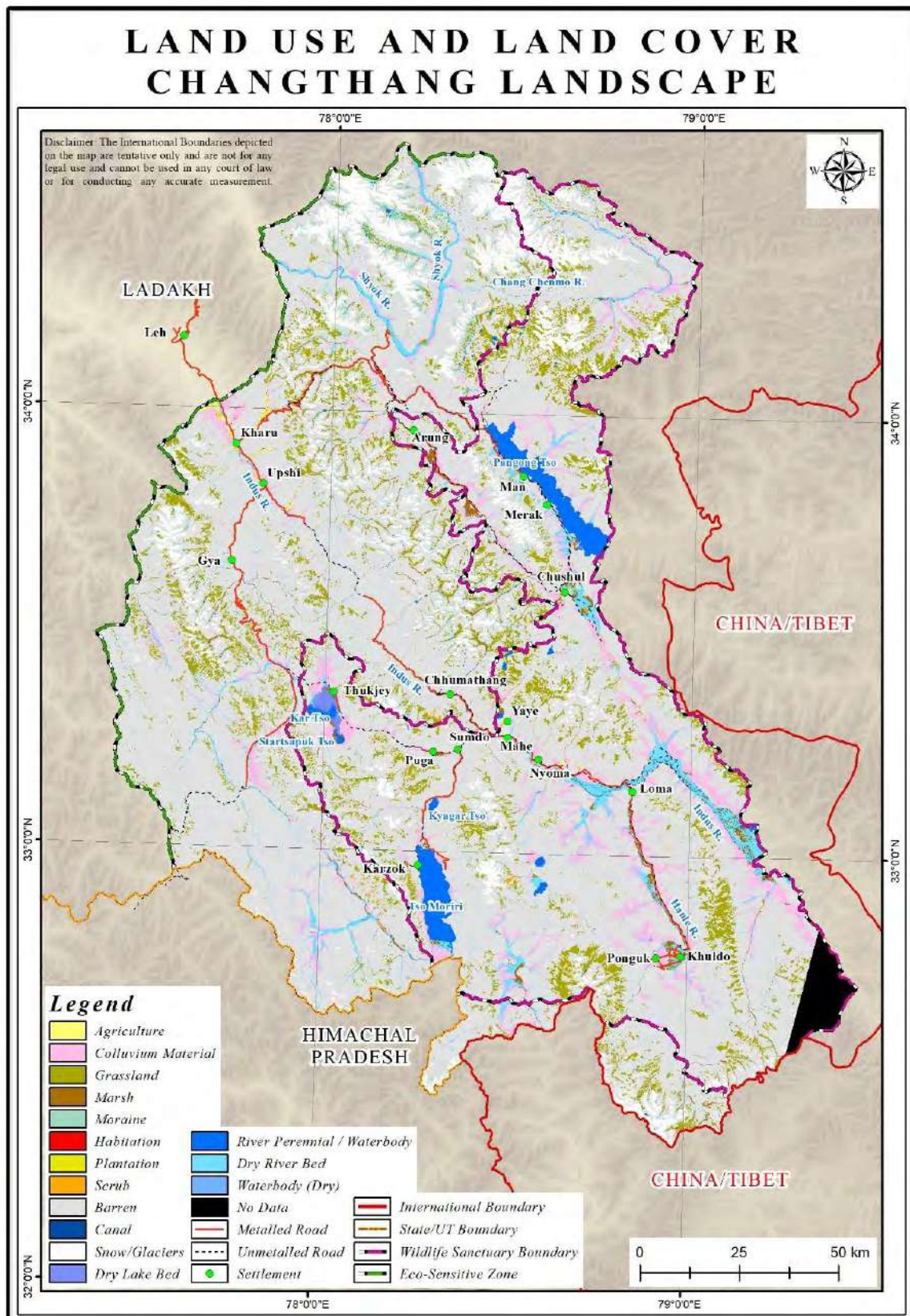


Figure 7 Land Use Land Cover Map of Changthang Landscape (IGIS, 2020)

Within the landscape, 7.6% (2, 03,192 ha.) of the geographical area has natural vegetation coverage in the form of scrub and grassland and 1.8% (47208 ha.) of the area is covered by the perennial water bodies. Habitation in the landscape accounts for 0.029% (769 ha) of the landscape and agriculture 0.16% (4407 ha.).

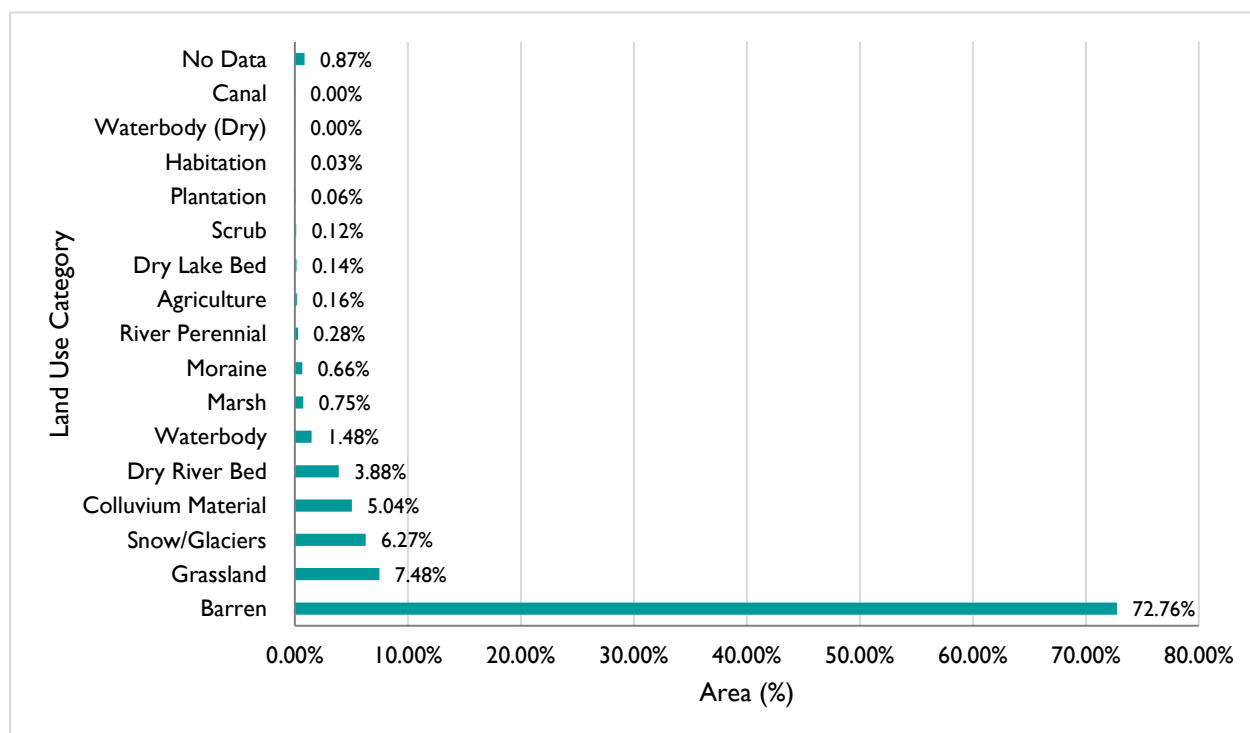


Figure 8 Area under each Land Use Class (%)

## 2.2.5 Water Resources

The Changthang Plateau spans sections of the Upper Indus and the Shyok sub-basins categorised under the larger Indus Basin (India-WRIS, 2014). The district of Leh receives an average annual precipitation of only 83mm (Pir, 2016) and the residents of the area are largely dependent on snowmelt streams, traditional water management systems and supplementary irrigation projects for commercial, household and irrigation requirements. There are a reported total of 961 natural wetlands covering an area of 203,195 hectares in the district of Leh (National Wetland Atlas: Jammu and Kashmir, 2010).

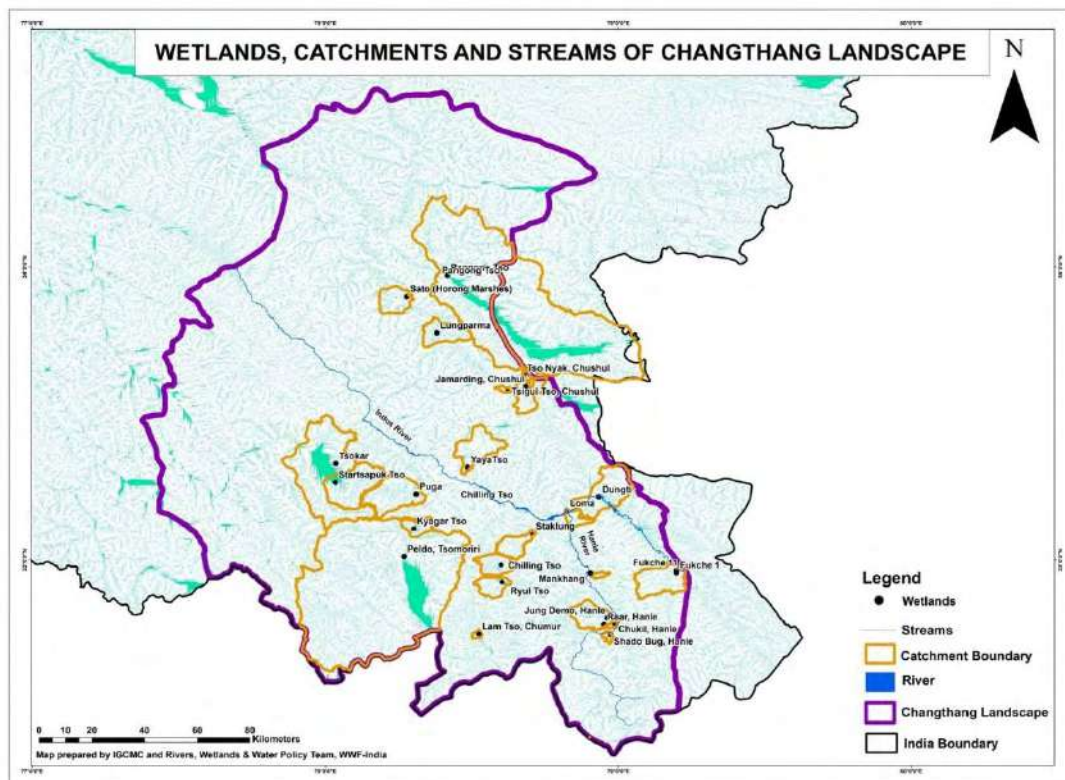
### 2.2.5.1 Drainage in Leh District

The Leh district is drained by the perennial Shyok and Nubra rivers that flow between the Ladakh range in the north and the Zaskar range in the south (District Ground Water Information Brochure, Leh District, n.d.). The peaks of the Ladakh, Saltoro and Karakoram ranges act as a water divide for Shyok and Nubra rivers.

The Shyok River originates from the South and Central Rimo glacier and flows in the northwest to southeast direction, before taking a turn towards the northwest at Shyok village. The Shyok River meets Nubra River at Disket. Small glaciers present along the flow of River Shyok are Chong Kumdan glacier, Thangman (Kichik Kumdan) glacier and Tash glacier. Nalas flowing in the north to south direction into the Shyok are Starga lungpa and Fastman lungpa originating from Thursa glacier, and Warshi lungpa originating from Urdolep glacier. Nalas flowing in the south to north direction into the Shyok are Tashi lungpa, Sumdo lungpa, Glachurap lungpa, Taru lungpa, Yaglung lungpa and Malasha lungpa.



The Nubra River originates from the Siachen Glacier and flows from the northwest to southeast. Nalas (locally termed lungpas), that flow in the northeast to southwest direction into the Nubra are Warshi lungpa originating from Warhi glacier, Phukpocche lungpa originating from Phukpocche glacier, Panamic lungpa originating from Panamic glacier, Chameshan lungpa originating from Stondok and Phukatang glacier and Sumur lungpa that is fed by snow fall at higher reaches. Nalas that flow in the southwest to northeast direction into the Nubra include the Nyungsted lungpa originating from Nyungsted glacier, Khimi lungpa originating from Khimi glacier and the Kubed lungpa originating from Kubed glacier.



*Figure 9 Wetlands, Catchments and Streams of Changthang Landscape (Source: IGCMC and Rivers, Wetlands and Water Policy Team, WWF-India)*

### 2.2.5.2 High Altitude Wetlands in Changthang

Changthang harbours a large number of wetlands that have formed in the vast enclosed basins that are present along the rivers Indus, Shyok and Hanle. The lakes of this region were mostly formed during the glacial epoch and are primarily fed by snowmelt (Aldenderfer & Yinong, 2004). A few have external outlets, resulting in brackish to saline waters. Changthang wetlands include freshwater marshes, saline marshes, seasonally flooded meadows and valley bogs. They feature prime habitats for flora and fauna, and the adjacent marshes serve as winter pastures for both wild and domestic ungulates. Some prominent wetlands, which have also been designated as Important Bird Areas (IBA) in the landscape area—Pangong Tso, Chulshul Marshes, Hanle Plains/Marshes, Tso Kar and Tso Moriri.



**Table 3. Area estimates of Wetlands in Leh district (National Wetland Atlas: Jammu and Kashmir, 2010)**

Wetland Category	Number	Total Wetland Area (in hectare)	Open Water Area (in hectare)	
			Post-Monsoon	Pre-Monsoon
Medium - Large Wetlands (> 2.25 ha)	485	1,02,934	98,877	98,839
Small Wetlands (< 2.25 ha)	440	440	-	-
River/Stream	36	99,821	87,270	87,582
Total	961	2,03,195	1,86,147	1,86,421

The high altitude lakes and marshes in the Ladakh are restricted to the Changthang region of the Tibetan plateau. A study by WWF-India has identified 24 wetlands in Changthang landscape (Table 3).



**Table 4 List of identified wetlands in Changthang Landscape (WWF, 2020)**

S No.	Name of Site	Coordinates	Altitude (m amsl)	Area of Wetlands (ha.)	Area of Catchments (ha.)
1	Tsigul Tso, Chushul	33°34'43.4"N 78°37'27.6"E	4,445	17	762
2	Shado Bug, Hanle	32°44'42.3"N 78°58'25.3"E	4,298	97	1047

S No.	Name of Site	Coordinates	Altitude (m amsl)	Area of Wetlands (ha.)	Area of Catchments (ha.)
3	Lam Tso, Chumur	32°42'38.0"N 78°33'22.2"E	4,405	12	707
4	Mankhang/Lalphari	32°57'18.8"N 78°54'15.8"E	4,215	3	1006
5	Tso Nyak, Chushul	33°37'43.8"N 78°40'36.6"E	4,348	5	974
6	Sato (Horong Marshes)	33°53'57.75"N 78°16'40.51"E	4,359	58	8617
7	Lungparma	33°46'29.5"N 78°22'50.5"E	4,558	670	10376
8	Jamarding, Chushul	33°35'29.0"N 78°41'01.6"E	4,394	637	7933
9	Fukche 1	32°57'21.4"N 79°11'56.3"E	4,180	353	15041
10	Fukche 11	32°57'51.4"N 79°11'56.3"E	4,178	353	15041
11	Raar, Hanle	32°46'47.3"N 78°57'02.0"E	4,326	180	10975
12	Jung Demo, Hanle	32°48'07.6"N 78°57'41.6"E	4,305	224	10975
13	Startsapuk Tso	33°15'55.54"N 78°2'3.27"E	4,533	461	20210
14	Peldo, Tsomoriri	33°0'41.42"N 78°16'9.42"E	4,521	14278	232686
15	Puga	33°13'28.16"N 78°18'36.04"E	4,401	155	18813
16	Tsokar	33°19'45.6"N 78°02'07.7"E	4,582	1401	73046
17	Staklung	33°05'20.7"N 78°42'25.9"E	4,173	8	7236
18	Chukil, Hanle	32°46'53.9"N 78°59'20.9"E	4,276	47	705
19	YayaTso	33°18'59.2"N 78°29'08.8"E	4,720	164	13762
20	Dungti	33°12'53.22"N 78°56'1.30"E	4,300	673	19904
21	Loma	33°10'2.85"N 78°49'25.47"E	4,250	17	3477
22	Pangong Tso	33°58'19.76"N 78°25'1.35"E	4,510	7507	106488
23	Ryul Tso	32°55'26.76" N 78°36'10.8" E	4985	642	6129
24	Kyagar Tso	33°6'25.2" N 78°18'6.12" E	4671	540	4596

Out of the 22 identified wetlands, there are five key wetlands in the landscape. These are described in the following sections.

### 2.2.5.2.1 Hanle Marshes

Hanle Plains (Hanle River marshes) are located west and north of Hanle village in Ladakh, near the border with China. They are partly state owned and partly under the Hanle Buddhist monastery. The habitat is a complex of fast flowing streams, stagnant pools, saline marshes, seasonally flooded marshes, and bogs along the Hanle river, 45 km south of its confluence with the Indus river. The wetlands are frozen from November to April and are fed

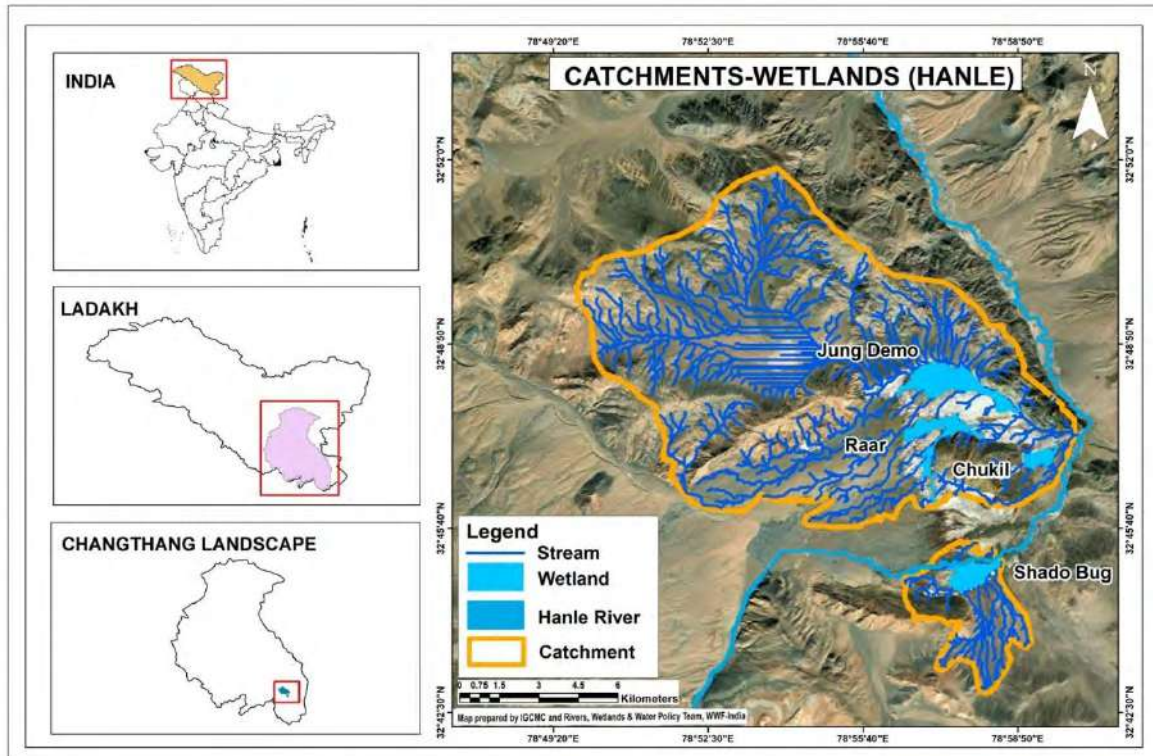


Figure 10 Zone of Influence and Drainage Map of Hanle Complex (Source: IGCMC and Rivers, Wetlands and Water Policy Team, WWF-India)

by snowmelt in summer. The freshwater pools shelter species such as *Hydrilla* spp., *Myriophyllum* spp., *Potamogeton* spp., and an edible aquatic lichen. The area is an important breeding ground for various endangered waterfowl including the black-necked crane. This site is also an important breeding area for the ruddy shelduck *tadorna ferruginea* and the lesser sand plover *Charadrius mongolus*. During autumn migration, many birds pass through this site, including the globally threatened greater spotted eagle *Aquila clanga*. The slopes above Hanle plain are an important habitat of the Tibetan wild ass. In 1995-1996, the first Tibetan gazelle were spotted in the area after 35 years of regional extinction. The Tibetan wolf and red fox are also found (Birdlife International, 2019; WWF- India, 2020).

As per the analysis by WWF, total catchment area of Hanle wetland complex is about 127 square kilometers (sq. km) of which 86% is Jung Demo and Raar, 6% Chukil and 8% is under Shado Bug wetlands.

### 2.2.5.2.2 Tso Moriri

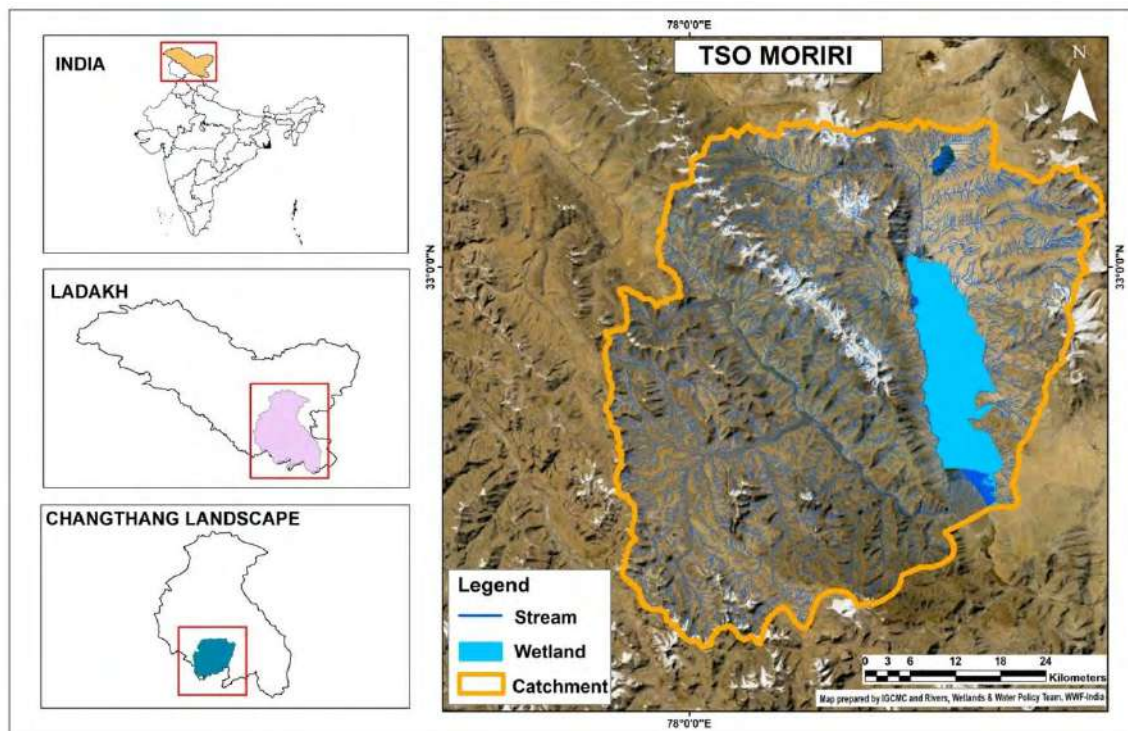
Tso Moriri in eastern Ladakh is the largest of the high altitude Trans-Himalayan lakes situated entirely within the Indian Territory. The lake formerly had an outlet to the south, but has now become landlocked, because of which the water is now brackish to saline. The lake is fed by streams and snowmelt from two major stream systems, which create extensive marshes when they enter the lake. The lake is frozen from November to April. Small



islands near the north and south ends are important for breeding waterfowl. The lake is bounded by mountain ranges with peaks exceeding 6,500 m. On the north and east sides, the lake is bounded by the hills of the Tibetan cold desert. The western side is bordered by steeper peaks exceeding 5,500m. The Pare Chu River, which originates about 40 km upstream of the lake, flows along the southern



side. Between Tso Moriri in the north, and the Pare Chu in the south, lies the Nuro Sumdo wetland, covering an area of about 2,000 ha (Mishra and Humbert-Droz 1998). There does not appear to be any vegetation in the deeper parts of the lake, but shallow areas have some *Potamogeton* spp. Various species of sedge and rushes grow in the marsh, notably *Carex* spp. *Caragana* spp. and *Astragalus* spp. characterise the steppe vegetation. *Juncus thomsonii* and *Leontopodium* spp. are also found. (Birdlife International, 2019; WWF-India, 2020).



**Figure 11** Zone of Influence and Drainage Map of Tso Moriri (Source: IGCMC and Rivers, Wetlands and Water Policy Team, WWF-India)

### 2.2.5.2.3 Tso Kar

Tso Kar is the basin of a former large freshwater lake (Chatterjee et al. 2002). It lies between the Zaskar range in the southwest and the Ladakh range in the northeast, south of the Indus River. It is called Tsokar, meaning white lake, because of the white



salt efflorescence found on the margins due to the evaporation of highly saline water. The water-spread has contracted into two principal waterbodies, Startsapuk Tso, a freshwater lake of about 300 ha to the south, and Tso Kar itself, a hypersaline lake of 2,200 ha to the north. The lakes are frozen over from November to April. Startsapuk-Tso is fed by perennial springs and snow, attaining a maximum depth of 3 m in July and August, when it overflows northwards into Tso Kar. The basin is surrounded by peaks rising to over 6,000 m. The presence of freshwater mollusc *Lymnea auricularia* fossils proves that it was a freshwater lake in the past (Sharma, 2000). The present lake is a remnant of a large freshwater lake of nearly 13,600 ha. In the less saline parts of the basin, the pools have aquatic vegetation including *Potamogeton* spp. and *Hydrilla* spp. These plants die in winter, and

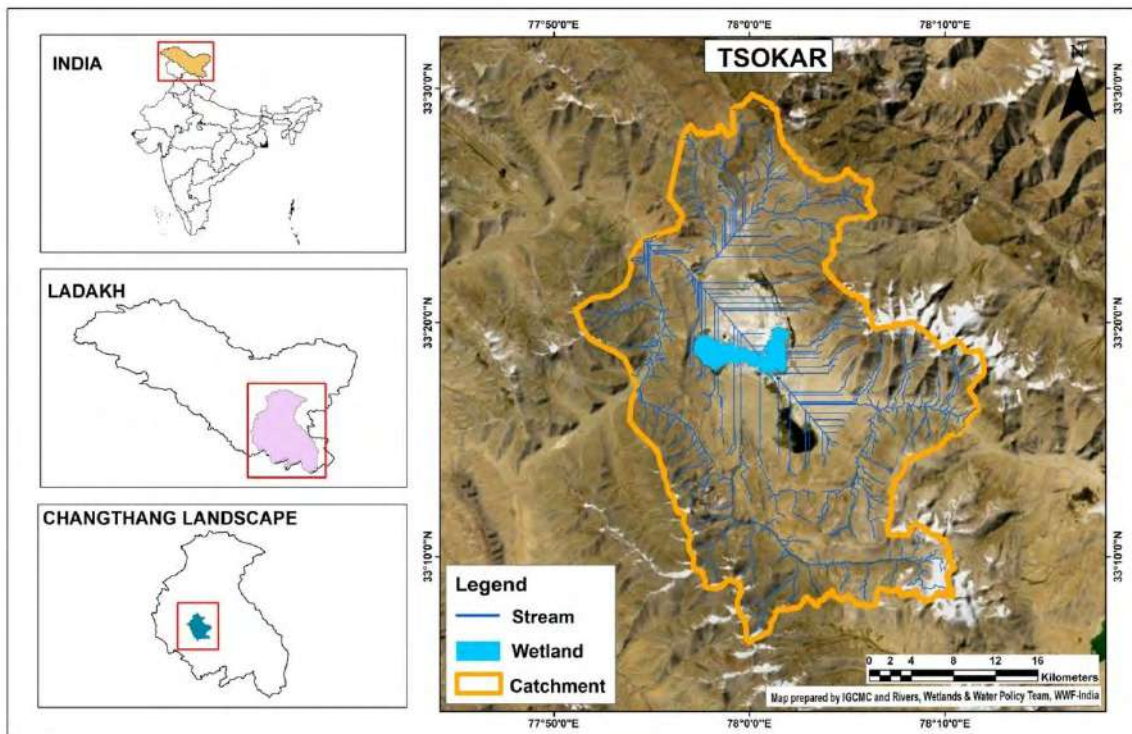


Figure 12 Zone of Influence and Drainage Map of Tsokar (Source: IGCMC and Rivers, Wetlands and Water Policy Team, WWF-India)



form floating mats of vegetation in spring. The adjacent freshwater marshes and damp meadows support a mixture of *Carex* spp. and *Ranunculus* spp. The arid steppe vegetation of the surrounding areas is dominated by species of *Astragalus* spp. and *Caragana* spp. (Birdlife International, 2019; WWF, 2020).

#### 2.2.5.2.4 Pangong Tso



Pangong Tso is a long, narrow, brackish lake spanning the Indian/ Chinese border, in a valley in the upper drainage basin of the Indus river, at the east end of the Karakoram Range. Only the westernmost one-third of the lake lies in Indian territory. It is a chain of four interconnecting lakes, formed by natural damming of the valley. Five rivers fed by perennial springs and snowmelt flow into the Indian portion of the lake. The

runoff from the west end of the lake flows northwest into the Shyok river, a tributary of the Indus. There are some brackish to saline marshes near the western end, with adjacent wet meadows. The lake has been suggested as a Ramsar site due to its biological, cultural and geological values (Chatterjee et al. 2002). It is the largest and most brackish wetland in the cold desert ecosystem of the Trans-Himalaya. A fossil freshwater mollusc *Lymnea auricularia* was discovered in ancient lacustrine clay deposits above the present level of lake, providing evidence that earlier it was a freshwater lake (Sharma, 2000). Due to its extreme salinity, Pangong Tso does not have any vegetation in the deeper sections, but at the margins and marshy areas, typical, steppe vegetation is seen. Sedges

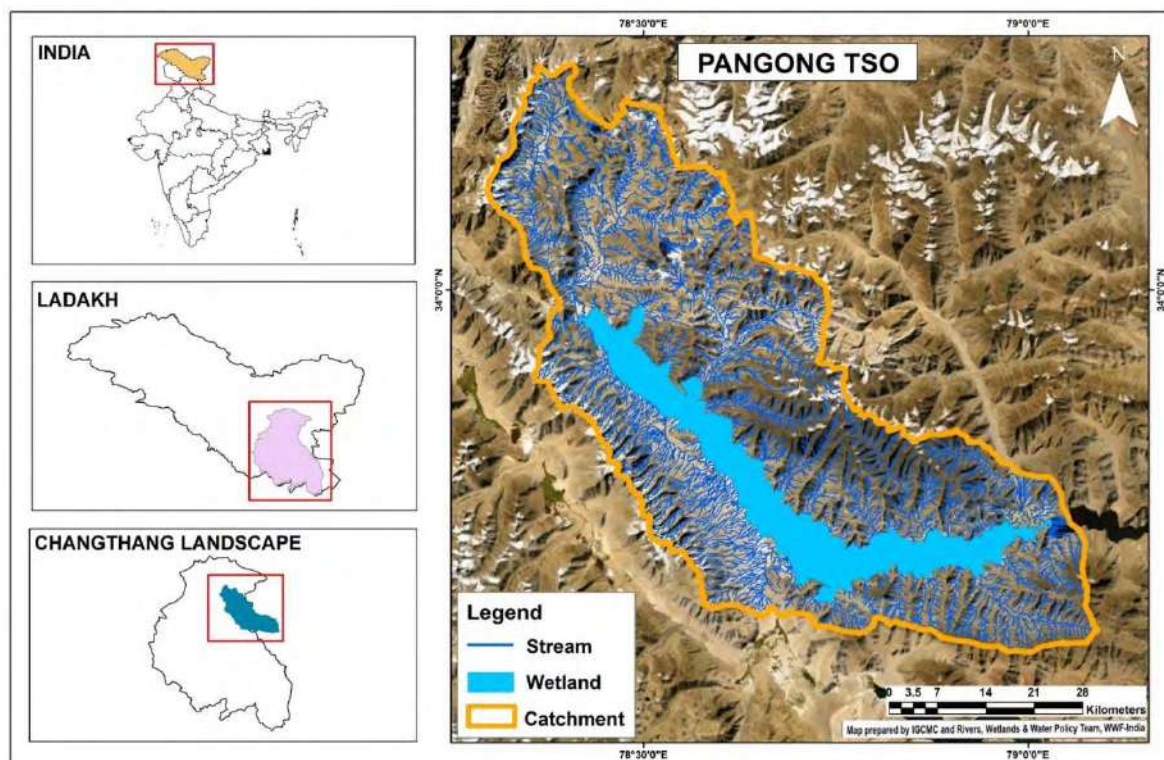


Figure 13 Zone of Influence and Drainage Map (Source: IGCMC and Rivers, Wetlands and Water Policy Team, WWF-India)

and grasses are found towards the northern and eastern sides. The surrounding plateau and hills support low thorn scrub and perennial herbs. (Birdlife International, 2019; WWF, 2020).

### 2.2.5.2.5 Chushul Marshes

The Chushul Marshes lie east and west of Chushul village near the Indo-Chinese border and is a complex of four smaller marshland areas of Tso Nyak, Jamarding 1 and 2 and Tsigul Tso.

The major habitats in these marshes consist of shallow ponds, marshes, borax plains and wet meadows in a broad predominantly sandy valley. The ponds and marshes are a result of the water coming from springs and streams of Ladakh. Some streams terminate on the sandy plains in stagnant pools which and hence increase the salinity of the area while others drain into the Pangong Tso. In winters, most of the ponds and marshes are frozen particularly for the months of November to March. Major floral species consists of *Hydrilla spp.*, *Myriophyllum* in the ponds and *Carex*, other sedges and grasses in the marshes. *Caragana* is usually found in the surrounding steppes.

Several species of waterfowl, such as the great crested grebe *Podiceps cristatus*, ruddy shelduck *Tadorna ferruginea*, lesser sand plover *Charadrius mongolus*, common redshank *Tringa totanus* and common tern *Sterna hirundo* nest in these marshes. Three pairs of black-necked crane *Grus nigricollis* have also been recorded to inhabit the Chushul marshes, of which two pairs consistently breed at Tsigul Tso and Tso Nyak (Hussain & Pandav 2001; Rauf Zargar pers. comm. 2003). Other migratory birds include the barheaded geese *Anser indicus*, which also breeds in the area as well. The Tibetan sandgrouse *Syrrhaptes tibetanus*, and Tibetan partridge *Perdix hodgsoniae* are also found in the area. Amongst the mammalian species- the kiang, argali, bharal and Tibetan antelope in known to inhabit the area (Birdlife International, 2020).

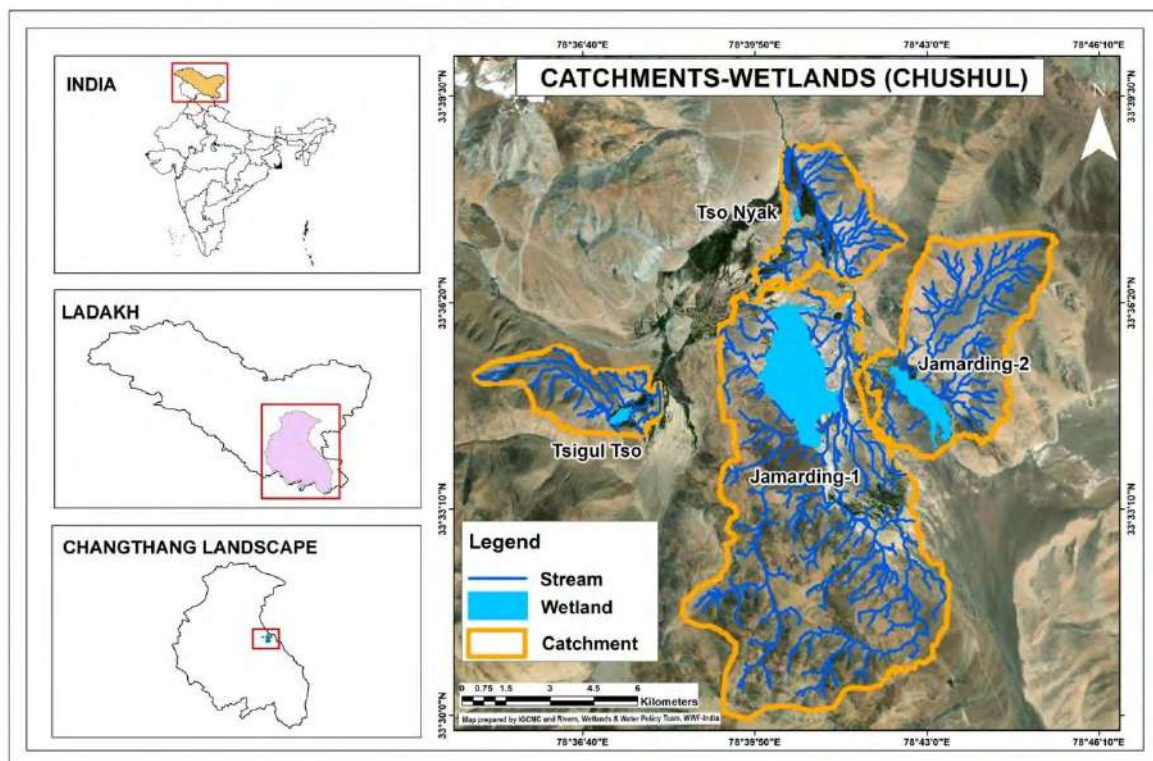


Figure 14 Zone of Influence and Drainage Map of Chushul Complex (Source: IGCNC and Rivers, Wetlands and Water Policy Team, WWF-India)

### 2.2.5.3 Artificial Water Sources

Main source of irrigation in the district is driven by surface water-based sources as the underlying consolidated rock formations have low porosity and limit groundwater development opportunities (District Ground Water Information Brochure, Leh District, n.d.). Water shortage faced during the spring or Rabi agricultural season is lessened through the usage of alternate water sources.

### 2.2.5.4 Alternate Watershed Management Techniques

The Public Health Engineering and Irrigation & Flood Control (PHE/I&FC) department has constructed tube wells, dugwells and handpumps in villages across the district to help mitigate the water shortage problems (District Ground Water Information Brochure, Leh District, n.d.). However, the construction of structures such as tubewells is only viable in the limited areas with valley fill deposits and moraine deposits. The department have installed tubewells to cover groups of Changpa herders corrals in the landscape. However, in the Changthang area alternate options for supplementary water supply such as the traditional snow water harvesting structures locally known as zing, check dams and artificial glaciers is essential.

Zings are small tank-like structures used to collect melted glacier water through a network of guiding channels that lead from the glacier to the storage tank. Local water heads, known as Churpons, are nominated by villagers and are held responsible for the impartial distribution of collected water through gravitational channels and reservoirs.

Artificial glaciers are a novel technique of water harvesting and storage that is gaining popularity across the district since its introduction in 1987 (Norphen & Tashi, 2015). The process of storing water in artificial glaciers involves diverting melting stream water and slowing down its flow to allow the conversion of stream into ice. Artificial glaciers are built at much lower altitudes (13,000 – 14,000 ft a.s.l.) than natural glaciers to facilitate faster melting during spring, resulting in convenient water supply during the critical Rabi season.

### 2.2.6 Biogeographic Information

Ladakh is part of the Trans-Himalaya of the Tibetan Plateau. They are a cold desert interspersed with high altitude plains, green patches of marshy meadows, willow plantation near habitations and sparse vegetation. The entire region is classified under the ‘Trans-Himalayan Cold Desert’ (Zone 1) biogeographic zone.



Located on the leeward side of the Himalaya, the annual monsoon bearing winds are blocked, thus creating the



desert-like conditions with an abridged growing season and frigid temperatures due to the high elevation. The Changthang landscape falls under the biogeographic provinces 1B, which constitute the Changthang Plateau in eastern Ladakh, which is contiguous with the Tibetan Plateau. These locations are at an elevation of more than 4,000 meters above the mean sea level. The ecology and biogeography of the area are unique and often forms vast rangelands on which a large number of domestic animals of the local communities depend upon for food. Harsh and erratic also climatic conditions also occur in the region, which includes high diurnal fluctuation in temperature, scanty and erratic rainfall, heavy winds during summer and heavy snowfall during winter months (Kumar, 2017).

#### 2.2.6.1 Floral Values

The Ladakh Himalaya comes under alpine and high alpine zones. The area is dominated by annual and perennial herbs and a few stunted shrubs and bushes. The vegetative growth starts at the beginning of summer when the melting snow provides the required moisture. Full bloom in August, the flora starts disappearing by the end of September (Chaurasia, 2008).

Champion and Seth (1968) described the vegetation of Ladakh as 'dry alpine scrub' that is characterised by the complete absence of forest cover, aside from some patches of juniper *Juniperus polycarpus* in certain parts of Zangskar and Sham. Other prominent trees present are willow *Salix* spp. and poplar *Populus* spp. That are restricted mainly to cultivated areas along rivers (Namgail, 2012). The vegetation of eastern Ladakh is mostly dominated by Hemicryptophytes, followed by Therophytes and Chamaephytes (Klimeš, 2003).

**a) Alpine mesophytes:** This zone is characterised by high humidity and more rainfall. The majority of the plants growing in this particular zone are also found in temperate regions. The common alpine forest species found in this zone are *Betula utilis*, *Pinus wallichiana* and *Rhododendron campanulatum*. Some of the other common mesophytic species are *Podophyllum hexandrum*, *Lavatera kashmiriana*, *Lotus corniculatus*, *Astragalus rhizanthus*, *Verbascum thapsas*, *Lagotis cashmeriana*, *Lagotis kunawurensis*, *Picrorhiza kurroa*, *Oxyria digyna* and *Capsella bursa-pastoris*, etc. (Chaurasia, 2008).

**b) Oasitic vegetation:** Plants found in this particular zone are generally found near habitations like Leh, and are diverse. This type of vegetation is represented by a variety of exotic in addition to indigenous species—growing near habitation, along water channels, streams, nalas and in moist places. The common species found in this vegetation are *Mentha longifolia*, *Pedicularis longiflora*, *Potentilla* sp., *Stachys tibetica*, *Sedum ewersii*, *Rhodiola quadrifolia*, *Lancea tibetica*, *Trifolium pretense*, *Melilotus alba* and *Melilotus officinalis* (Chaurasia, 2008).

**c) Desert vegetation:** This particular zone is characterised by slight rainfall, extreme fluctuation of diurnal temperature, low humidity, and high-velocity winds. Some of the common plant species, which are growing around the barren valley of Indus and Changthang, are *Polygonum aviculare*, *Atriplex crassifolia*, *Corydalis flabellata*, *Caragana pygmaea*, *Capparis spinosa*, *Echinops cornigerous*, *Ephedra gerardiana*, *Physochlaina praealta* and *Peganum harmala* (Chaurasia, 2008).

The vegetation specifically of the Changthang plateau can be broadly grouped as scrub formations, desert steppe and marsh meadows. Rawat & Adhikari (2001) have reported the following major plant communities in the area: Caragana – Eurotia, Artemisia – Tanacetum, Stipa – Oxytropis – Alyssum, and *Carex melanantha* – *Leymus secalinus*. Stream banks and marsh meadows around the lakes are found to have distinctive sedge dominated

vegetation represented by species of *Carex* spp., *Kobresia* spp., *Scirpus* spp., *Triglochin* spp., *Pucciniella* spp., *Ranunculus* spp. and *Polygonum* spp. The water bodies and shallow lakes support dense growth of aquatic plants such as *Hippuris vulgaris*, *Potamogeton pectinatus*, *P. perfoliatus*, *Zannichellia palustris*, and *Ranunculus natans* (Rawat, 2001; Rawat, 2017).



**Figure 15 A: Marshes at Tsokar B: Grasslands at Tsokar C: Alpine Meadow at Sumdo D: Rangelands at Hanle**

#### 2.2.6.2 Faunal Values

The main faunal species present in the landscape can be categorised into roughly three types- Mammals, birds and agricultural fauna. The landscape also holds many rare, endangered and threatened species and the landscape management plan to be developed would aim at conserving these species.

#### Mammals

The mammalian diversity present in the Changthang landscape is not very large. Still, quite elusive and specialist species occur in the area that has adapted themselves to the frigid temperatures of the winters. Primarily the large mammals reported from the landscape include the snow leopard, bharal or blue sheep, Tibetan wolf, Tibetan argali, Lynx, Kiang or the Tibetan wild ass and red fox. The table below highlights the mammal species recorded in Trans-Himalayan rangelands along with their IUCN Red List categories and their distribution in the Changthang Region. A list of mammals found in the region along with their conservation status and distribution in Ladakh is presented in Annexure 4.

**IUCN Status:** Vulnerable

**Indian Wildlife (Protection) Act 1972:** Schedule I

**CITES:** Appendix I



Snow leopards (*Panthera uncia*), are big cats in the family Felidae, measuring 1-1.3 meters in body length, 0.8-1.1m in tail length and weighing 20-50 kilograms. They have white, cream-yellow and smoke gray pelage with brownish black spots and rosettes. Snow Leopards inhabit mountainous rangelands at elevations of 3,000 to over 5,000 m in the Himalaya and Tibetan Plateau (McCarthy et al. 2017). The species is distributed across mountain habitats of central Asia including Altai, Tian Shan, Pamir, Hindu Kush, Karakorum and Himalayas. In India, they are present in Jammu and Kashmir, Ladakh, Uttarakhand, Himachal Pradesh, Sikkim and Arunachal Pradesh. Snow leopards are adapted to those conditions by having long and dense pelage, inflated nasal cavity and broad nasal bones (for extracting more oxygen and warming inhaled air), and long tibiae and vertebra segments (for flexibility in leaping and turning). Adults are generally solitary, but groups of 2-4 form during breeding and birthing season. There is strong within-sex territoriality. Snow leopards prey on wild sheep and goat, and occasionally yaks, horses and cattle. They are a keystone species for their ecosystem.

#### **i. Tibetan Wolf**

**IUCN Status:** Least Concern

**Indian Wildlife (Protection) Act 1972:** Schedule I

**CITES:** Appendix I

Tibetan wolves (*Canis lupus chanco*), are carnivores from the family Canidae, averaging at 1.1 meters in head and body length, 76 centimeters tall at the shoulder and weighing 35 kilograms. Their pelage is thick, woolly, brownish-grey on the back and tail and yellowish white on the face, limbs and belly. The wolves inhabit the Trans-Himalayan region and the Tibetan plateau, including parts of China, India and Nepal. Within India, it is found in



Ladakh, Himachal Pradesh, Sikkim and Uttarakhand. Tibetan wolves are adapted to the cold environment by having thick pelage as well as genes that help withstand low oxygen levels and initiate cardiac excitation. They are territorial and live in packs averaging at 8 individuals. Packs hunt on large ungulates, but are opportunistic and eat other species and carrion.



**ii. Eurasian Lynx**

**IUCN status:** Near Threatened

**Indian Wildlife (Protection) Act 1972:** Schedule I

**CITES:** Appendix II

Eurasian lynxes (*Lynx lynx isabellinus*), are small cats in the family Felidae, with head and body length measuring 80-130 centimeters, tail length 11-24 centimeters and weighing 8-38 kilograms. They have varying pelage (thin reddish-brown or yellowish-gray in summer and thick ashy blue or off-white in winter) with dark spots. Eurasian lynxes live in high-altitude forest habitats in Europe, central and east Asia preferring areas with hiding spots (Breitenmoser et al. 2015). In India they are distributed across Ladakh, Himachal Pradesh and most other Himalayan states. They have long legs with thick hair that creates a snow-shoe effect for travelling in the snow. The lynx preys on small rodents, rabbits and mares as well as larger ungulates. In winters they follow prey to lower elevations. The lynxes are solitary adults and are nocturnal or crepuscular, sleeping throughout the day.

**iii. Tibetan Sand Fox**

**IUCN status:** Least Concern

**Indian Wildlife (Protection) Act 1972:** Schedule I

**CITES:** No listing

Tibetan sand fox (*Vulpes ferrilata*) is a fox in the Canidae family having head and body length of 63-70 centimeters, tail length of 21-33 centimeters and weighing 4-5.5 kilograms. They have soft, thick pelage of gray

or sandy colour. They are endemic to the steppes and arid deserts of the Tibetan plateau, China, Bhutan and Nepal. In India, they are present in the Ladakh portion of the Tibetan plateau and in Northern Sikkim. They are adapted to this climate by having thick pelage that provides thermal insulation. They prefer semi-arid upper plains, barren slopes and hills at 2,500-5,200 meters above sea level, burrowing at the base of large rocks and boulders. The foxes are active throughout the day and dusk when their prey species are active. Prey include pikas, small rodents, insects and lizards, and the foxes are also known to scavenge carcasses of wolf kills (Harris, 2014).

**iv. Wild Yak**

**IUCN status:** Vulnerable

**Indian Wildlife (Protection) Act 1972:** Schedule I

**CITES:** Appendix I

Wild Yaks (*Bos mutus*), are bovids in the family Bovidae having shoulder heights of 1.3-2.0 meters and weighing 350kg (females) to over 800kg (males). They have large bodies with stout legs, small ears, horns, conspicuous humps and round hooves. Their pelage is black with rust-brown, gray hues with a dense wool undercoat and long hair on the chest, flanks and thighs. The species is distributed in the Tibetan plateau in China and India. In India it is present in Changthang region of Ladakh. They prefer alpine meadows to alpine steppes. They are genetically and morphologically highly adapted to survive the cold, low oxygen levels and aridity. The yaks are not migratory, but move up and down slopes to forage and to avoid human contact. They are herbivorous ruminants preferring seasonal grasses and hedges, but also consuming herbaceous plants, mosses and lichens. They are herding ungulates and form groups of more than 200 individuals, as solitary males, females and offspring or mixed. They are a flagship species in their ecosystems.

**v. Tibetan Argali**

**IUCN status:** Vulnerable

**Indian Wildlife (Protection) Act 1972:** Schedule I

**CITES:** Appendix I

Tibetan Argalis (*Ovis ammon hodgsoni*), are ungulates in the family Bovidae, having head and body length up to 1.7-2.0 meters, horns up to 1 meter, and weighing up to 180 kilograms. They are stout bodied with short tails and the longest and heaviest spiral horns of wild sheep. Pelage colour varies from gray-brown to reddish-brown. The Tibetan Argali are distributed across southern the mountains of, China and India and Nepal. In India, they are present in the Changthang region of Ladakh and in the state of Sikkim. They live in mountains (300- 5750 meters above sea level), preferring gently sloping open areas in winter and steep slopes in the summer. Argali are adapted for fast running over long distances. They group by sex (2-150 in number), males moving to higher regions in the summers. The argali primarily eat cereals, sedges and forbs, and eat saline soils during warmer months. Wolves are their main predators.

**vi. Tibetan Gazelle**

**IUCN Status:** Least concern

**Indian Wildlife (Protection) Act 1972:** Schedule I

**CITES:** No listing

Tibetan gazelles (*Procapra picticaudata*), are ungulates in the family Bovidae, having head and body length 90-105cm and weigh 12-16 kg. They have a small, slender and compact body with fine limbs. Their pelage is sandy in winter to gray in summer. Tibetan gazelles are endemic to the Tibetan plateau at elevations from 3500-5000 meters, over 90% spread in the China with few hundred individuals in Ladakh and Sikkim regions of India. They prefer open landscapes of alpine meadows and steppes. They are not well adapted to extreme snowfall conditions, which can cause death of individuals. The numbers are highest in east and south of Changthang nature reserve. They are crepuscular, resting during the day and moving and feeding at dawn and dusk. They live in scattered small groups by sex. The gazelles eat legumes, forbs and grasses.



**vii. Tibetan Wild Ass**

IUCN status: Least concern

Indian Wildlife (Protection) Act 1972: Schedule I

CITES: Appendix II



Janani Pradhan

Tibetan Wild Asses (*Equus kiang*), are the largest of wild asses in the family Equidae, having body length of 1.8-2.0 meters, tail length 30-40 centimeters, weighing 250-400 kilograms. The pelage is chestnut brown in the upper part and white in the flank and legs, which gets darker and thicker in winter. The ass is endemic to the Tibetan plateau at elevation of 2700-5300 meters, in Pakistan, India and China. 95% of the population occurs in the Tibet region of China with small numbers in Ladakh and Sikkim regions of India. They prefer alpine meadow and steppes, in broad open valleys and basins. They do not have a regular migratory pattern but move to hilly regions in summer and flats in the winter. *E.kiang* are often found in solitary or in small groups, which is a survival strategy in arid regions with low food supply. The wild ass feeds on graminoids, forbs and shrubs.

#### viii. Palla's Cat

**IUCN Status:** Near threatened

**Indian Wildlife (Protection) Act 1972:** Schedule I

**CITES:** Appendix II

Palla's cat (*Otocolobus manul nigripictus*), of the family Felidae has a body length of 40-70 centimeters, tail length of 20-30 centimeters and weighs 2-5 kilograms. It has a stout and plush appearance due to the presence of long dense fur, in the colours of ochre and dark gray, which turns darker in winters. The cat is distributed along grasslands and montane steppes of central Asia in Russia, Turkmenistan, Mongolia, China, Kazakhstan, Pakistan, Iran, Afghanistan, India, Nepal and Bhutan. In India, it is found in Ladakh and Sikkim regions. They prefer selected habitats in the steppes with disruptive cover such as rocks, shrubs, ravines and hill slopes to protect from predators. They are rarely found in areas with snow cover. They are solitary creatures who come out to hunt in afternoons. They prey on diurnally active lagomorphs and rodents such as pikas, gerbils, squirrels, hamsters and less frequently birds, hares and reptiles.

#### - Birds

Irrespective of the extreme climatic conditions that the region faces, The Changthang landscape is home to a considerable diversity of bird species. 280 avifaunal species has been recorded from Ladakh. The Changthang with a unique landscape along with high altitude lakes and wetlands such as Tso-Kar and Tsomoriri provide breeding grounds for a host of resident and migratory birds. Most migratory birds are summer visitors.

Ladakh is one of only 11 known breeding ground of Black-necked Crane *Grus nigricollis* in India. Several species of birds like the Bar-headed Goose *Anser indicus* Great-crested Grebe *Podiceps cristatus*, Ruddy Shelduck (*Tadorna ferruginea*), Lesser Sand Plover (*Charadrius mongolus*) and Brown-headed Gull (*Larus brunicephalus*) use these wetlands as their breeding grounds. Some key avian species are discussed in detail in the following sections.



**i. Black Necked Crane**

**IUCN Status:** Vulnerable

**Indian Wildlife (Protection) Act 1972:** Schedule I

**CITES:** Appendix I



Black-necked crane (*Grus nigricollis*), is a medium-sized crane, in the family Gruidae, averaging at 1.3 meter length, 2.3 meter wingspan and 5.5 kilogram. It has whitish gray plumage with black head and legs. The crane summers and breeds in the Tibetan plateau including India, China and Bhutan, preferring alpine meadows, marshes, river valleys and barley/wheat fields at 2600-4900 meters altitude. Wintering regions are valleys in lower altitudes. In India they are present in Ladakh, Sikkim and Arunachal Pradesh regions. The cranes forage in small groups and migration occurs in family groups. They are omnivorous and feed on sedge tubers, plant roots, earthworms, frogs, other small creatures and fallen grains from fields.

**ii. Saker Falcon**

**IUCN status:** Endangered

**Indian Wildlife (Protection) Act 1972:**

**CITES:** Appendix II

Saker falcons (*Falco cherrug*) are large falcons in the family Falconidae, having 40-60 centimeter length, 97-130 centimeter wingspan and weighing 0.7-1.3 kilograms. The falcon has varied plumage from brown to grey with white sections. They are sedentary, part- or full migratory depending on food availability. The bird breeds from Eastern Europe to Central Asia, wintering in Ethiopia, the Arabian Peninsula, Pakistan, India and China. They are resident in India and found in Ladakh region and Sikkim. The bird hunts close to ground and prefers open areas of alpine steppes, meadows, and agricultural areas. The birds occur singly or in pairs. They prey on terrestrial rodents and other birds.





### iii. Bearded Vulture/ Lammergeier

**IUCN Status:** Near Threatened

**Indian Wildlife (Protection) Act 1972:** Schedule

**CITES:** Appendix II

Bearded vultures (*Gypaetus barbatus*) are vultures in the Accipitridae family, having 94-125 centimeter length, 2.3-2.8 meter wingspan, and weighing 4-8 kilograms. The adult falcon has dark gray, rust and white colour plumage. Characteristic features include long narrow wings and long wedge shaped tail. The range of the vulture includes mountainous regions in Europe, Africa, Asia. It is resident in India and found throughout the Himalayas in Ladakh, Uttarakhand, Sikkim and Arunachal Pradesh. The bird prefers remote, mountainous areas with precipitous terrain above 1000 meters altitude in areas where wolves and large ungulates are present. The bird feeds on carrion, bones occasionally live mammals, and birds.

This landscape with its diverse ecosystems and unique species assemblage is incredibly fragile and is prone to many anthropogenic disturbances. The excessive grazing of livestock near the wetlands has led to degradation of the substantial breeding grounds of the rare and endangered migratory birds. At the same time, unregulated tourism activities near the wetlands also pose a significant threat to the birds. This damage is more as the peak migratory season in Ladakh coincides with the peak tourism season.

#### 2.2.7 High Conservation Value Areas

The Himalayan ecosystem is under severe threat from high dependence of local communities on natural resources, pressures from economic development, selective removal of medicinal and aromatic plants, and the emerging threat of illegal wildlife trade and wildlife crime. WWF-India has thus identified spaces with the aim of promoting the sustainable management of the high range Himalayan ecosystems in high altitude alpine pastures, sub-alpine forests and critical watersheds in the Trans- and Greater Himalayan region in the form of High Conservation

Value Areas (HCVA) (WWF-India, 2020). The output is in the form of a geographical information system that illustrates available information and analysed datasets and results in such a way that guides better demarcation of currently established protected areas, that may include exclusion and inclusion of sites based on the presence of social/environmental HCV values.

To identify and demarcate High Conservation Values (HCVs), different social and environmental values along with its spatial representation were utilised. The concept is derived from the need to design and more importantly, realise climate resilient development pathways and sustainable natural resource use led to several initiatives globally, especially since the UN Conference on Environment and Development held in Rio de Janeiro in 1992, popularly known as the Earth Summit.

The following parameters were identified as HCVs in Changthang:

- i) Areas that contain or provide biodiversity support function to protection or conservation areas like notified protected areas and sites of conservation significance like Important Bird Areas;
- ii) Areas that contain habitats for viable populations of Rare, Endemic, Threatened (RET) or protected species; Ten mammal species, eight bird species and thirty two plant species were selected for this;
- iii) Areas that contain intact and RET ecosystems and ecotones like high-altitude wetlands, alpine grasslands, salt marshes, moist sedge meadows and seasonal springs;
- iv) Areas that provide basic regulating ecosystem services in critical situations, including protection of water catchments as Changthang is a drought prone area, and control of erosion of vulnerable soils and slopes,
- v) Areas and resources fundamental to the provision of basic needs of local communities like food, drinking water, fuelwood, livelihood including livestock grazing areas High Conservation Value Areas of Changthang, Ladakh 15 and especially the critical winter pastures; and
- vi) Areas important in maintaining the cultural identity of local people like Buddhist monasteries, sacred natural deities and sites like rock formations, mountains, pastures, lakes and historical sites like stupas, chortens, fort ruins and petroglyphs.

The HCVA's were mapped and identified across the landscape of Changthang. The different HCV categories for Changthang landscape are summarised in the Table 5.

*Table 5 Summary of HCV categories and interpretation for Changthang (WWF-India, 2020)*

HCV No.	HCV Definition	HCV Sub-category
HCV 1	<b>Species Diversity</b> Concentrations of biological diversity including endemic species, and rare, threatened or endangered species, that are significant at global, regional or national levels.	<b>HCV 1.1</b> Areas that contain or provide biodiversity support function to protection or conservation areas
		<b>HCV 1.2</b> Areas that contain habitat for viable populations of Threatened, Restricted Range or Endemic / Protected species.
HCV 2	<b>Landscape Level Ecosystems</b> Large landscape-level ecosystems and ecosystem mosaics that are significant at global, regional or national levels and that contain viable populations of the great majority of the naturally	<b>HCV 2.1</b> Natural landscapes that have the capacity to maintain their natural ecological functions and dynamics are delineated as contiguous mosaic landscapes with mostly natural ecosystems
		<b>HCV 2.2</b> Areas that contain two or more contiguous ecosystems

	occurring species in natural patterns of distribution and abundance.	
<b>HCV 3</b>	<b>RET Ecosystems and Habitats</b> Rare, threatened, or endangered ecosystems, habitats or refugia.	<b>HCV 3</b> Areas that contain Rare, Threatened and Endangered ecosystems like wetlands or specific grasslands communities
<b>HCV 4</b>	<b>Regulating Ecosystem Services</b> Basic ecosystem services in critical situations, including protection of water catchments and control of erosion of vulnerable soils and slopes..	<b>HCV 4.1</b> Areas or ecosystems important for the provision of water and prevention of floods for downstream communities
		<b>HCV 4.2</b> Environmental services areas that are important for the prevention of erosion and sedimentation
<b>HCV 5</b>	<b>Community Needs</b> Sites and resources fundamental for satisfying the necessities of local communities or indigenous peoples (for livelihoods, health, nutrition, water, etc...), identified through engagement with communities / indigenous people.	<b>HCV 5</b> Natural areas critical for meeting the basic needs of local people like food, water (drinking, irrigation and household), clothing, materials for the house and tools, fuelwood, medicines and livestock grazing areas
<b>HCV 6</b>	<b>Cultural Values</b> Sites, resources, habitats and landscapes of global or national cultural, archaeological or historical significance, and/or of critical cultural, ecological, economic or religious/sacred importance for the traditional cultures of local communities or indigenous peoples	<b>HCV 6</b> Areas critical for maintaining the cultural identity of local communities like Changpas, Tibetans and Ladakhis identified through engagement with them directly through surveys and discussions along with secondary data.

### 2.2.7.1 HCV 1.1- Areas that Contain or Provide Biodiversity Support Function to Protection or Conservation Areas (WWF-India, 2020)

Table 6 Areas in Ladakh that Support Biodiversity Conservation

No.	Site of Conservation Significance	Designation	Recognised by
1	Hemis High Altitude National Park	National Park	Jammu and Kashmir Wildlife (Protection) Act, 1978
2	Changthang Wildlife Sanctuary	Wildlife Sanctuary	Jammu and Kashmir Wildlife (Protection) Act, 1978
3	Tso Moriri	Ramsar Site and Important Bird Area	Ramsar Convention on Wetlands, 1971
4	Pangong Tso	Important Bird Area	Birdlife International
5	Tso Kar basin	Important Bird Area	Birdlife International
6	Chushul marshes	Important Bird Area	Birdlife International
7	Hanley marshes	Important Bird Area	Birdlife International

Layers representing the demarcated boundaries of each site were overlaid on the landscape boundary to prepare the map illustrating potential HCV 1.1 areas.

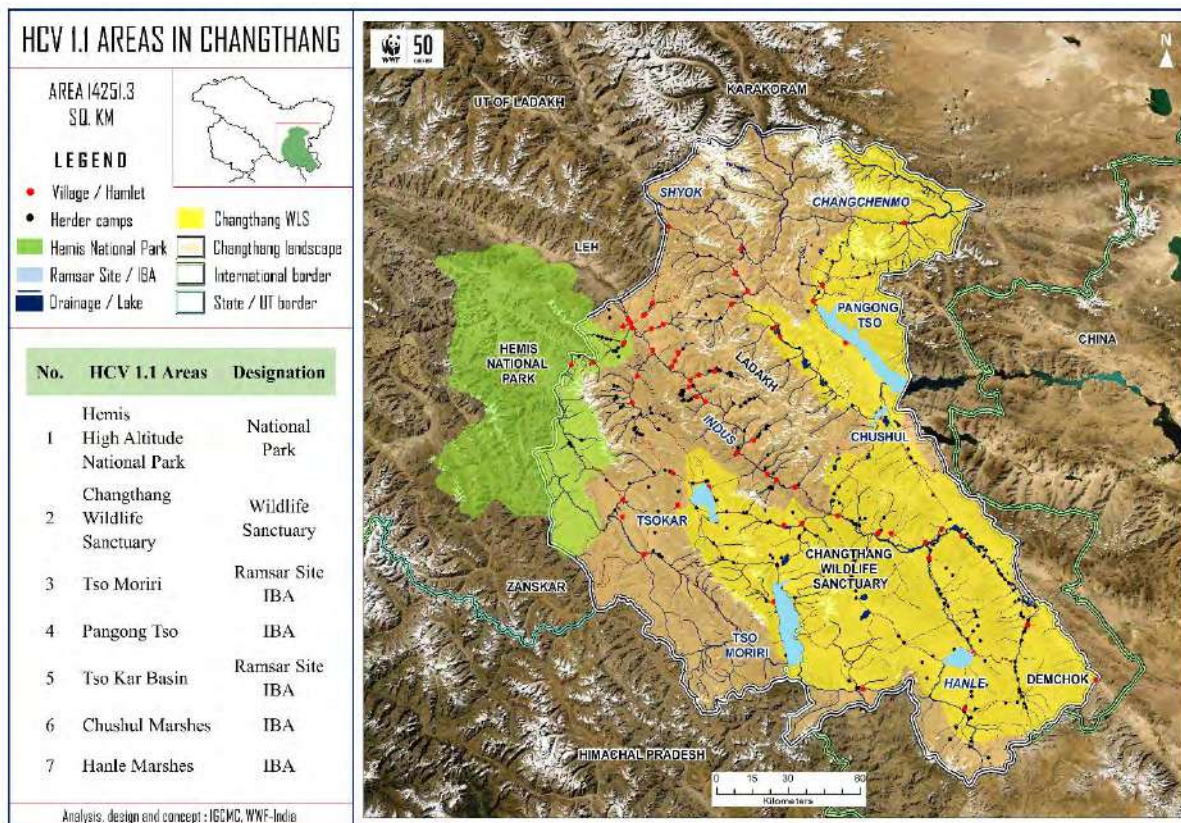


Figure 16 Map showing HCV 1.1 areas in Changthang landscape (WWF, 2020).

### 2.2.7.2 HCV 1.2- Areas that Contain Habitat for Viable Populations of Endangered Species.

Rare, Endemic, Threatened (RET) and other significant species were identified after thorough literature review and consultation with experts. They have been categorised into flora, mammalian fauna and avifauna with special focus on medicinal and aromatic plants, snow leopard and its prey species and migratory birds.

Among them, few focus species were selected for MaxEnt analysis for the identification and modelling of critical habitats. The maps shown below depict potential HCV areas for flora and fauna. Map showing high conservation value areas of individual species are presented in Annexure 5.



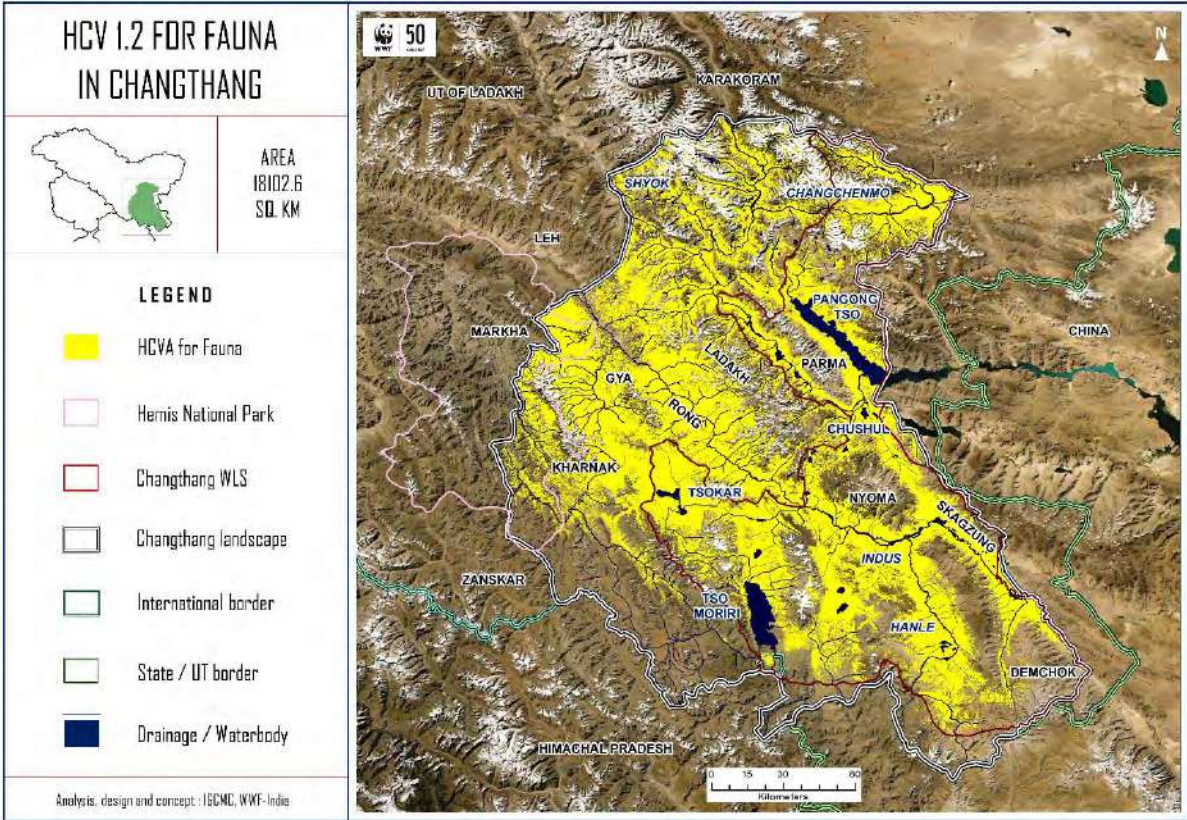


Figure 17 Map showing potential HCV areas for faunal species.

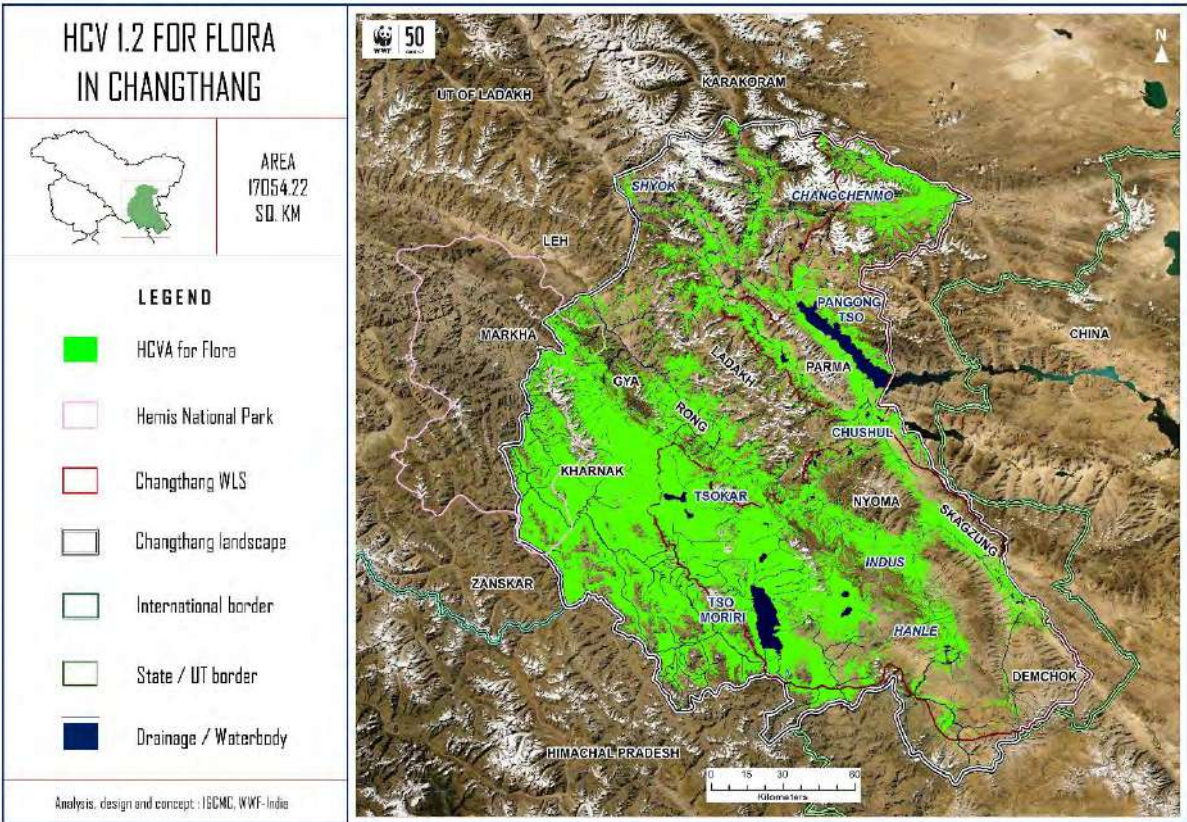


Figure 18 Map showing potential HCV areas for floral species.



2.2.7.3 HCV 2- Large intact ecosystems (2.1) and ecotones that maintain ecological processes and dynamics (2.2)

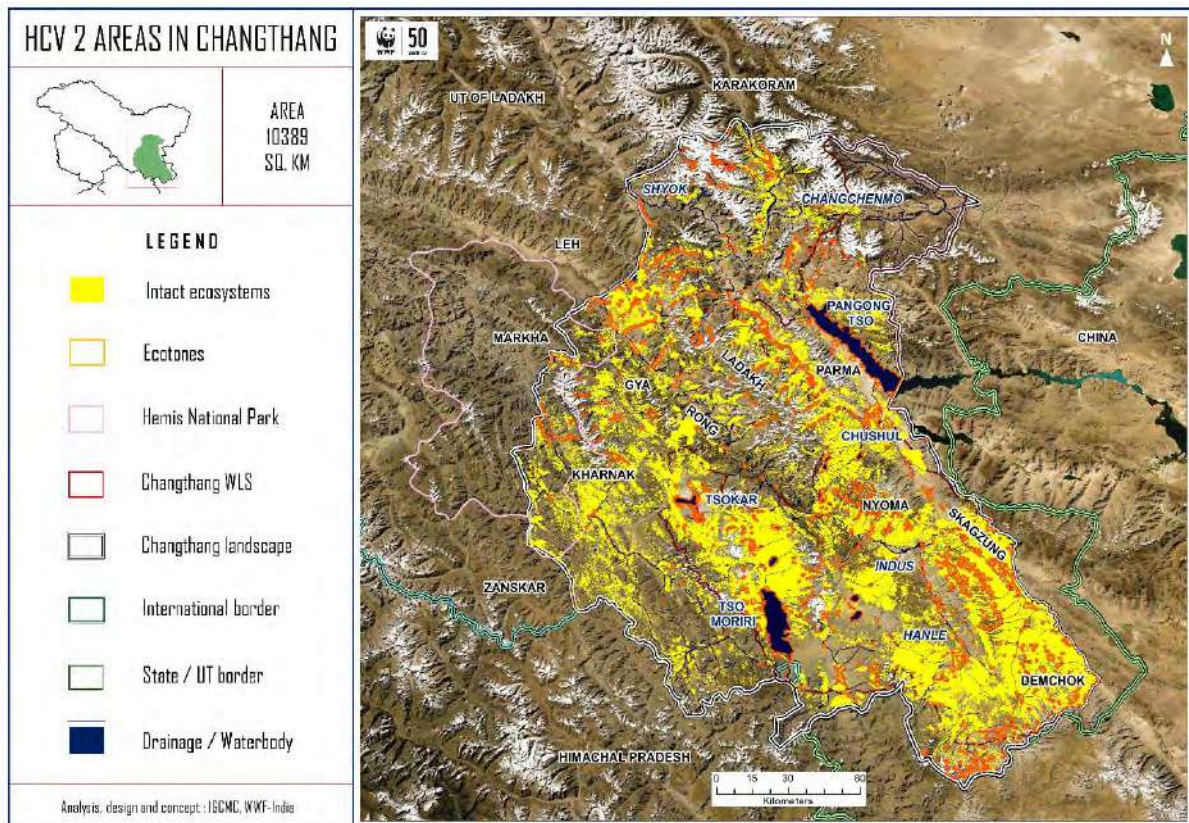


Figure 19 Map showing potential HCV 2 Areas for Intact Ecosystems

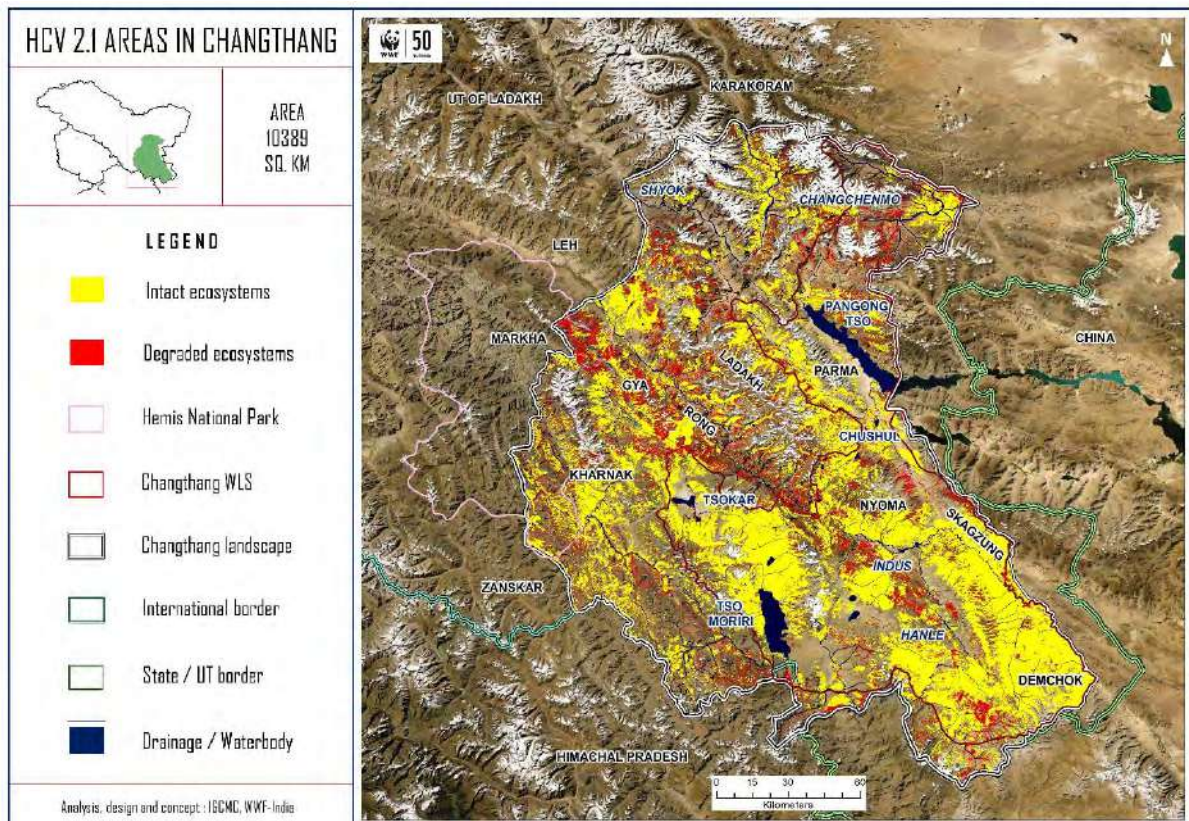


Figure 20 Map showing HCV 2.1 Areas for Ecotones in Changthang

The important vegetation types were identified in the landscape to demarcate large intact landscapes and ecotones and communities found to exist together in each of them. Primary habitats included were salt marshes, shrublands, water bodies, semideserts and steppes, alpine grasslands, screes and boulder fields etc.

#### 2.2.7.4 HCV 3- Areas that contain Rare, Endemic, Threatened and Less Known Ecosystems, Habitat and Refugia

Ecosystems that are rare, endemic and threatened in terms of area and / or presence of RET species, and hence need to be protected due to the possibility of them declining are identified as HCV 3. This may include:

1. Naturally rare and declining ecosystem types.
2. Remaining intact grasslands (where large landscape level grasslands are rare or absent). • Unique and/or diverse ecosystem types.
3. Rare / endemic or endangered freshwater or grassland ecosystems / habitat types.

According to guidance in the HCV Toolkit for HCV 3, an ecosystem is considered endangered if it meets one or all of the following criteria:

- The ecosystem has lost 50% or more of its original extent in the physiographic region;
- The ecosystem is expected to lose 75% or more of its original extent within the physiographic region, based on the assumption that the entire area is currently allocated for conversion in spatial plans will be converted.
- A natural ecosystem that represents less than 5% of remaining natural vegetation cover in the assessed physiographic regions.

**Table 7 Perennial / Seasonal and Hot Springs Identified as HCV 3**

Perennial / Seasonal and Hot Springs					
S No.	Name	Type	Location	Latitude	Longitude
1	Chushul	Hot Spring	Chushul	33.6218	78.6481
2	Puga	Hot Spring	Puga	33.2227	78.3154
3	Tsarap	Hot Spring	Near Takh	33.0896	77.5611
4	Chumathang	Hot Spring	Chumathang	33.3603	78.3242
5	Changchenmo	Hot Spring	Gogra	34.3025	78.952
6	Zingmoche	Hot Spring	Demchok	32.6828	79.4352
7	Chutse Nema	Hot Spring	Tuna	33.7592	77.8822
8	Nalbukar	Spring	Nalbukhar, Tsokar	33.4352	77.9774
9	Rale	Spring	Thukje	33.3528	78.0202
10	Shyok Chumik 1	Spring	Shyok	34.1742	78.1275
11	Shyok Chumik 2	Spring	Shyok	34.1755	78.1502
12	Neya Chumik	Spring	Upper Shyok	34.4369	78.323
13	Dong Chumik	Spring	Upper Shyok	34.4147	78.319
14	Tigur Chumik	Spring	Mahe - Nyoma	33.2276	78.5687
15	Kosa	Spring	Yaya Tso - Raldong -Nunnery	33.3008	78.5021
16	Chumik Gomale	Spring	Near Koyul	32.6204	79.1875
17	Koa Chumik	Spring	Shubrale near Koyul	32.771	79.193
18	Chumnik Longbole	Spring	East of Lalpahadi - Rhongo	33.0391	78.9217
19	Mepdo Chumik	Spring	Near Gongma La	32.684	79.0491

Perennial / Seasonal and Hot Springs					
S No.	Name	Type	Location	Latitude	Longitude
20	Kiangma Chumik	Spring	Near Kalak Tartar	32.6295	78.9999
21	Hale Chumik	Spring	Near Hale	32.5043	78.9942
22	Kiun Chumik	Spring	Kiun Karangle	32.4856	78.9889
23	Chibra Chumik 1	Spring	Near Karlak Tsp	32.9493	78.79
24	Chibra Chumik 2	Spring	Near Karlak Tsp	32.9465	78.7934
25	Raphale Chumik	Spring	Hanle	32.7485	78.9684
26	Gilungle Chumik	Spring	Staklung	33.092	78.7125
27	Chumik Agrachan	Spring	East of Chilling Tso	32.9865	78.6693
28	Churchu Chumik	Spring	East of Tso Moriri	32.9598	78.3584
29	Nukanchik Chumik	Spring	East of Tso Moriri	32.9221	78.3625
30	Chumik Shiallile	Spring	Near Norbu Sumdo	32.7136	78.3512
31	Salsal Chumik 1	Spring	Near Salsal La	32.8215	78.5887
32	Salsal Chumik 2	Spring	Near Salsal La	32.8513	78.6237
33	Handling Chumik	Spring	Near Salsal La	32.8251	78.6145
34	Pachalung Chumik	Spring	Near Kiari La	33.4562	78.0167
35	Sango Chumik	Spring	Sango amchok near Rhongo	33.05	78.7977
36	Chumik	Spring	Sango amchok near Rhongo	33.0237	78.7978
37	Chomo Chumig	Spring	Hanle	32.7873	78.9638
38	Takdong Marpo Chumik	Spring	Nidder	33.159	78.6085
39	Nyoma	Spring	Nyoma	33.213	78.6579
40	Chumik Gongma	Spring	Taruk	34.0132	78.1063
41	Chumik Kurkur	Spring	Taruk	34.0132	78.1063
42	Chumik Chagra	Spring	Taruk	34.0132	78.1063

*Table 8 Moist Sedge Meadow and Springs identified as HCVA 3*

RET ECOSYSTEM	HCVA
Perennial / Seasonal / Hot Springs	Nalbukhar, Staklung, Loma - Rongo, Hanle - Kalak - Tartar, Quin Tso - Salsal La – Chumur patch.
Moist Sedge Meadows	Parma valley, Chushul, Tsaga nala, Skagzung, Hanle river valley (Hanle - Loma).



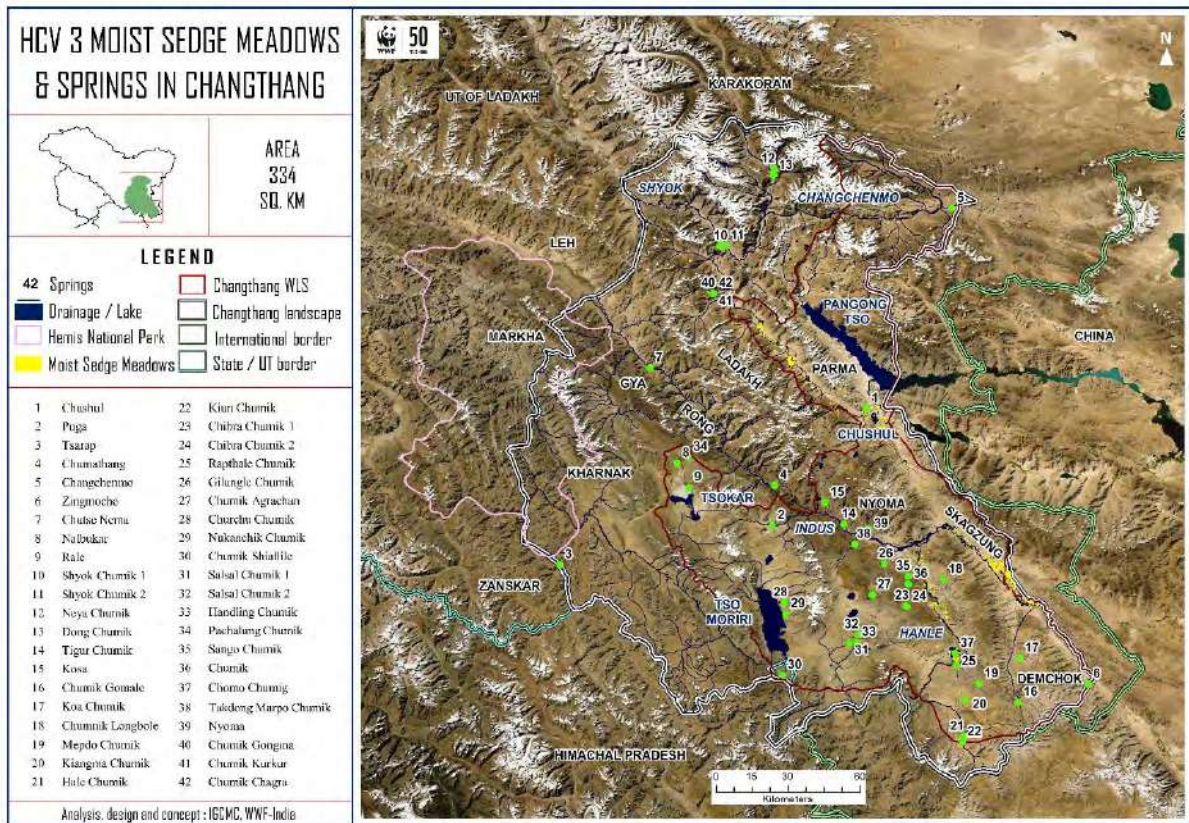


Figure 21 HCV 3 Degraded Ecosystems in Changthang Landscape

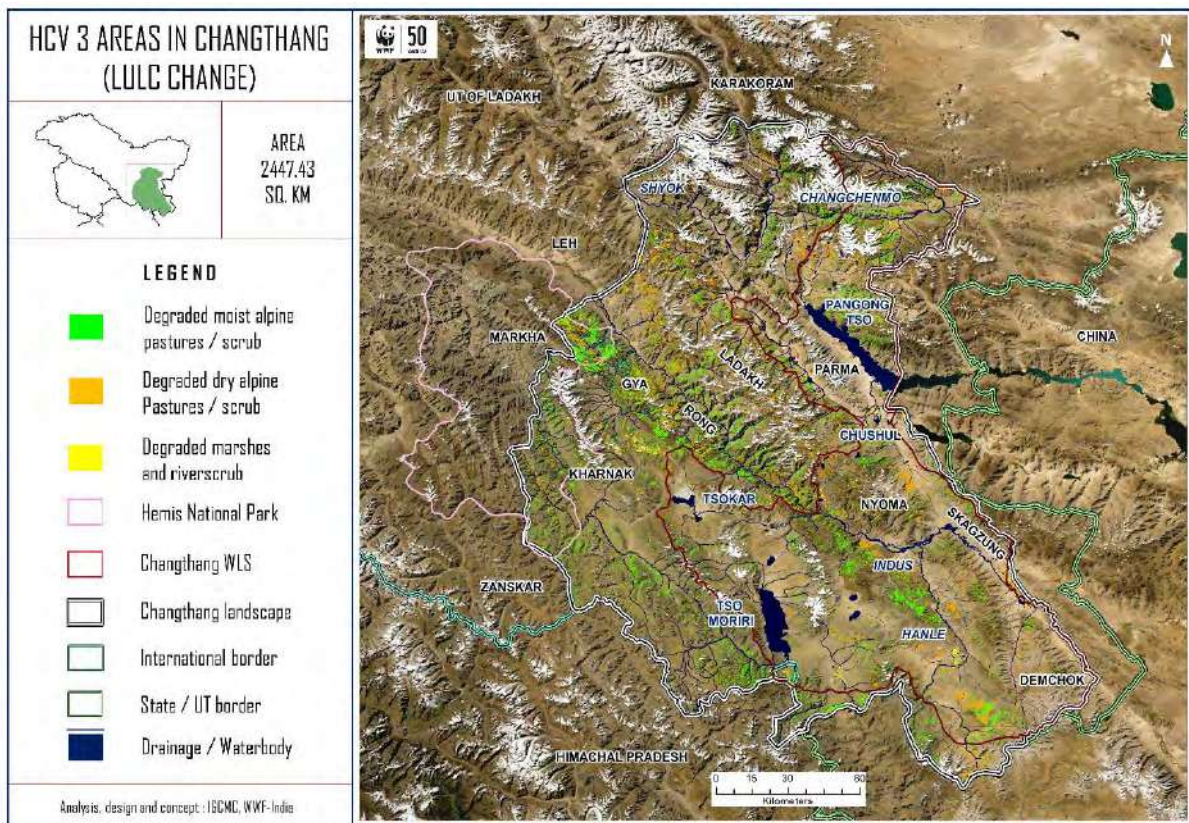


Figure 22 HCV 3 Moist Sedges and Seasonal Springs in Changthang Landscape



**2.2.7.5 HCV 4- Areas that are critical for Regulating Ecosystem Services like Groundwater Recharge (4.1) and Prevention of Soil Erosion (4.2)**

In Changthang, HCVAs that provide basic services of nature in critical situations were identified using -

1. Ground water recharge zones (HCV 4.1)
2. Erosion prevention zones (HCV 4.2)

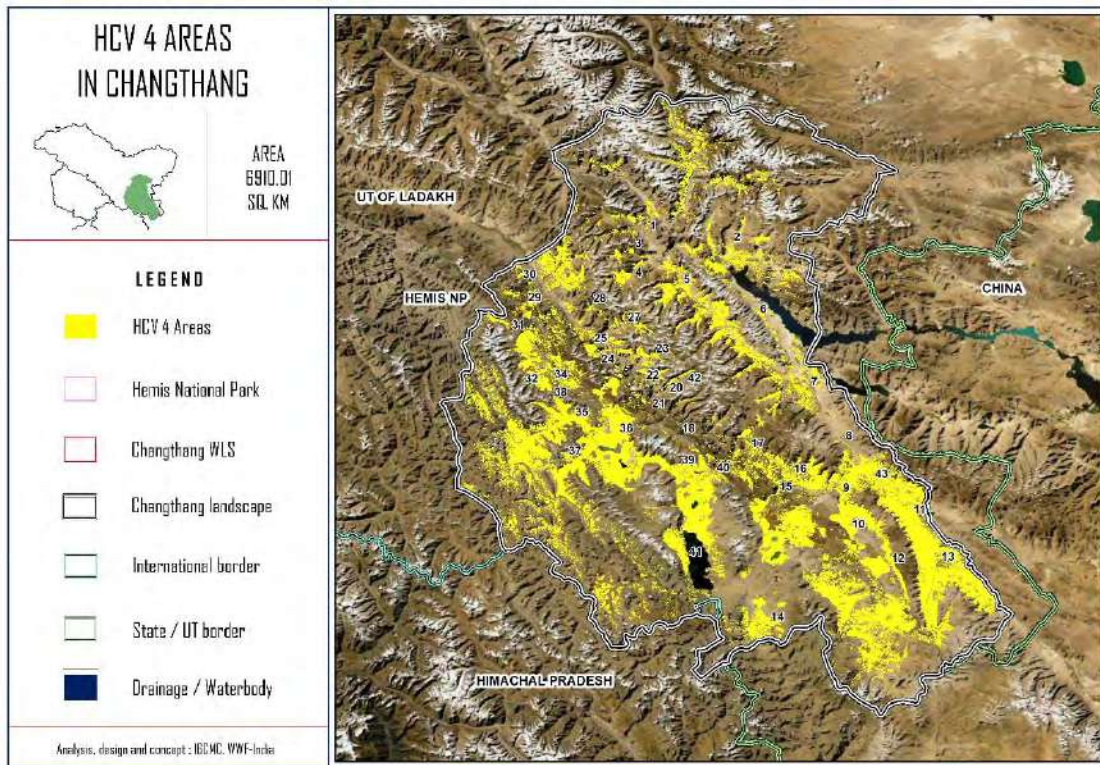


Figure 23 HCV 4 Areas in Changthang Landscape

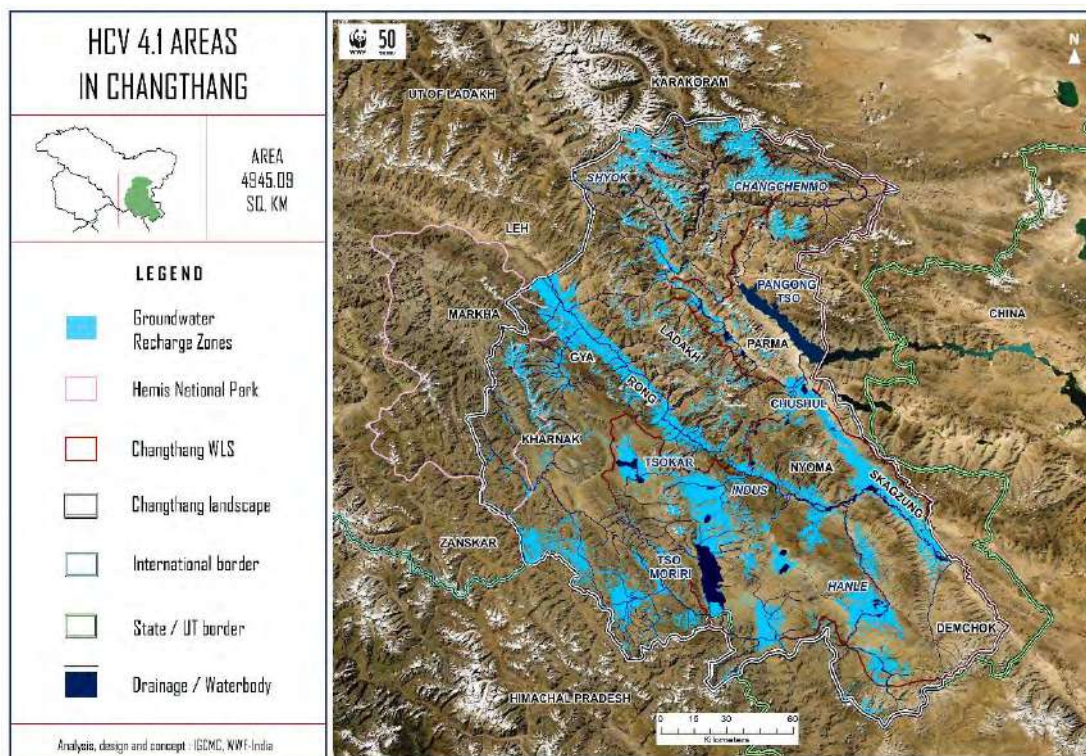


Figure 24 HCV 4.1 Areas in Changthang Landscape



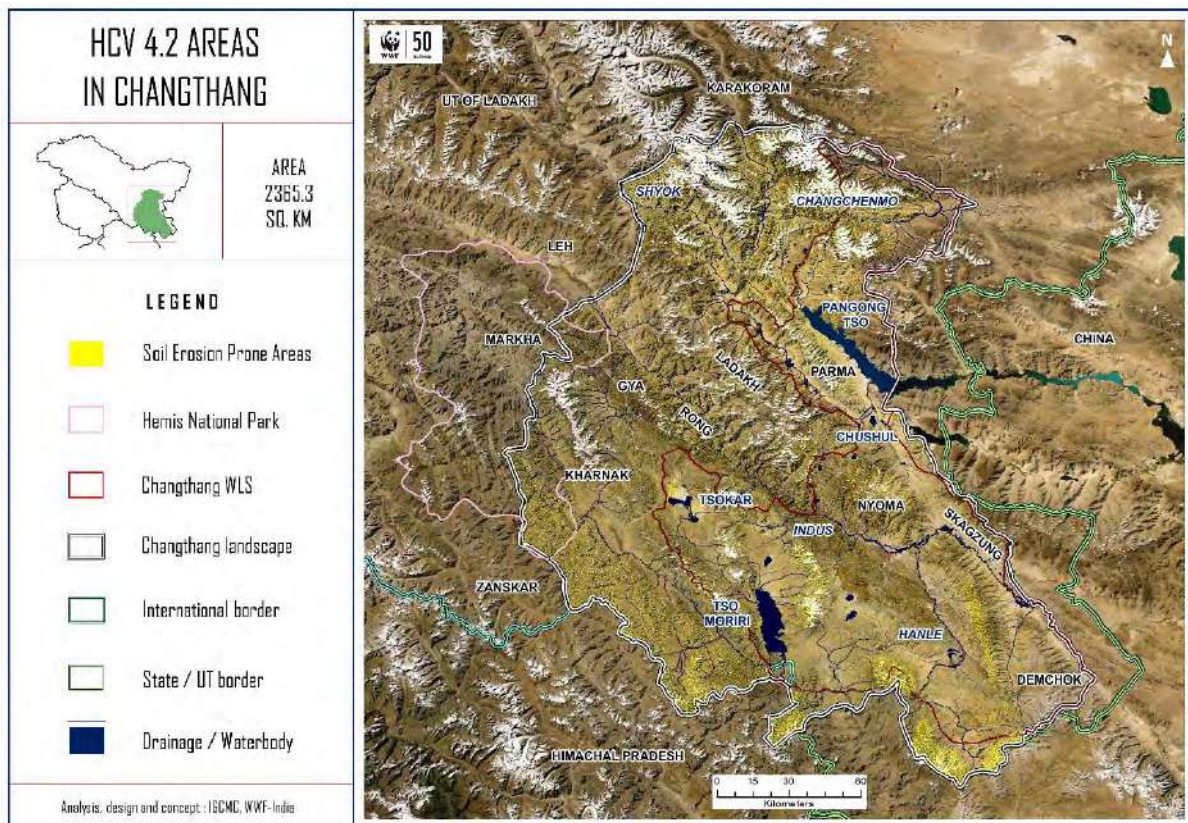


Figure 25 HCV 4.2 Areas in Changthang Landscape

### 2.2.7.6 HCV 5- Areas that are Critical in meeting the Basic Needs of the Local Community

The basic needs of local people considered under HCV 5 are the following –

- a. Food
- b. Water (drinking, irrigation and household)
- c. Clothing
- d. Firewood
- e. Medicine
- f. Livelihood

Basic needs dependent on natural resources are fuelwood, timber, other forest produce, medicine, food, water and livelihoods. The conservation of these areas is important because they are critical for the livelihood of the people residing here. For HCV 5, the consent of the local community has been considered to be the most significant. Management strategies could take in to account, the participation of local people so that conservation of these sites should not overpower their needs. Awareness through workshops could be undertaken so that human-wildlife conflict could be avoided, as species habitats fall under these sites.

For HCV 5 the villages were identified based on presence of each community type/stakeholder and their dependence on natural resources to assess criticality and threats to other environmental HCVs. Areas important for collection of fuel, cultivation, drinking and irrigation water, medicinal plants have also been delineated as HCV 5. Based on the estimated area of grazing pastures and their locations and livestock population data provided



by the Sheep Husbandry Department, Ladakh, grazing intensity was calculated for each village along with their human population density.

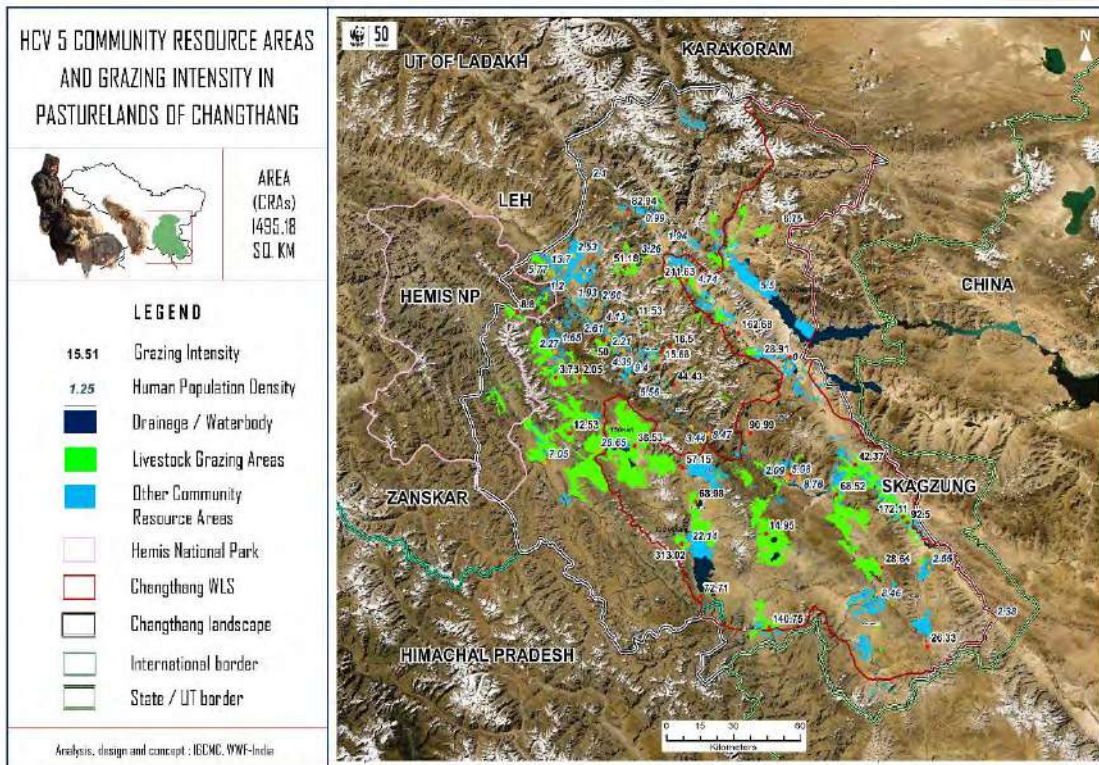


Figure 27 HCV 5 Community Resource Areas of Changthang Landscape

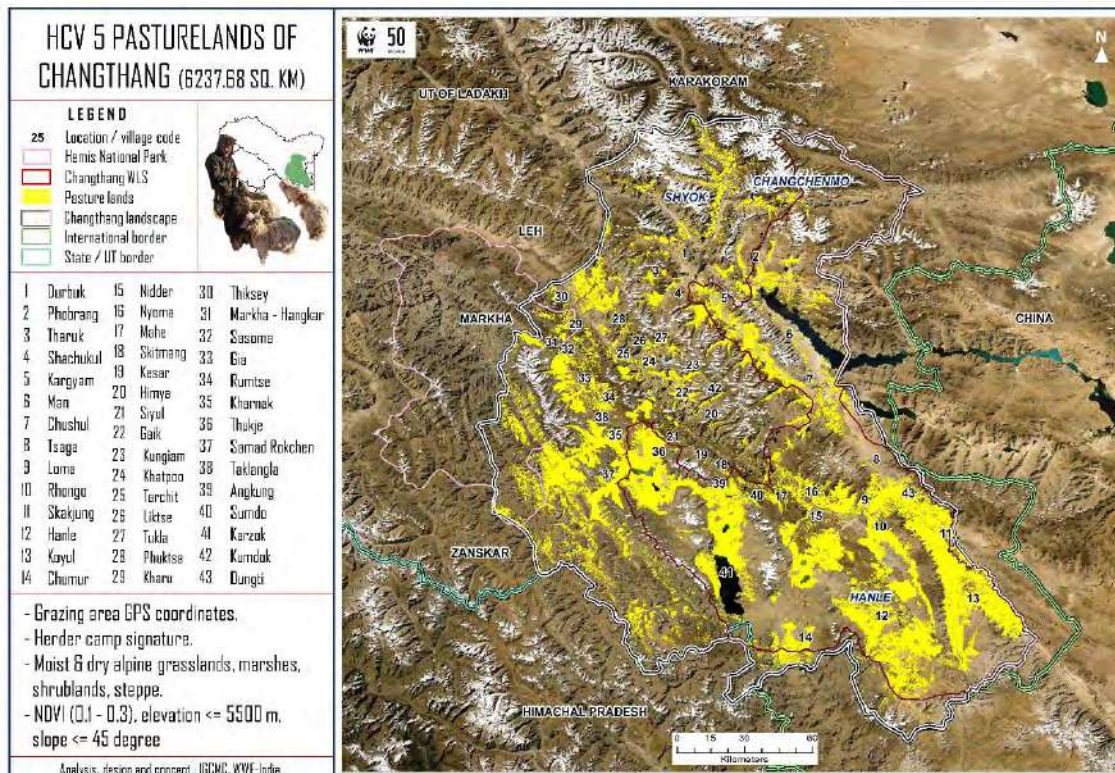


Figure 26 HCV 5 Pasturelands in Changthang Landscape

### 2.2.7.7 HCV 6- Areas that are Critical in maintaining the Cultural Identity of the Local Community

HCV 6 Areas that are critical in maintaining the cultural identity of the local community. The culture of Changthangi people is an interesting mix of Tibetan, Mon, and other customs. Changpas are truly nomadic traveling to several seasonal camps through the year on the Tibetan Plateau. In HCV 6, historical and sacred natural sites that are integral to the cultural identity of the local community, especially the Changpas like temples, sacred natural sites, and recreational sites were mapped. The sites and their significance are described in the table below:

*Table 9 HCVAs for Historical Sites in Changthang*

No.	HCVs for Historical Sites	Significance
1	Shera - Shernos - Phuktse and Shera – Likkse	<ol style="list-style-type: none"> <li>1. One of the most important concentrations of petroglyphs of Bronze Age</li> <li>2. One of the highest densities of large fortified settlements</li> <li>3. Easternmost pre-15th century Buddhist carving known in Ladakh</li> <li>4. Chorten with some of the oldest wall paintings in Changthang</li> <li>5. Temple with some of the finest murals from 16th - 17th century</li> <li>6. Shera valley probably a former mining site</li> </ol>
2	Nyoma - Mudh - Staklung	<ol style="list-style-type: none"> <li>1. One of the most important concentrations of petroglyphs of Bronze Age</li> <li>2. One of the highest densities of large fortified settlements</li> <li>3. Easternmost pre-15th century Buddhist carving known in Ladakh</li> <li>4. Chorten with some of the oldest wall paintings in Changthang</li> <li>5. Temple with some of the finest murals from 16th - 17th century</li> <li>6. Shera valley probably a former mining site</li> </ol>
3	Hanle	<ol style="list-style-type: none"> <li>1. Border with Guge probably since Metal Age</li> <li>2. May have been outpost of Upper Tibet (Zhangzhung Tibetan Empire) in an otherwise Mon territory</li> <li>3. Richest grasslands as a strategic post for any mounted army</li> </ol>
4	Durbuk – Yerad	<ol style="list-style-type: none"> <li>1. Large number of sites with Central Asian elements</li> <li>2. Former gold mine</li> <li>3. Probably, a long-term border area since Metal Age</li> </ol>
5	Gya Valley	<ol style="list-style-type: none"> <li>1. Home of Gyapa Jo dynasty (original Ladakh lineage) who ruled over Rong, Rupshu, Upper Ladakh</li> <li>2. Vast resource of agriculture, herding, salt mining, ores</li> </ol>
6	Liktse - Tukla - Tiri - Nyi – Tamduk	High density of a variety of historical sites



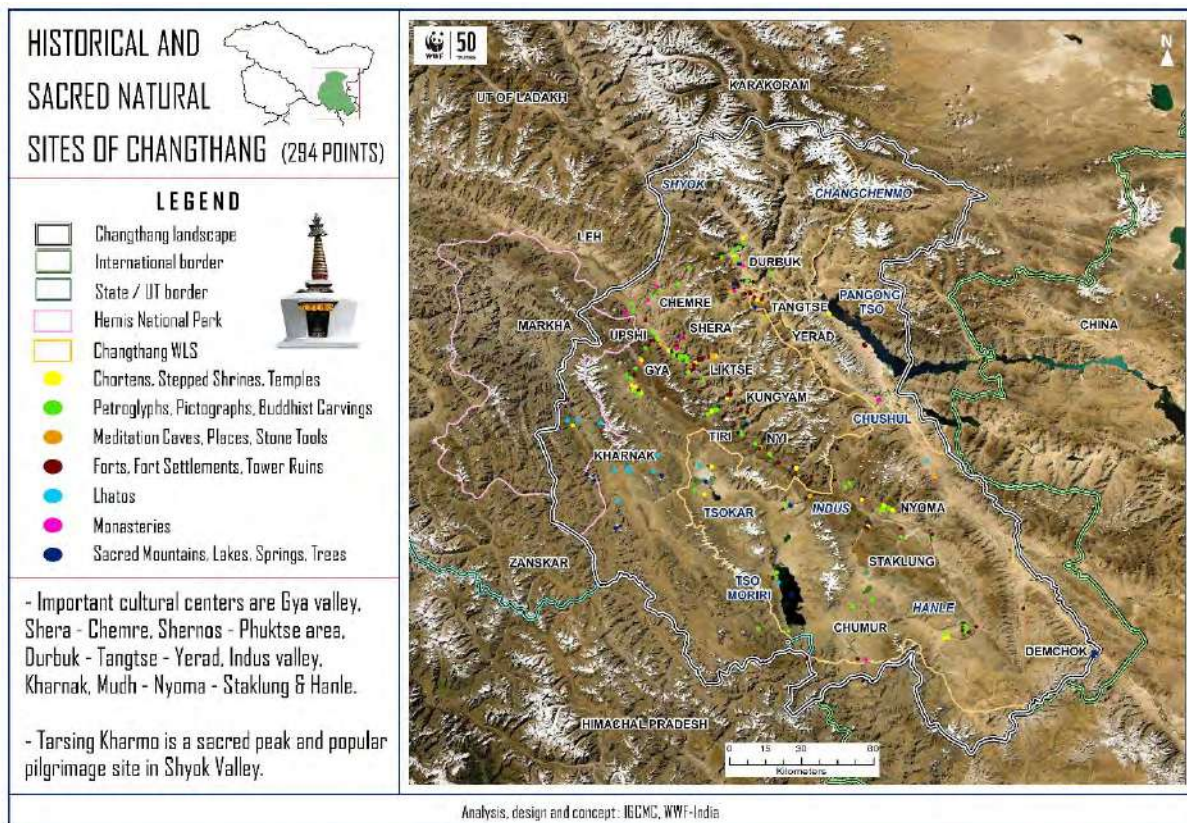


Figure 28 HCV 6 Cultural Sites in Changthang Landscape

### 2.2.8 Ecosystem Services in Changthang Landscape

The concept of ecosystem services was motivated by the idea that ecosystems make crucial contributions to human well-being, which are often unaccounted for or undervalued (Costanza et al. 1997). Ecosystem services are defined as the outputs of ecosystems that affect human well-being (Haines-Young & Potschin, 2012). In part due to the undervaluing of natural systems, human activities often tend to lead to the fragmentation and degradation of ecosystems, which in turn, can negatively affect human well-being (Cardinale et al. 2012).

Today's developmental pressures threaten the landscape, and environmental degradation affects human communities inhabiting the region. While economic development is essential, the associated environmental cost of large-scale development projects and extractive industries are rarely taken into account. Many threats that affect snow leopards and associated species also affect the well-being of people living in these landscapes. Human communities living in snow leopard landscapes are dependent on the ecosystem for their lifestyles and livelihoods (Murali et al. 2017).

Local peoples' main livelihood were dependent on local provisioning of ecosystem services like those required for agriculture and livestock rearing while some proportion of the respondents were employed in other sectors in addition to using agriculture and livestock rearing related ecosystem services. According to a study by Murali et al. 2017, this accounted for 24.5% of the respondents in the Changthang region while the rest of the respondents (75.5%) were involved in the agriculture/livestock. The overall ecosystem services provided by the Changthang landscape with the percentage of respondents using these services is shown in Table 10.

Table 10 Ecosystem Services and the Services Utilised in Changthang (Murali et. al.2017)

Ecosystem Services	Services Identified	Service Used (%)
Cultivated Crops	Crops-barley, green pea, black pea, mustard, turnips, wheat, potatoes, cauliflower, alfa alfa (for livestock)	85
Reared animals and their outputs	Goats reared for commercially valuable cashmere, sheep for wool, cow and <i>dzomo</i> for milk and yak, horse & donkey for draught power. All livestock except donkeys and horses for meat.	95.8
Wild plants, algae and their outputs	Wild onion, mushroom, rhubarb and green leafy plants to eat	41.3
Wild animals, algae and their outputs	Not used	0
Surface water	Water for household and agricultural purposes. Water for downstream uses.	100
Ground water	Not used	0
Fibres and other materials from plants, algae and animals for direct use or processing	Medicinal plants, plants for dyes, plants for roofing	43.7
Materials from plants, algae and animals for agricultural use	Anima dung as fertiliser, wild plants as fertiliser, forage as livestock	100
Plant based resources	Wood for heating	70.4
Animal-based resources	Animal dung for heating	67.7
Animal-based energy	Horses used for herding, ploughing and transport, yak for ploughing the land, donkey to transport material	42.5

As per the table, surface water was the only ecosystem service that was used by all respondents across the landscape. Livestock rearing and forage for livestock were among the most used services across the landscapes, with users utilising 95.8 % of the services.

Table 11 Ecosystem Services Use between Nomadic and Agro-pastoral Population (Murali et al. 2017)

Ecosystem Services	Nomadic		Agro-pastoral	
	Ecosystem Service Value (USD/HH/yr)	Contribution to Total ES (%)	Ecosystem Service Value (USD/HH/yr)	Contribution to Total ES (%)
Total Ecosystem Services	79,303 ± 9,204		15,083 ± 1656	
Cultivated Crops	0	0	929± 67	6.2



Ecosystem Services	Nomadic		Agro-pastoral	
	Ecosystem Service Value (USD/HH/yr)	Contribution to Total ES (%)	Ecosystem Service Value (USD/HH/yr)	Contribution to Total ES (%)
Outputs of Reared Animals	3,042± 437	3.8	929± 67	6.2
Wild Plants and their Outputs	233± 35.9	0.3	80.9± 12.8	0.5
Medicinal Plants	0	0	0	0
Wild Animals and their Outputs	0	0	0	0
Water for Household Use	3.4 ± 0.2	0	3.5± 0.1	0.02
Water for agriculture/livestock Use	99.2± 12.1	0.1	38± 3	0.3
Plants for roofing/livestock fibre for housing	0	0	2.5± 0.6	0.02
Forage for livestock	75,025 ± 8848	94.6	13,550± 1606	89.8
Plant and Animal based Resources	900± 151	1.1	197 ± 23	1.3

The Changthang landscape provides direct ecosystem services such as water for agriculture, human and livestock consumption, forage for livestock, firewood, useful wild plants. Indirectly, through crop production, people derived nutritional benefits and through livestock rearing, people derived benefits such as wool, dung, milk, and meat. These provisioning services contributed to different aspects of human wellbeing such as adequate livelihood, sufficient nutritious food, clothing, shelter, access to clean air and water, strength, and health. Their lifestyles and nature of dependence on ecosystem services have contributed to a unique way of life, forming a strong cultural identity in each of these landscapes. This has resulted in the contribution of cultural services in addition to the provisioning and regulatory services.

Forage was also determined as the highest valued ecosystem service, contributing to more than 90 % of the total ecosystem service, as evident from Table 12. The ecosystem service values for the nomadic pastoral communities in Changthang was reported to be especially high, primarily because of the high number of livestock holdings per household. Traditionally, nomadic pastoralism is believed to have been the prevalent land-use across much of snow leopard habitat. This is rapidly reducing in Ladakh, with only about 60 households (3600 people) in the study site who continue with this way of life. Ladakhi cashmere is considered to be among the finest in the world (Butola 2012 et al., Tumurjav 2015). The external demand for cashmere has a direct impact on the local use of ecosystem services (Berger et al. 2013). The ecosystem service input for producing cashmere is substantial. It was estimated that in Changthang we estimated it to cost 495 USD (forage and water consumption value of livestock) to produce 1 kg of cashmere. The costs of rearing these large herds, while heavily offset by the natural ecosystem,

also place immense pressure on it. Traditionally, mobility among pastoralists was a livelihood strategy to distribute the pressure across a larger resource area, and prevent over-grazing. However, over the last few years, the increased demand for cashmere has led to increasing herd sizes, and caused the degradation of pastures. This is particularly evident on the Tibetan plateau, where overgrazing has led to the formation of degraded soil that supports little forage growth (Dong et al. 2012).

Well-functioning ecosystems are essential to sustain the supplies of resources critical to health, livelihoods and production, for which it is important to understand the trade-offs that land-use practices can have on ecosystem services and the users of ecosystem services that it is going to impact. Adopting practices that safeguard biodiversity are essential for sustainable management of ecosystem services.

## 2.2.9 Socio-Economic Profile of the landscape

### 2.2.9.1 Demographic Profile

For the delineated landscape for Changthang, the landscape has a total population of 14445 individuals out of which 7454 are female and 6991 are males. There are 2795 households in the landscape, the average household size in Ladakh being 5.29 persons (IHD, 2008).

The SC population is low in the landscape accounting for only 0.1% of the total population with 10 individuals. The ST population comprises 84.8% of the total population comprising of 12243 individuals. 55% of the population in the landscape is literate.

*Table 12 Demographic Profile of Changthang Landscape (Census of India, 2011)*

Number of households	2795	Non Workers	6990
Total Population	14445	CL (Main+Marginal)	2420
Total Male	6991	AL (Main+Marginal)	357
Total Female	7454	HHL (Main+Marginal)	308
Population (0-6 years)	1701	OW (Main+Marginal)	2171
SC Population	10	Average Household Size (per Household)	5.29
ST Population	12243	Proportion of Urban Population (%)	0
Literates	7929	Sex Ratio	
illiterates	6516	Proportion of SC (%)	0.1
Total Workers	7455	Proportion of ST (%)	84.8
Main Workers	4331	Literacy Rate (%)	0.55
Marginal Workers	3124	Density of Population (persons per sq. km)	3

### 2.2.9.2 Cultural Practices

Two kinds of communities live in the Changthang region of Ladakh—agro-pastoral and nomadic pastoralists, who have a combined population of about 31,000 (Leh district profile, Government of India, 2015). Agro-pastoral

communities have permanent settlements with agricultural land and livestock, who depend on agriculture and livestock rearing. Nomadic communities depend on livestock for their sustenance, where their main income is from the sale of pashmina. They move their settlements four to twelve times a year, based on the availability of forage for livestock (Namgail et al., 2007).

The Changpas are nomadic pastoralists who originally migrated from Tibet in the eighth century A.D. (Jina, 1995) and who now graze the rangelands of Changthang. The Changpa are Buddhists and share cultural and linguistic affinities with Tibet, following the Kargyupa sect of Mahayana. While the term “Changpa” is the generic in nature, they are not one homogeneous community. The groups are in fact separated by their place of origin, each having its own chief and its specified grazing areas and each inhabiting a different part of the plateau (Ahmed, 2004; Bhasin, 2012). Ladakh is home to 14 such groups, varying in size from 20 to 176 families. All the groups fundamentally share the same way of life, with some variations existing. The three nomadic Changpa groups that inhabit the high plateaus of Rupshu-Kharnak are composed of three independent groups located at Kharnak, Samad and Korzok.

Being nomads, the Changpas do not live in permanent houses or practice agriculture. However, they do have permanent structures in the area either that is used either for storage or for shelter. Korzok, Thugje and Dat are the permanent winter settlements of the Changpas of Korzok, Samad and Kharnak respectively. In Samad and Kharnak, the entire community leads a transhumant life, while in Korzok, although ninety percent are



transhumant, the other ten per cent lead a sedentary way of life. The three groups share the same way of life raising pashmina goats, sheep and yaks on natural pasturelands (Bhasin, 2012).

The principal form of income of the Changpa nomads is that of livestock rearing, each family rearing hundreds of pashmina goats, sheep and yak. The domestic goats of Changthang are reported to produce the finest cashmere

wool or pashmina in the world (Misra, 1998; Ahmed, 2004). The pashmina from the area is of especially fine quality due to the harsh climate on the plateau where the goats are reared. (Goodall, 2004; ICIMOD, 1998). All of the livestock are grazed in the high pastures during a majority of the year. However, the cows on the other hand are grazed in the riverine pastures near the human settlements. In addition to grazing livestock, the Changpas also extract shrubs like *Artemisia* spp. from the rangelands for fuel.

They emphasize that the term ‘Changpa’, apart from defining one who lives in the north, also refers to one who owns sheep and goats. Therefore, though everyone who lives on the Changthang is a pastoralist, they are not all nomads. The latter are commonly referred to as ‘Rongpas’, a term pertaining to those that practice agriculture and have a fixed village space. Dollfus, 2013 mentions in her study that it is altitude rather than aridity which resulted

in practice of pastoralism in Changthang, as environmental constraints pose severe restrictions on agricultural activities. Thus, it is largely unsuitable for cultivation because of extreme cold climate and also has water scarcity.

### **Trade**

Historic references to Changthang have often focused on trading relations, especially along the border that Ladakh shared with Tibet. These political and commercial relations were a matter of great concern for the rulers of Ladakh, Tibet, Kashmir and British officials. This also affected the Changpas, those living in Ladakh and those in western Tibet, as it had a direct effect on their livelihood. Most of the literature focuses on the trade in pashmina, and how the trade was maintained and controlled by governments, revealing that the trade was not a result of custom or usage (Lamb 1960). In fact, it was a desire to secure a monopoly over the entire pashmina trade by the ruler of Jammu, Gulab Singh that led to Zorawar Singh's invasion of Ladakh and the consequent rule by the Dogras over Ladakh.

Salt was equally important among the trading items that crossed the Changthang. This used to come from Tibet, till 1959 when the borders closed and the Changpas began to look for sources of salt in Ladakh's Changthang. Tso Kar then became an important source, but after the 1990s this began to dry up and is now no longer functional (Ahmed 1999).



Today, the Changpas produce some of the best pashmina in the world. While Changra goats are also found in other part of Ladakh, those in Changthang produce better quality because these are reared on higher mountain plateau under intense cold climate (Hagalia 2004; Goodall, 2004; Namgail et al. 2010). According to Blaikie

(2001), on an average, pastoralists in Ladakh earn higher income than that of households, which depend on subsistence agriculture. Changpa nomads of Ladakh started getting benefits as demand and value for pashmina wool increased after the closure of the border with Tibet (Ahmed 2004, Rösing & Spurkhapa 2006). As a result, Pashmina has acquired increasing commercial significance in Ladakh. Today, Pashmina is one of the most important livestock products and sources of livelihood for the Changpas. This has resulted in an increase in number of pashmina goat and decline in number of sheep. It is pertinent to study and understand the changes in the composition of livestock in Changthang region in light of growing economic importance of pashmina.

### **Local Institutions/Governance**

A significant level of organisations among the Changpa relates to community governance and representation. The village leader or chief is known as goba. Below him are two assistants called 'members' and a kotwal. These positions are all held by men, and these would be the male heads of the big tents (not the small tents to which their elderly parents would have moved to). The Jammu & Kashmir Panchayat Raj system was introduced in Ladakh



in 1989. The first elections to the Panchayat Raj system was held in Ladakh, including Changthang, in 2001. However, the system is not fully empowered and the goba continues to hold the greater influence in community affairs and management.



The monastery is another important local institution among the Changpas. Earlier, the monastery used to own a large number and variety of livestock. Their livestock was looked after by Changpa households on a rotational basis along with their own livestock. There has been a tradition

of taking the monastery's livestock to better pasture. Wool, milk and products made from milk of the monastery's livestock are kept separately and given to the monastery at fixed intervals (LAMO, 2020).

Both Changpa and TR (Tibetan Refugee) social organisation is patrilineal and male-dominated. There is however, a marked gender distinction in the Changpa pastoral production system, with the women involved mostly in milking and dairy processing, while males are responsible for shearing cashmere wool, herding and selling of animals. In the past, Changpa society was predominantly polyandrous, where several brothers married a single woman, which perhaps served as a population control mechanism, but this is declining due largely to a change in young people's attitudes. The family is the primary unit of production, but communal cooperation is an important feature of the Changpa society. Traditional bartering of several subsistence commodities, such as barley, has also ceased (Namgail et al. 2017).

### **Livestock Practices**

Composition of herds of pastoralists mainly depends on biological particularities and environmental conditions. It is also influenced by economic, political, social and cultural factors (Khazanov 1981). Composition of herd can be regulated according to the demands of given pastoralist for the various products of livestock or for activities such as transport and for various cultural reasons. Pastoralists maintain diversity of livestock, in order to mitigate risk of loss of livestock from disease or extreme weather events and to have efficient feeding strategies as each species grazes different plants or parts of plants.

Livestock are taken out for grazing every day, in summer and winter, exceptions may be made for intensely bad cold weather and lots of snow. Seasonal variations occur with respect for grazing, with longer hours in the summer (8 am to 6 pm) and shorter in the winter (10 am to 4 pm). Shepherds (lugsis) often walk eight to twelve kilometres in a day, grazing the livestock. While they are usually young boys and girls in their teens, this has been changing since the last 20 years as more children attend school. It is now more common to see elders taking livestock out to graze, something they are not pleased about as this is a responsibility that has traditionally devolved with age.

Herding may also be pooled between families who have smaller herds and less man/woman power to tend to the animals. While families with less income may also work for others in exchange for payment.

Yaks and horses are left untended in the high mountain valleys where they graze by themselves, as these areas are said to have more grass. The practice is similar in Tibet where it is said yaks usually do not wander too far from where they are left so when they are needed for transportation it is not difficult to locate and bring them back (Goldstein & Beall 1990). This balances out the pressure on the pasturelands accessed by livestock,



though occasionally yaks and horses do go missing or are killed by predators. Horse's hooves are said to destroy the pasture of sheep and goats, and yaks have a negative effect as they dig up grass with its roots, and the pasture takes two to three years to recover (Humphrey et. al. 1993).

Herding is not done indiscriminately. There is a carefully worked out system of pasture allocation that prevents overgrazing of particular pastures and ensures that livestock will always have enough to eat. Each community in Changthang has rights over grazing lands, and no land is individually owned. Rules are also imposed on those who violate grazing laws. While grazing lands are left fallow, there does not appear to be fixed rules for this. However, in recent years grazing has become increasingly difficult on the Changthang with tourists coming in with their horses and the army setting up posts.

Milking is women's work, so too are the products made from it – butter, cheese, and yogurt. In contrast, removing the fibres from the animals is men's work. This is usually done in the months of June and July. But nowadays if the Changpa face shortage of help, these rules are not consistently adhered to. Sheep wool (bal), goat hair (ral), yak hair (rtsid-pa) and yak wool (ku-lu) are widely used in Changthang with some percentage traded; pashmina (lena) tended to always be sold. Prices are generally set collectively rather than individually, but final decisions governing who to sell to and the final price are made independently (LAMO, 2020).

### **Transhumance Route and Grazing Pattern**

One of the major reasons for movement of pastoral nomads is the seasonal and spatial variability of resources (Hagalia, 2004). Fewer moves inculcate overgrazing, degradation and result in speculation of long-term pasture damage (Sternberg, 2009; Ayantunde et. al., 2011). They move to new pasture when faced with shortage of grass for grazing and low availability of water. Time and route of movement are decided by the chief (goba). Pastures are divided into many parts and are used only at certain periods in a year. All grazing lands are known by different names. As mentioned earlier, various factors have led to variations in the route of movement and grazing pattern of nomads of Changthang in general, and of Samad Rokchen in particular.

## **Change in Culture**

The Indo-China border dispute of 1962 had a significant impact on the pastoral community of Changthang, which led to considerable changes in socio-economic structure of the Changpas. Earlier, nomads of Changthang had access to several traditional pastures of western Tibet, where they can no longer go as they have lost access to those pastures after the conflict, which brought increased Chinese presence and control in Tibet. Some of these areas around the lakes like Pangong Tso were key pastures for winter (Namgail et al. 2007; Goodall, 2004). At the same time, there was an influx of Tibetan refugees in 1959 after the occupation of Tibet by China. Tibetan refugees came over the border to India along with their livestock. This resulted in significant shrinkage in pasturelands, which led to strain over grass and water resources and tensions between different pastoral groups in Changthang and changes in the pattern of movement (Dollfus, 2013). It also led to considerable conflict between Tibetan nomads and the Changpas.

Construction of roads, rapid expansions of means of transport and increased accessibility have speeded up movement of people from villages to urban areas and integration with the outsiders. Every year, a large number of nomads migrate to Leh town and neighbouring villages to work as casual labourers, despite the high value and demand for livestock and livestock products like pashmina and meat. Integration with outsiders and other factors resulting in realization among the Changpa about the importance of education. This also led to migration of nomads to Leh town to enroll and educate their children. Changthang region was opened to tourists in 1994, and since then the number of tourists arrival has increased manifold. While animal husbandry continues to be the chief source of livelihood for the Changpas, other avenues to earn an income are also emerging. These include tourism, joining the army or moving to Leh and taking up odd jobs. While the Changpa do make a range of products using felt, leather, wool and other fibres, they largely make these for themselves. However, they may sell the odd rug or saddlebag to a passing tourist or to antique shops in Leh. It is only very recently that the Changpa have been making textile products specifically for sale. While some of this is being done in Changthang, these products are primarily made by Changpa women living in Kharnakling.

Tourism has become a most important sector providing significant contribution to the indigenous subsistence economy of Ladakh since last four decades. Its contribution has been in creating forms of new income, jobs and in execution of more public work projects in the region. All these factors resulted in significant transformation of the region.

The Changpas are nomadic pastoralists, and move from pasture to pasture on a seasonal basis, although the system is changing gradually (Namgail et al., 2007a). They live in yak-hair tents, although people in recent years have started building concrete houses in more centralised locations with good access to water. Thus, a sedentarisation process is under way in many parts of Changthang (Namgail et al., 2007a). This is reinforced by an increasing trend of agriculture being practised relatively intensively. Agriculture necessitates people settling near crop fields, which need to be weeded, irrigated and guarded against domestic and wild ungulates. Furthermore, in some areas people are settling down to provide education for their children, since mobile schools that once operated have become rare because teachers refuse to move with the nomads. These settlements are encouraged by the Government, which finds it easier to supply food provisions and modern health facilities in these easily accessible locations (Bhatnagar et al., 2006b; Namgail et al., 2007; Namgail 2010)

Changpas live in yak-hair tents, known as Rebos, except in their winter settlements where they have one-room structures made of stone and mud. They sometimes indulge in cultural festivals especially during Losar (the New Year) where a special dance called Zhabro is performed (Namgail 2010).

### **2.2.9.3 Economic Activities**

For the last many decades, Ladakh region has been dependent mainly upon subsistence agriculture and pastoralism (Raghuvanshi et al. 2017). The mechanisation of agriculture suited to the plains is not appropriate in mountainous areas having higher degree of slope, thin soil cover, poor soil moisture and humus content. Under such circumstances crop farming has to be amplified through other area-specific economic activities.

In Changthang, there is a trend towards increasing the livestock population, especially a breed of goat (*Capra sibirica*) that produces one of the finest natural fibres— pashmina, which is the mainstay of economy of Changpa nomads. These nomadic pastoralists rear livestock under extensive and completely migratory production system as their prime occupation for livelihood and are concentrated in the areas with an elevation range from 3940-4550 masl (Malik & Wani, 2017). The livestock in the areas mainly consist of Changthangi goats, Changluk sheep, Yaks and horse. Changpa visit their villages during summers where they grow barley and wheat. The Changthang region produces the best quality pashmina and is the economic mainstay of the nomadic people of Changthang. Pashmina fibre is very expensive, it being used for production of world's finest shawls. The Changthang region alone produces around 35,000 kg of raw pashmina fibre every year from about 0.15 million of Changri goats. This alone which form 80% of the total pashmina production of the entire country. 90% of the population in the Changthang area survives on the income from goat and sheep, which is nearly \$8.4 million, annually (Beigh, 2019).

Historically, subsistence agriculture has formed the organising structure of both society and the economy in the region. With scarce water availability, the villages are scattered between small areas of land in the river valleys of the Indus, and its tributaries Shayok and Zanskar. Pastoral herding is followed by both the nomadic and settled communities, while the latter also cultivate barley, wheat and peas, and increasingly horticulture products like apricots and apples. The arable agricultural schedule is inhibited by the short growing season (between May and September). Therefore, the farmers in Ladakh have been averse to adopting untested technology due to the risks (Angchok & Srivastava, 2016). Families in the region mostly rely on subsistence agriculture based on principal crops like wheat, barley, peas and potato.

### **2.2.10 Agriculture**

Agriculture in Leh is a way of life for the agrarian population and nearly 70% of the population is directly or indirectly dependent on the sector. Despite the vast geographical area, 62% of the households have less than 1 ha cultivable land (LAHDC, 2019).

However, in Changthang, since the agro pastoral life is more predominant, the agrarian population is less compared to that of Leh as a whole. As per the Census 2011, the population of agricultural labourers is only that of 357 individuals (104 and 253 belonging to the main category and marginal category respectively) (Census of India, 2011). In the delineated Changthang landscape, 1014.87 hectares of the land is under various crops.

Since cropping is dominant as double cropping is possible, only in limited areas falling below approx. 3000 m. Agriculture production is entirely based on irrigation. Glaciers are the main source of water for irrigation and the



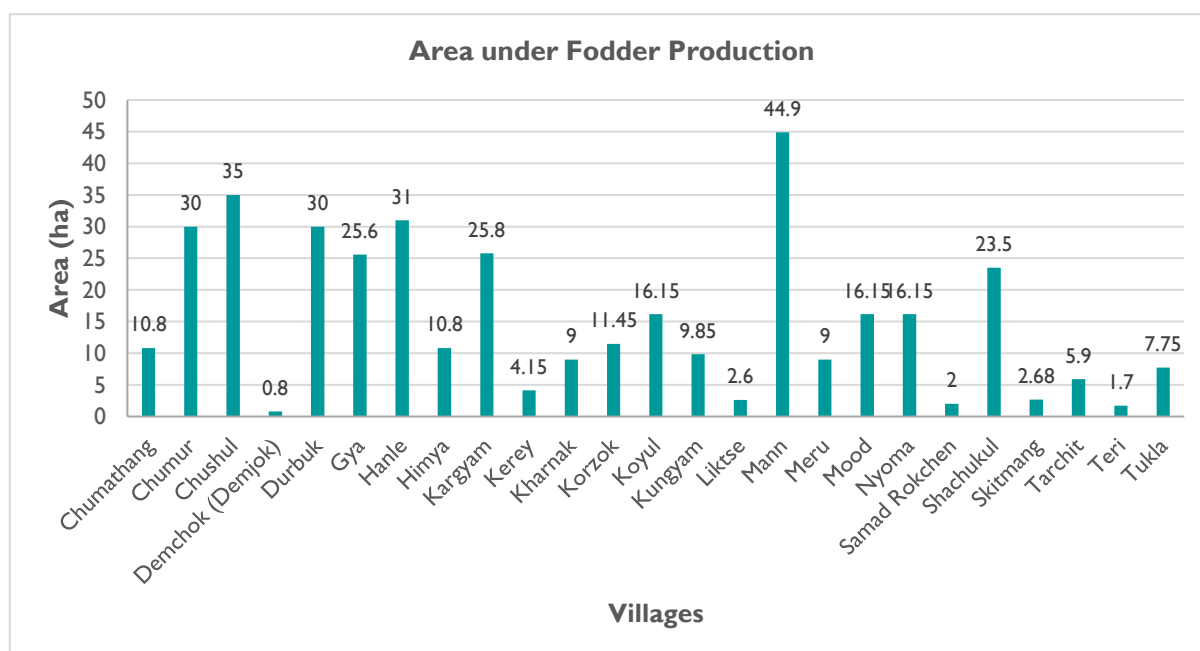
rivers that flow in the region remain underutilized for agriculture purposes. Production of unique natural resources such as apricot, apples and off-season vegetables remain limited due to water scarcity.

As per the data received from the Agriculture Department, Ladakh, the predominant crops under agriculture are wheat, barley, pulses, millet, vegetables, oil seed, fodder and fruit. Barley is most produced crop in the villages within the Changthang landscape followed by fodder (Table 14). Pulses and oilseeds seem to be the least produced with 0.6% and 0.3% respectively. Pulses can be grown successfully in Ladakh’s conditions, although it occupies only 0.6% of the total cropped area in the landscape.

**Table 13 Area under Crops in Changthang (Source: Agriculture Department, Ladakh)**

Crops	Area under Crops (ha.)	Percentage
Wheat	30	3.0%
Barley	546.55	53.9%
Pulses	6.5	0.6%
Millet	0	0.0%
Vegetables	24.5	2.4%
Oil Seed	3.5	0.3%
Fodder	382.73	37.7%
Fruit	21.09	2.1%

Fodder is the backbone of agriculture and animal husbandry industry in Ladakh. Cultivated fodder occupies 22.4% (2290 hectares) of the total cropped areas. The region is known for high quality alfa alfa. Dried alfa alfa is traditionally used as the main source of fodder during winter months. There is a need to increase area under fodder cultivation for sustainable organic farming system in the district. The details of crop productivity village-wise is provided in Annexure 6. Figure 29 shows village wise fodder production in Changthang landscape.

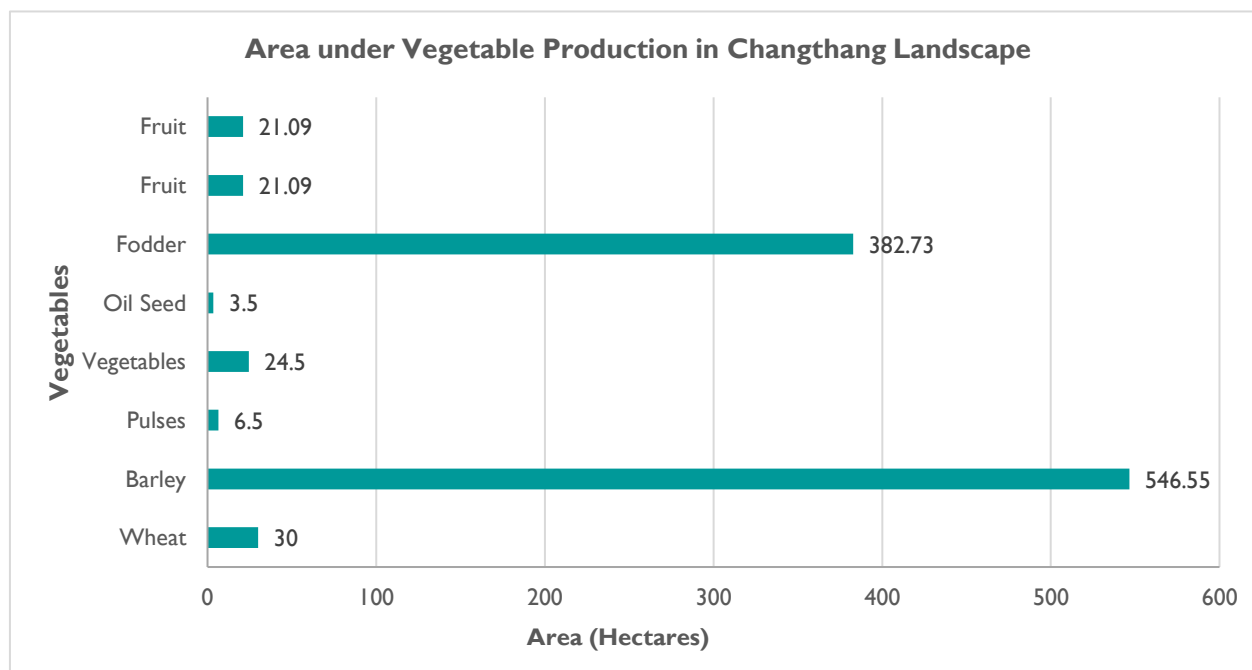


**Figure 29 Village-wise Fodder Production (Source: Agriculture Department, Ladakh)**

As given in Table 15, onion, cabbage, cauliflower, carrot, radish, beans, cucurbits, potatoes and peas are the crops under cultivation in the villages within the Changthang landscape (Agri Department). Potatoes seem to be most cultivated vegetable with 8970 MT (44.9% of the total agricultural production), followed by peas with 1268 MT accounting for 30% of the total area under production.

*Table 14 Vegetable Production Details (Source: Agriculture Department, Ladakh)*

Crops	Production (MT)	Area under Production (ha)	Area under Production (%)
Onion	402	37	6.6
Cabbage	397	21	3.7
Cauliflower	212	17	3.0
Carrot	242	23	4.1
Radish	95	6	1.1
Beans	40	12	2.1
Cucurbits	34	2	0.4
Potato	8,970	253	44.9
Pea	1,269	169	30.0
Others	206	24	4.3



*Figure 30 Area under Vegetable Production in Changthang Landscape (Source: Agriculture Department, Ladakh)*

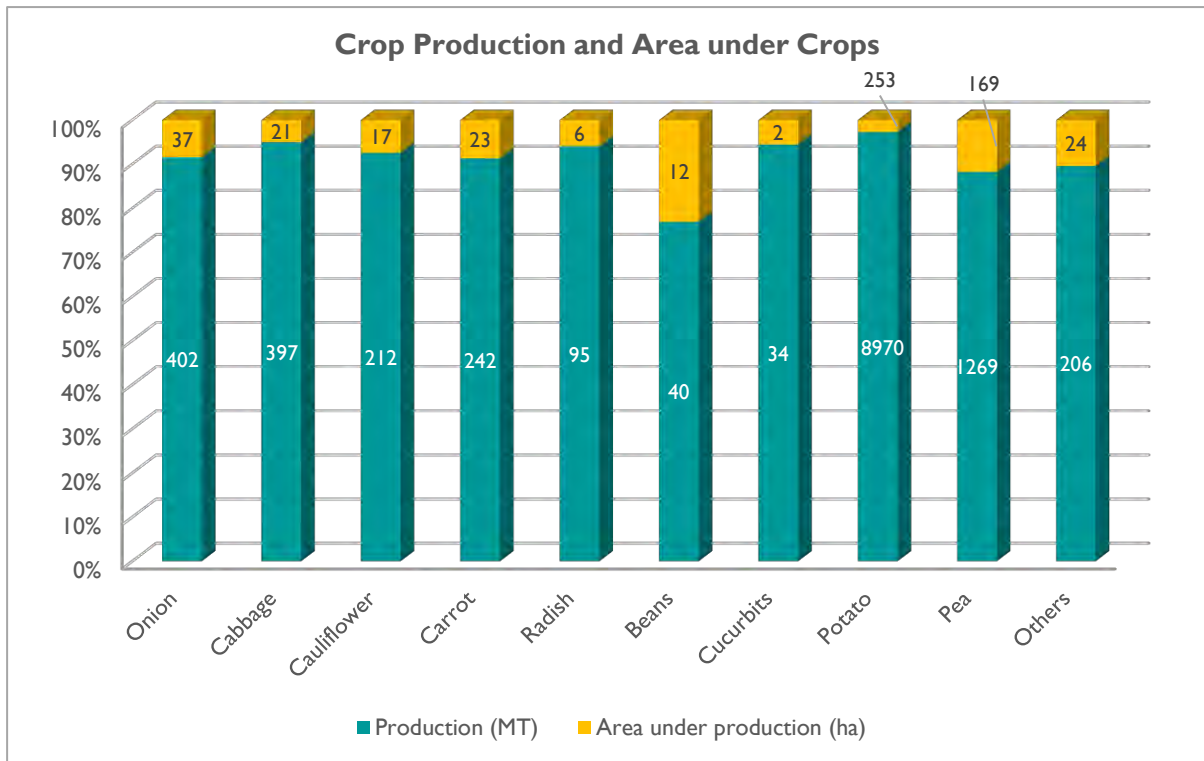


Figure 31 Production Details of Vegetables (Source: Agriculture Department, Ladakh)

### Chemical Fertiliser Use

Although subsistence farming is practiced traditionally in the landscape and has been self-sufficient, in the wake of modernization, there has been a consequent use of chemical fertilisers. However, it can be observed from Figure 32 that the chemical fertiliser use has had an increasing trend from 2016 until 2018 in the landscape of Changthang. While the national average consumption of fertiliser during 2016-17 was 1.23 q/ha, it was only 0.52 q/ha for Leh during 2017-18. There is now a push for organic farming and to bring organic farming to the

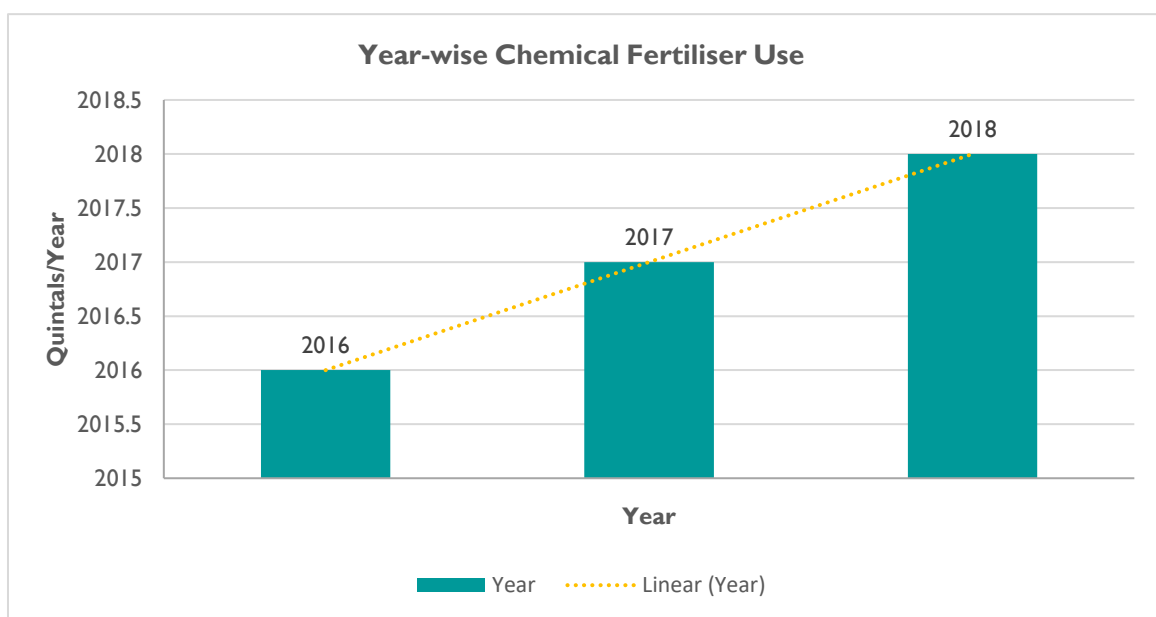


Figure 32 Chemical Fertiliser Use in Changthang (Source: Agriculture Department, Ladakh)

mainstream agricultural production system of Ladakh (LAHDC, 2019). There is a target to certify Leh as Organic Farming District by 2025. Detailed figures of chemical fertiliser use in Changthang is provided in Annexure 7.

### 2.2.11 Animal Husbandry

Since the delineated landscape is spread across five blocks—Kharu, Nyoma, Durbuk, Rong and Rupshi, the figures and details are presented for the mentioned blocks and as per the villages lying within the landscape, as mentioned in Section 2.1.2.

As per the data received from the Animal Husbandry Department, goat production is observed to be the most in the landscape out of the other animals with a population of 169312 followed by that of sheep, yak and then cattle (Figure 33)

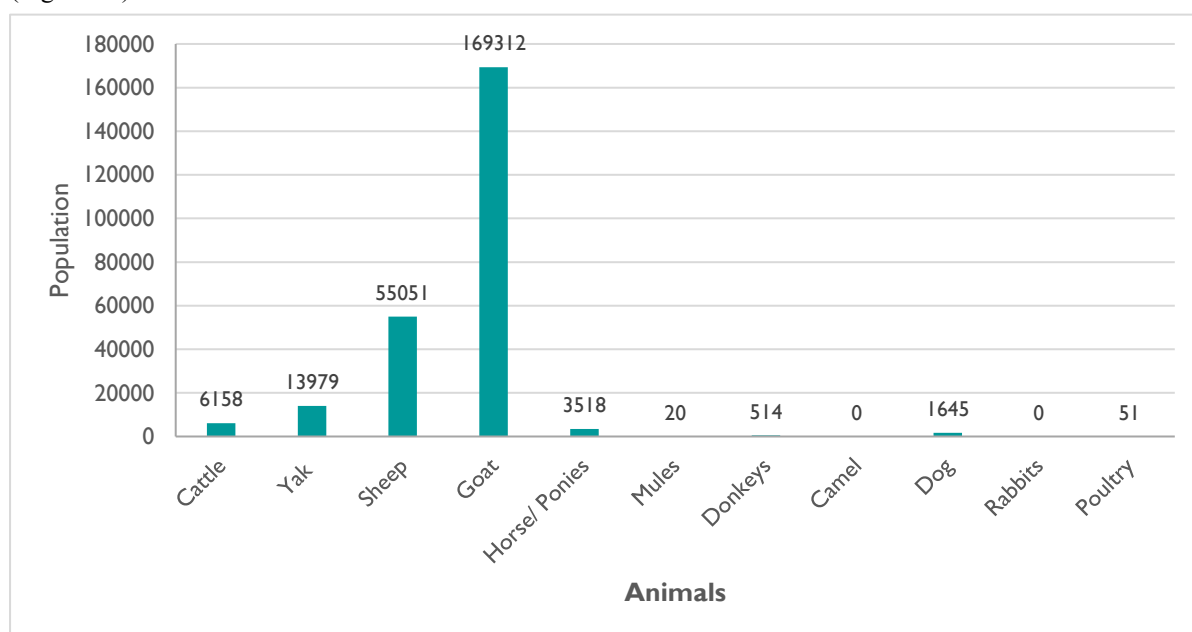


Figure 34 Animal Husbandry Productivity (Source: Animal Husbandry Department)

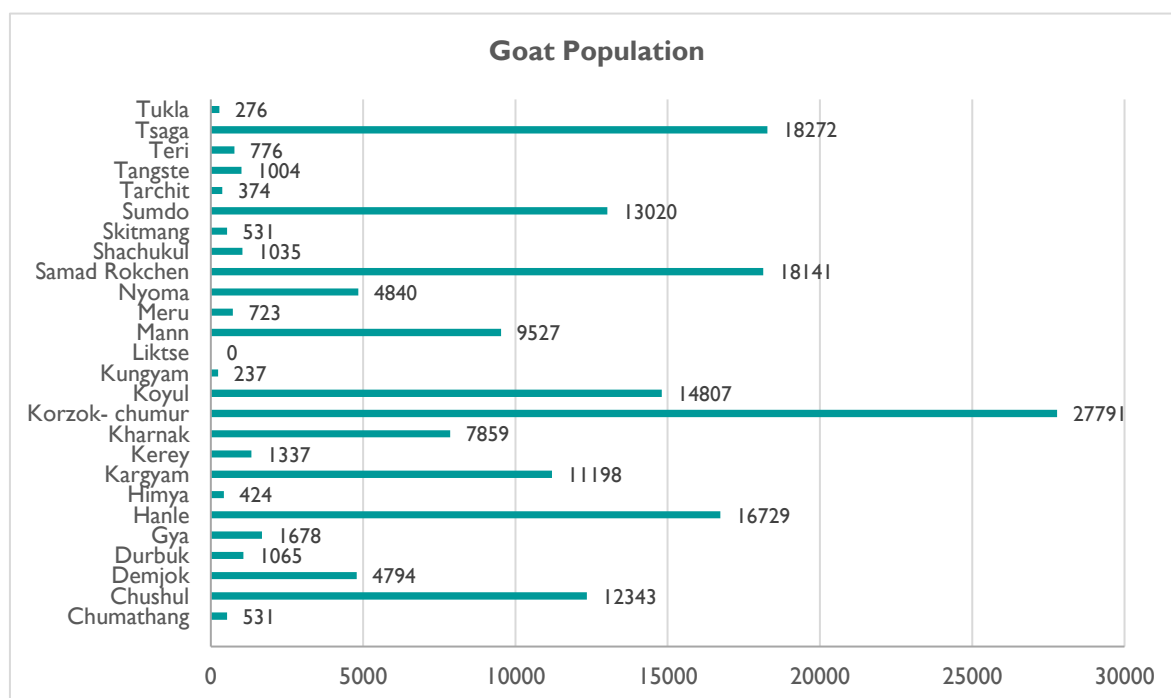


Figure 33 Village-wise Population of Goat (Source: Animal Husbandry Department)



In terms of the goat population, the block where the most goats are reared is observed to be in Korzok, Chumur followed by Tsaga (Figure 34).

According to the data provided in the Statistical Handbook Leh, 2018-19, aside from Kharu block, none of the other blocks hold non-pashmina goat in the landscape. The number of pashmina to non-pashmina goats is provided in Table 15.

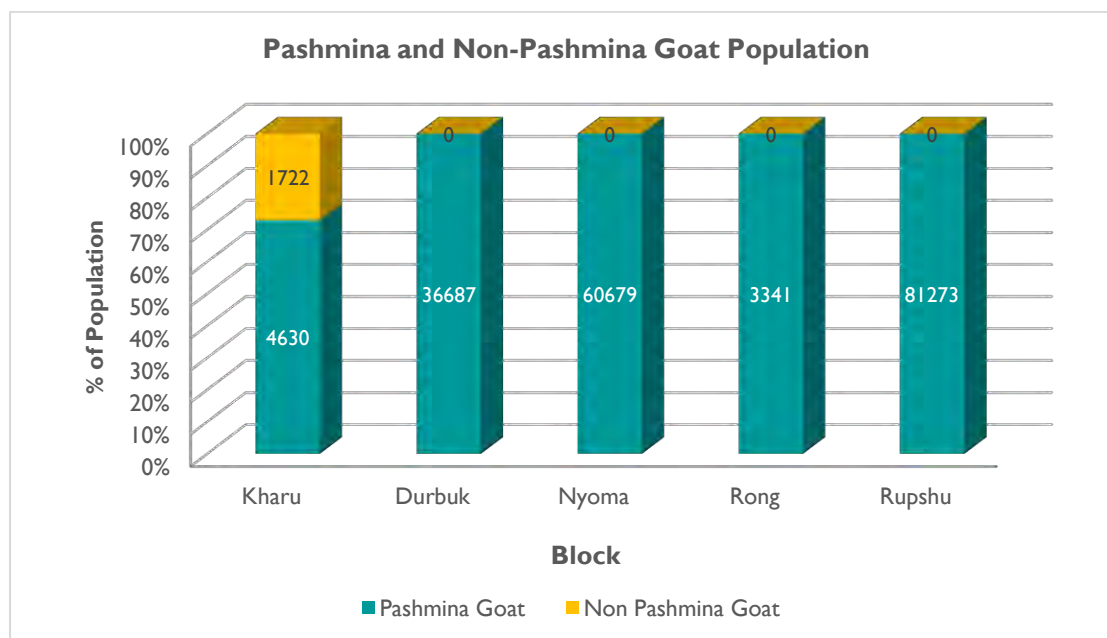


Figure 35 Presence of Pashmina and Non-Pashmina Goat (Source: Animal Husbandry Department)

Table 15 Block-wise Sheep and Goat Population for the Delineated Landscape (Source: Statistical Handbook Leh, 2018-19)

Block	Sheep	Goat	
		Pashmina Goat	Non Pashmina Goat
Kharu	23151	4630	1722
Durbuk	10236	36687	0
Nyoma	22222	60679	0
Rong	687	3341	0
Rupshu	49346	81273	0

In terms of sheep husbandry, for the year 2018-19, the products and the target of production of the Sheep Husbandry Department in Leh are provided below (Statistical Handbook Leh, 2018-19). It is observed that the department exceeded its targets for the year.

Table 16 Targets and Achievement of Sheep Husbandry Department (Source: Statistical Handbook Leh, 2018-19)

S. No	Item	Units	Physical Target	Achievement ending December '19
1	Wool	Kgs	101670	102009
2	Pashmina	Kgs	43517	46003.6
3	Mohair	Kgs	775	803

S. No	Item	Units	Physical Target	Achievement ending December '19
4	Mutton	Kgs	664950	624265.79
5	Milk	Litres	-	520

### 2.2.12 Tourism

Tourism is one of the top contributors to the economy of Ladakh and provides important livelihood sources to the people of the Union Territory. It is reported to have contributed 6.70 to the GSDP of Jammu and Kashmir in 2014-2015 although it is likely to be much higher for Ladakh alone. The tourism sector has transformed the Ladakh region and it has seen a huge jump in number of tourists from 527 tourists in 1974 to over 1, 79,491 tourists in 2011 (Dar et al. 2016) and and 2, 77,000 in 2017. Ladakh offers a diverse ecotourism platter which includes Buddhist shrines and gompas (monasteries) catering to cultural and spiritual tourism, snow-shrouded peaks attracting adventure seekers and trekkers keen to conquer the enormous heights, vast plains for bikers to navigate for driving enthusiasts and high altitude saline wetlands such as Pangong Tso for avid birders amongst many more.



In the Changthang landscape, tourists largely flock the high altitude lakes- Tsokar, Tsomoriri and Pangong. Hanle is also increasingly becoming famous with Indian tourists because of the observatory situated there and the amazing star gazing opportunities. Snow leopard tourism in winters is the main revenue earner, although it is still not very prominent in the Changthang landscape. Birding at Tsokar, Hanle and Tsomoriri is also an important tourism activity with Ladakh documented to have 310 bird species (Pfister, 2004). The local people of Changthang



are also benefitted from the tourism sector. The ‘homestay model’ that was pioneered by the Snow Leopard Conservancy to integrate conservation and livelihood goals, is now well known and recognised in Ladakh (Jackson R, Wangchuk R., 2004) and has been widely adopted by a number of agencies including the Wildlife Department and WWF-India. Hanle and Korzok has seen some major development in terms of homestays.

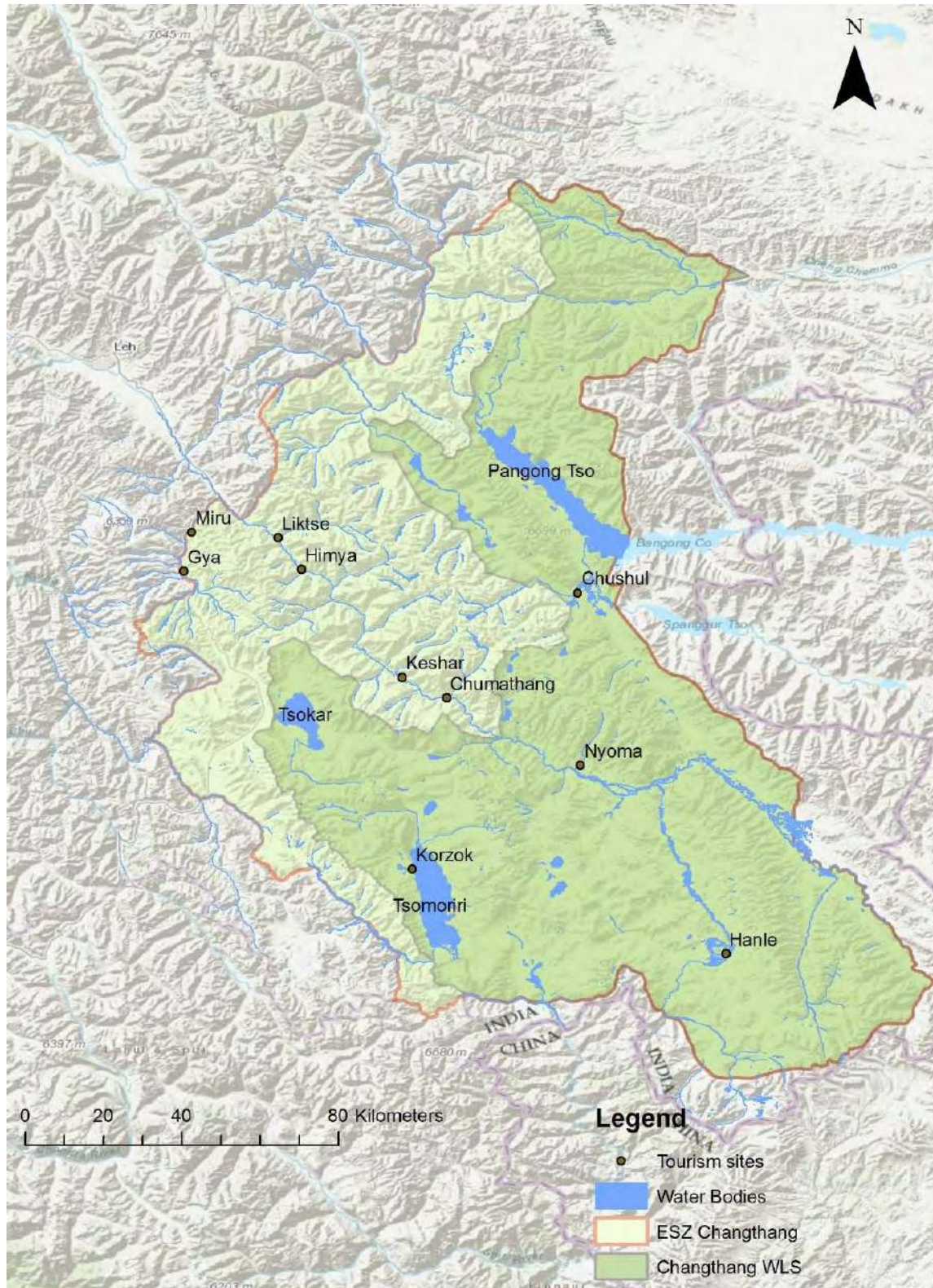
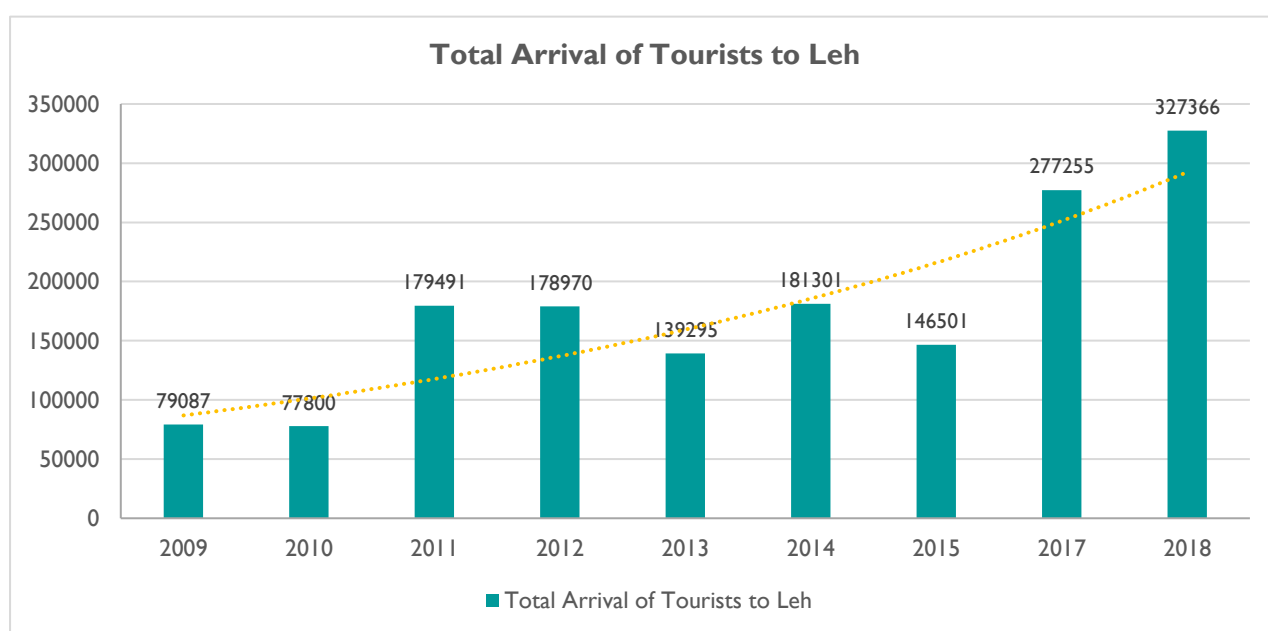


Figure 36 Major Tourism Sites in Changthang

**Table 17 Villages located in the tourist hotspots of Changthang landscape**

Place	Village Names	Demographic Composition
Tsokar (1)	Thukjey	Changpas
Tsomoriri (1)	Korzok	Changpas
Hanle (9)	Khaldo	Changpas
	Naga	Changpas
	Panguk	Changpas
	Buk	Changpas
	Shado	Changpas
	Kongjee	Changpas
	Radar	Changpas
	Parkyok	Tibetan Refugees
	Jhingsoma	Tibetan Refugees
Pangong (6)	Panguk	Mix composition
	Phogram	Changpas
	Lukung	Changpas
	Spangmik	Changpas
	Maan	Changpas
	Merak	Changpas
	Khaktat	Changpas

The footfall data for Leh (Statistical Handbook Leh, 2018-19 shows an increasing trend in terms of arrival and footfall 2009-2019 (Figure 38).

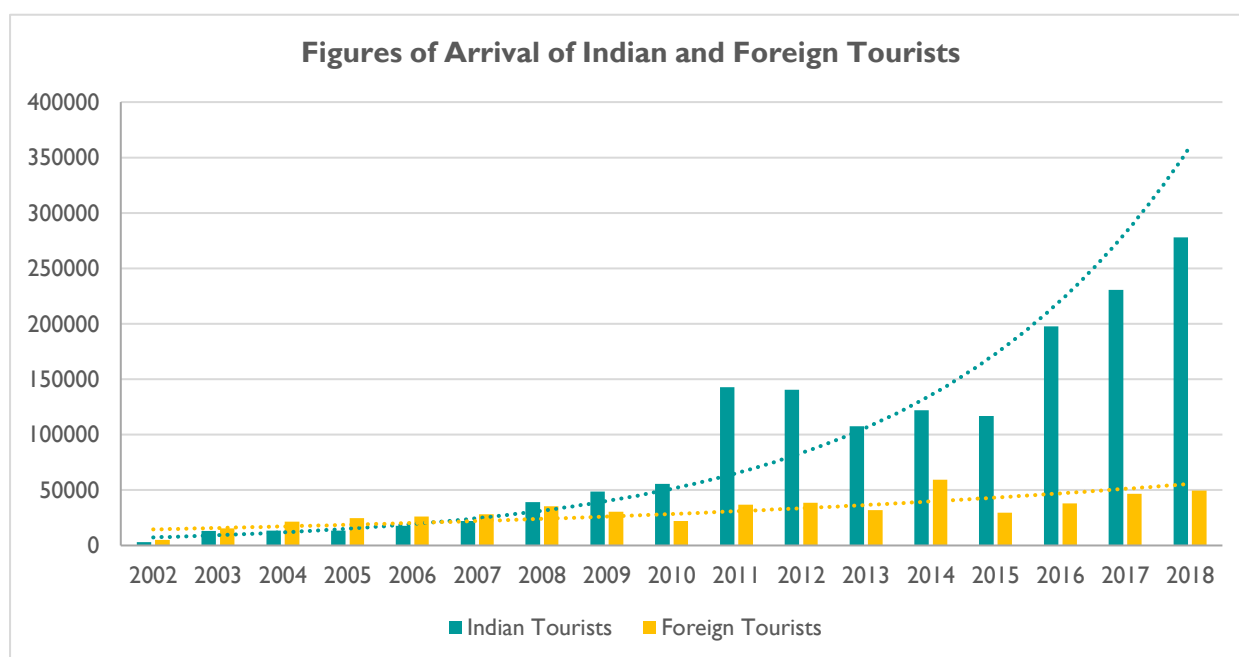


**Figure 37 Total Arrival of Tourists to Leh (Source: Statistical Handbook Leh, 2018-19)**



**Table 18 Percentage of Tourist Arrival from 2009-2018 (Source: Statistical Handbook Leh, 2018-19)**

Year	Percentage of Tourist Arrival
2009	5.0%
2010	4.9%
2011	11.3%
2012	11.3%
2013	8.8%
2014	11.4%
2015	9.2%
2017	17.5%
2018	20.6%



*Figure 38 Percentage of Tourist Arrival from 2009-2018 (Source: Statistical Handbook Leh, 2018-19)*

**Table 19 Overall Arrival of Tourists in 2018 (Source: Statistical Handbook Leh, 2018-19)**

Nationality	Total Arrival in 2018
Canadian	846
American	2820
French	5067
German	2891
Swiss	942

Nationality	Total Arrival in 2018
Australian	1317
English/British	2784
Italian	2025
Others	30785
Indian	277889

In 2018, 277889 Indian tourists visited accounting for 85% of the total visitors. The detailed numbers for the influx of tourists is provided in Annexure 9 and Annexure 10.

After opening for tourists, tourism in Leh showed a rapid increase in terms of both international and domestic tourists. As shown in Figure 39, from 2002 onwards the rate of increase in tourist inflows rises significantly, in case of both foreign as well as domestic tourists. The even steeper increase after 2006 is attributed to the large increases in the inflow of domestic tourists. This sudden increase in the influx of Indian tourists could be attributed to a number of factors—the increase in services consumption by the rising Indian middle class, an increase in the number of flights to Leh, the introduction of tour packages from online travel companies and perhaps due to the increasing number of Indian films being shot in Ladakh. The above figure also depicts the downward trend in the foreign tourist arrivals during 2008-10, which can be attributed to the 2008 global financial crisis. However, Indian tourist arrivals continued to increase during this period, as the Indian economy was still able to grow since it is not as depend on global flows of trade and capital as most other countries (Shamim Shah, 2016).

Shah et al. 2016 estimates the carrying capacity of Leh at 566 visitors per day day. A study by Sethi & Lele, 2019 estimates the carrying capacity of Pangong Tso Lake at 871 visitors per day and 174 vehicles. However, in reality the lake witnesses 1500 people and 300 vehicles per day in peak tourism season which is 630 people more per day than the effective carrying capacity (Sethi & Lele, 2019). The unsustainable tourism is burdening the fragile environment and effective management strategies must be put in place in order ensure longevity of the landscape. Furthermore, these management strategies require the equal participation from the local communities, agencies and the government for their appropriate impact. There is a critical need to conduct carrying capacity studies for all the sites, which see considerable tourist influx.

### 2.2.13 Stakeholder and Institutional Analysis

Stakeholder analysis identifies the stakeholders and maps out their relative power, influence and interests in a certain domain or with regards to a specific initiative and identifies the role and action arena of each stakeholder (Morgan & Taschereau, 1996; Brugha & Varvasovszky, 2000; Aligica, 2006). The stakeholder mapping for the management plan of Changthang landscape aims to identify individuals, groups or institutions that will be involved in making the plan, implementing the activities and be directly impacted by it. Stakeholder mapping includes individuals or intermediaries who may play a supporting or a limiting role in the setup and operation in the landscape area.

The project team has followed established stakeholder mapping techniques to classify relevant stakeholders under different categories in the Changthang landscape. Identification and mapping of all stakeholders has been done

through the preliminary inception workshop, thorough secondary literature review and stakeholder consultations during field visits. The level of influence of each stakeholder has been mapped across four categories—veto players, key actors, primary stakeholders and secondary stakeholders (Stave, 2017). These categories are described below:

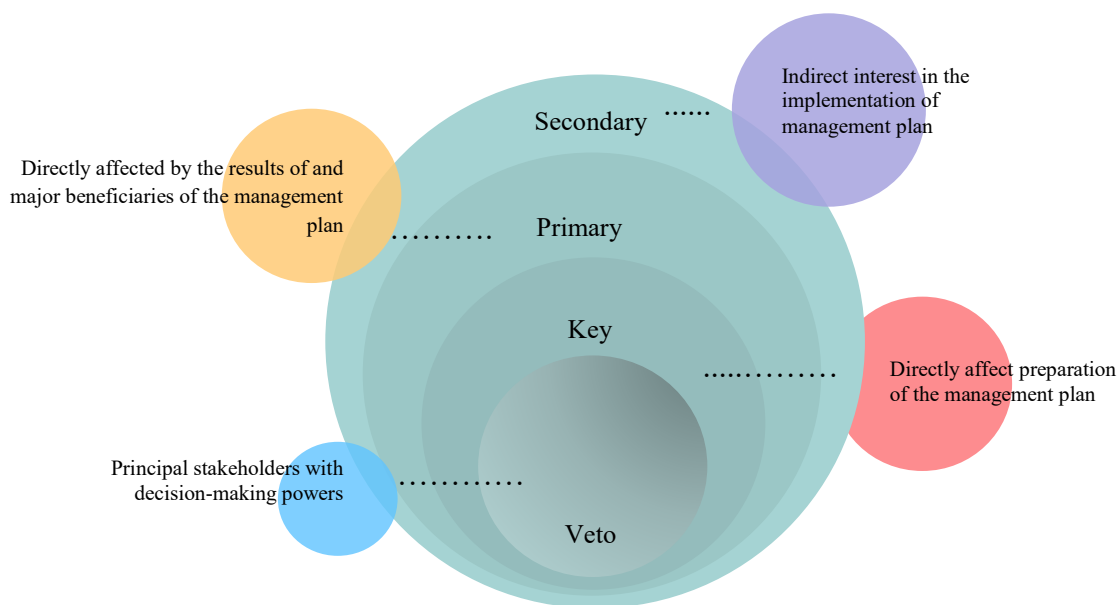
**Veto Stakeholders:** Stakeholders with decision-making powers who have a direct impact on the landscape management activity in question, with authority to direct the momentum of the project.

**Key Stakeholders:** Directly affects demand/supply scenario of forest resources or have a strong influence on forestry project activities

**Primary Stakeholders:** Stakeholders that directly affect the preparation of management plans or have a strong influence on it. They contribute significantly through their direct participation in the management activities throughout the design and implementation of the LMP. These stakeholders can be affected by the results of the management plan or are influenced by it directly.

**Secondary Stakeholders:** Secondary stakeholders are temporarily involved or have indirect interest in the actual landscape management and the plan activities. They may contribute in planning and implementation of the landscape management plan directly through provisions of various resources. Their actions may have an impact on the program. They might be even involved in different areas such as research activities, capacity building and trainings and other forestry extension activities for sustaining the landscape management plan interventions.

The categories of stakeholders is represented in the diagram below (Figure 40). The innermost circle is the core and each subsequent circle is dependent upon the circle inside it. This diagram represents how the different stakeholders may interact and influence each other management plan.



**Figure 39 Stakeholder Categorisation**

A number of government departments are involved in the process of making the management plan and that shall implement activities recommended in the management strategies. The 10 major government line department involved in the landscape are described below:

*Table 20 Stakeholders—Government Line Departments*

S No.	Government Department	Scope of work
1	Agriculture Department	<ol style="list-style-type: none"> <li>1. Increase agriculture production</li> <li>2. Research and provision of new agricultural techniques and methodologies.</li> <li>3. Promotion of organic farming.</li> <li>4. Promotion of improved seeds.</li> <li>5. Promotion of new irrigation techniques, such as sprinkler and drip irrigation</li> <li>6. Raising fodder species.</li> </ol>
2	Animal and Sheep Husbandry Department	<ol style="list-style-type: none"> <li>1. Protection of animal health</li> <li>2. Conservation of livestock resources and promotion animal products.</li> <li>3. Improvement off livestock for milk production.</li> <li>4. Development of pastures for grazing</li> <li>5. Sterilization of feral dogs.</li> </ol>
3	Department of Tourism	<ol style="list-style-type: none"> <li>1. Promotion and diversification of tourism activities.</li> <li>2. Promotion of sustainable tourism.</li> <li>3. Management of unregulated tourism.</li> </ol>
4	Department of Wildlife Protection	<ol style="list-style-type: none"> <li>1. Improvement of wildlife habitats.</li> <li>2. Protection and conservation of species,</li> <li>3. Management of conflict scenarios.</li> </ol>
5	Forest Department	<ol style="list-style-type: none"> <li>1. Afforestation of degraded areas.</li> <li>2. Reforestation of medicinal herbs/shrubs.</li> <li>3. Afforestation, Enrichment to substitute fuel and fodder.</li> </ol>
6	Handloom and Handicrafts Department	<ol style="list-style-type: none"> <li>1. Promotion of handloom and handicraft industry.</li> <li>2. Promotion of Pashmina and Yak wool products.</li> <li>3. Maximize income opportunities for local people involved in handicrafts and handlooms.</li> <li>4. Skill development.</li> </ol>
7	Horticulture Department	<ol style="list-style-type: none"> <li>1. Expansion of area under horticulture crops.</li> <li>2. Distribution and promotion of apple and apricots.</li> <li>3. Promotion of cultivation of seabuck thorn.</li> <li>4. Promotion of greenhouses/ polyhouses</li> </ol>
8	Irrigation and Flood Control Department	<ol style="list-style-type: none"> <li>1. Management of water resources.</li> <li>2. Overall planning, policy formulation, coordination and guidance in the water resources sector.</li> <li>3. Technical guidance, scrutiny, clearance and monitoring of the irrigation, flood control and multi-purpose projects.</li> <li>4. General infrastructural, technical and research support for development.</li> <li>5. Overall policy formulation and planning.</li> </ol>



S No.	Government Department	Scope of work
		6. Administration and monitoring of the Centrally Sponsored Schemes and promotion of Participatory Irrigation Management.
9	Rural Development Department	<ol style="list-style-type: none"> <li>1. Providing livelihood opportunities to those in need including women and other vulnerable sections with focus on Below Poverty Line (BPL) households.</li> <li>2. Providing for the enhancement of livelihood security of households in rural areas by providing at least 100 days of guaranteed wage employment in every financial year to every household demanding it/</li> <li>3. Capacity development and training of rural development functionaries.</li> <li>4. Promoting involvement of voluntary agencies and individuals for rural development.</li> <li>5. Restoring lost or depleted productivity of the land through watershed development programmes and initiating effective land reform measures.</li> </ol>

Additionally, a few other government institutions, local NGOs and organisations are directly or indirectly involved in the preparation and implementation of the management plan. They are involved in research and engage thoroughly with the local communities. The table below provides a list of such organisations.

*Table 21 Stakeholders— Local NGOs, Private Organisations and Other Government Institutions*

S No.	Local NGOs, Private Organisations and other Government Institutions	Scope of work
1	Defence Institute of High-Altitude Research (DIHAR)	Research and development in cold arid agro-animal technologies to enhance the agro-animal productivity and availability of fresh foods in Ladakh
2	National Institute of Sowa Rigpa	Fundamental and clinical research on various therapies and formularies of Sowa-Rigpa system of medicine, revalidate Sowa-Rigpa with scientific tools and parameters, explore and document herbal and mineral resources of Himalayas, develop and strengthen Sowa-Rigpa practice for public health and conservation and cultivation of Himalayan medicinal plants.
3	NCF	Promotion of science-based and socially responsible wildlife conservation.
4	Snow Leopard Conservancy- India Trust	Promotion of innovative community-based stewardship of the endangered snow leopard, its prey and habitat to the benefit of local people and the environment in the trans-Himalayan regions of Ladakh

S No.	Local NGOs, Private Organisations and other Government Institutions	Scope of work
5	Wildlife Conservation and Birds Club of Ladakh	Local community-based organization, involved real in sustain these conservation programs but creating awareness and enlightening the target communities who are in direct conflict with the wildlife of the region.
6	WWF-India, Leh Office	Promotion of nature conservation and environmental protection as the basis for sustainable and equitable development

Figure 40 provides a snapshot of the stakeholders involved and their interaction in terms of the landscape management plan.

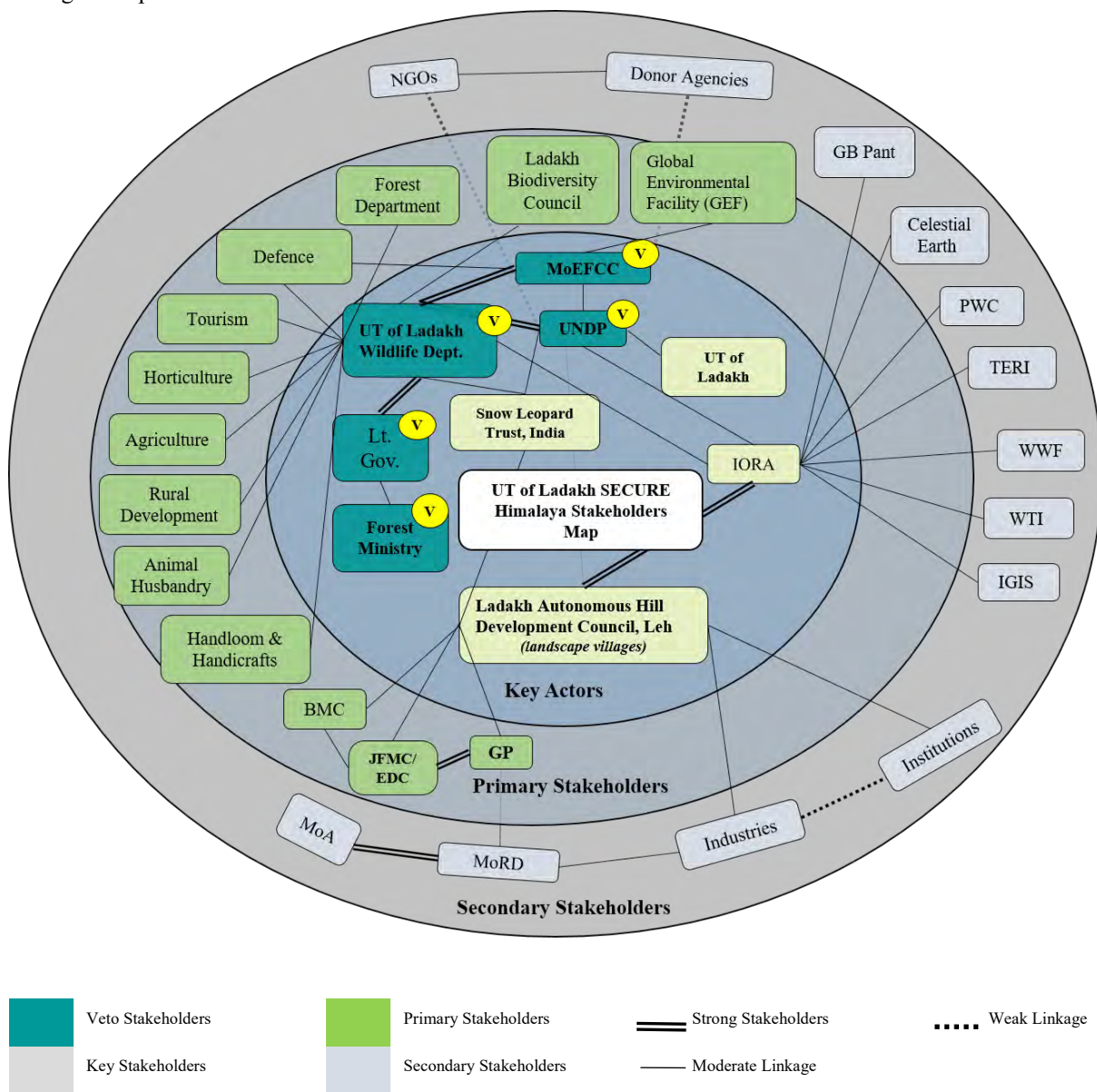


Figure 40 Stakeholder Map

As part of the SECURE Himalaya project, multiple agencies and organisations were awarded with specific projects. The following table provides a list of those agencies and the assignments that were awarded to them. These agencies are also important stakeholders as their research allowed to produce effective monitoring and evaluating indicators and contributed significantly to the management plan.

*Table 22 Agencies Working on SECURE Himalaya Project*

<b>S No.</b>	<b>Organisations</b>	<b>Assignment Awarded</b>
1	Celestial Earth	Updating State Biodiversity Strategy and Action Plans and Assessment of biodiversity and Ecosystem Services
2	GB Pant	Detailed assessment of medicinal and aromatic plants
3	IGIS Dehradun	Preparation of Land Use Maps, Vegetation Cover and biodiversity status report of the landscape
4	IORA Ecological Solutions Pvt. Ltd.	Preparation of participatory integrated landscape level management strategy and plans by defining the extent of the landscape (alpine and sub alpine) and evaluating landscape level existing strategies under GoI-UNDP-GEF SECURE Himalaya Project in Union Territory of Ladakh
5	PwC	Financial Inclusion for Changthang Landscape
6	TERI	Scope of Tourism at Changthang Landscape
7	WTI	Strengthening Wildlife Enforcement mechanism and mitigation of wildlife crime and illegal trade
8	WWF-India	Designing Comprehensive Human-Wildlife Conflict Management Strategy Identifying, assessing, delineating and mapping areas with High Conservation Values (HCVs) and developing a management plan for them in Changthang landscape in Leh district of Jammu and Kashmir, India. Developing a model management planning for high altitude wetlands

## 2.3 Review of Existing Schemes and Policies

Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
<b>Biodiversity Conservation</b>					
Project Snow Leopard (PSL)	The project mandates the facilitation of a landscape-level approach to wildlife conservation by rationalizing the existing protected area (PA) network and areas outside it. Further, conservation programmes for endangered species like snow leopard (SL) and its prey, restoration of degraded landscapes in the Himalayan region, promotion of knowledge based adaptive framework for wildlife management and human-wildlife conflicts, local capacity building, education and awareness to ensure ecologically responsible development is also directed.	Promotion of ecotourism (Rashid, 2010)	Ministry of Environment Forests and Climate Change		<p>Conservation of Snow leopard, associates carnivores and prey species as well as their habitat.</p> <p>Management of human-wildlife conflicts scenarios.</p> <p>Capacity building and awareness in the wildlife sector.</p> <p>Promotion of sustainability and eco-tourism.</p>
National Snow Leopard and Ecosystem Protection (NSLEP) Priorities.	The policy mandates the inventorisation and assessment of the status of habitat and the species, preparation of		Ministry of Environment Forests and Climate Change		Conservation of Snow leopard, associates carnivores and prey



Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
	<p>management plan for representative landscape identified in each state such that it includes, engagement of local communities for reducing Human-Wildlife Conflict, capacity building of stakeholders and scope of transboundary management and enforcement.</p>				<p>species as well as their habitat.</p> <p>Management of human-wildlife conflicts scenarios.</p> <p>Transboundary conservation mechanisms.</p>
<p>Global Snow Leopard and Ecosystem Conservation Program (GSLEP)</p>	<p>The policy mandates conservation of snow leopards through creation of sustainable local livelihoods, restricted access to critical snow leopard habitats and identification of corridors that link protected areas. Strengthening transboundary enforcement of laws for illegal wildlife trade, promotion of wildlife-friendly design and mitigation tools for development projects, intensification of scientific research for wildlife conservation,</p>	<p>Snow Leopard Population Assessment (SLPAI) will be done in Indian snow leopard corridor states (PIB, 2019).</p>	<p>Intergovernmental alliance of 12 snow leopard range countries</p>		<p>Conservation of Snow leopard, associates carnivores and prey species as well as their habitat.</p> <p>Management of human-wildlife conflicts scenarios.</p> <p>Transboundary conservation mechanisms.</p>

Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
	is also mandated under this program.				
Ladakh Sub State Biodiversity Strategy & Action Plan(BSAP) under National BSAP	The plan mandates the improvement of biodiversity knowledge base (characteristics, status, current and threats) by involvement of academia, government, NGOs and local communities. It further mandates sustainable use of wild plants, conservation of indigenous crops & breeds, community conserved areas, protected areas and local ecology through Eco Tourism.		UNDP, Global Environment Facility, MoEFCC		Improvement in knowledge and data for biodiversity conservation.  Promotion of sustainability and eco-tourism.
<b>Agriculture and Horticulture</b>					
National Mission for a Green India	The mission mandates the plantation of fuelwood and fodder varieties in fallow fields, habitat improvement activities, management of tourism / pilgrimage, maintenance of nature		Wildlife Department/Ministry of Environment Forests and Climate Change	430 crore (nationally) (Lok Sabha Secretariat, 2018)	Plantation of fodder species for livestock and promotion of stall feeding.

Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
	trails, establishment of medicinal plant conservation areas through concerted and participatory efforts by multiple stakeholders (local communities, government, industry etc.)				
National Mission on Sea buckthorn (under Mission for Integrated Development of Horticulture)	The mission mandates the creation of 'National Consortium of Sea buckthorn' for promoting R&D about sea buckthorn at national level. It further mandates a joint effort by multiple stakeholders (researchers, academicians, self-help groups and government) for increasing the area under sea buckthorn to 50,000 hectares of land by 2020 under phase one in four districts of Leh, Kargil, Kinnour and Lahoul & Spiti.	Study conducted on value chain analysis of Sea buckthorn ( <i>Hippophae Rhamnoides L.</i> ) In Leh Ladakh ( Stobdan and Phunchok, 2017)	Ministry of Agriculture and Farmer Welfare	25 crore (nationally) (MOEFCC, 2010)	Promotion of cultivation of sea buckthorn.  Livelihood enhancement through sea buckthorn's products.
National Mission for Sustaining the Himalayan Ecosystem (NMSHE)	The mission mandates the scientific assessment of the vulnerability of the Himalayan region due to climate change in physical, biological and sociocultural context through	Training on crop diversification and quality fruit production was organized	Department of Science and Technology, Government of India	150.24 crore (nationally) (Lok Sabha Secretariat, 2018)	Research and development in high altitude areas.

Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
	networking and cooperation with research institutions nationally and internationally. Capacity building at the central and state levels to formulate adequate policy based response measures and time bound action programmes to address the challenges in the Himalayan region is also mandated in the mission.				Policy recommendations and actions to address issues in the landscape.
Prime Minister's Development Package (PMDP) under Mission for Integrated Development of Horticulture (MIDH)	The program mandates the adoption of a value chain oriented approach for boosting horticulture. This will include the procurement of high-quality planting materials and rootstocks, rejuvenation of old orchards for grading, sorting, packing, cold storage and processing along with promotion of latest technology for increasing per plant produce (like high-density planting, integrated nutrient management systems), establishment of solar or hybrid operated cold storage facilities.	Integrated development of tourist facilities at Baramulla-Kupwara-Leh, small hydro projects of 25 MW (Igo- Upshi, Nimu-Chilling, Durbuk-Shyok-Drass, Trisha-Thoise) and 15 MW Upshi in Leh District, 20 MW (at Mangdum-Sang Brakoo-Thunia Sankoo) (Economic Survey, 2017)	Ministry of Agriculture and Farmer Welfare	39.67 crores (Ladakh) (PIB, 2019)	Promotion and cultivation of horticulture species as an alternate livelihood option.



Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
	Besides this, tourism and transport development in these areas is also promoted under the package.				
<b>Animal Husbandry and Handlooms</b>					
Pashmina Wool Development Scheme (PWDS)	The scheme mandates achieving efficient harvesting of pashmina, through setting up of buck exchange programme, enhancing foundation stock in new areas and provision of health coverage, feed supplement, portable tents, snow-boots, torch goggles, tents, improved combs, financial assistance for overhead expenses. Further, strengthening of existing fodder banks/farms and pashmina goat breeding farms along with establishment of, multipurpose extension centre (MPEC) and pasture farms on migratory routes is mandated. Lastly breeder orientation training, R&D/ consultancy is mandated for qualitative and quantitative	Installation of Pashmina Dehairing Plant at Leh, Distribution of 459 Pashmina bucks and feed supplement, establishment of 39 mini pashmina farms (50 pashmina goats each) and 420 Pashmina goat pens, 3 pasture farms on migratory routes. Provision of 775 portable tents, gumboots, goggles, etc., strengthened 3 breeding & 3 fodder banks/farms (PIB, 2017)	Central Wool Development Board	41.21 crore (Ladakh) (Central Wool Development Board, 2015)	Support in Pashmina wool development. Strengthening of existing fodder banks/farms and pashmina goat breeding farms. Capacity building and training on qualitative and quantitative improvement in pashmina wool.

Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
	improvement in wool production subsequently.				
“Risk Management & Insurance” (sub-mission on livestock development of National Livestock Mission)	The mission mandates the provision of subsidy restricted to 5 animals per beneficiary per household. This is applicable for all animals except sheep, goat, pig and rabbit. In case of sheep, goat, pig and rabbit the benefit of subsidy is to be restricted based on “Cattle Unit” (1e cattle unit = 10 animals i.e. for sheep, goat, pig and rabbit). Therefore, the benefit of subsidy to sheep, goat, pig and rabbit is to be restricted to 5 “Cattle Unit” per beneficiary per house hold. If a beneficiary has less than 5 animals / 1 Cattle Unit can also avail the benefit of subsidy.		Ministry of Animal Husbandry, Dairying and Fisheries		Compensation against loss of livestock.
Pashmina Promotion Programme (P-3)	The scheme mandates creation of common pashmina facilitation centre for wool testing, disease surveillance centre, geographic information system (GIS) lab,	Provision of grants for pashmina dehairing plant at Skalzangling, Leh and machineries required for scouring, drying, and boiler	Ministry of Textiles	30 crore (Ladakh) (PIB, 2019)	Quality check centres for Pashmina wool at pashmina facilitation centre.

Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
	shelters for nomads and additional distribution of portable electric units for handloom spinning/weaving, foundation stock (male & female goats) to farmers. It further specifies construction of shelter for housing of pashmina animals, solarised community centres and development of fodder grounds for grazing of pashmina goats.	along with construction of building for installation of these machineries at Leh (PIB, 2014)			Aids of herders and shepherds during harsh weathers.
Handloom Weavers Comprehensive Welfare Scheme(HWCWS)	The scheme mandates providing life insurance to handloom weavers/workers under Pradhan Mantri Jivan Jyoti Bima Yojana(PMJJBY) and both accidental and disability insurance coverage to those of age 18-50 years under Pradhan Mantri Suraksha Bima Yojana(PMSBY) and converged Mahatma Gandhi Bunkar Bima Yojana(MGBBY) for those of age between 51-59 years.		Ministry of Textiles	63.55 crore (nationally) (PIB, 2019)	Life insurance of handloom weavers and workers.

Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
<b>Rural Development</b>					
Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)	The act mandates provision of at least 100 days of guaranteed wage employment for voluntary unskilled manual labour in every financial year, to ensure livelihoods security in rural areas.	37000 beneficiaries in Ladakh (Mahatma Gandhi National Rural Employment Guarantee Act, 2020)	Ministry of Rural Development	71002 crore (nationally) (Outlay on Major Schemes)	Providing employment to villagers with scare livelihood sources.
Scheme for Capacity Building in Textiles Sector (SCBTS) (extension of Integrated Skill Development Scheme (ISDS))	The scheme mandates addresses the skilling needs of textile and related segments, with the help of existing institution for trainings and capacity building, through basic training, skill upgradation, advanced training, training of trainers and entrepreneurship development. The scheme proposes PPP model wherein the government meets 75% of total cost and the balance 25% is met from fee/ industry contribution.	Training centre in Leh	Ministry of Textiles	1300 crore (nationally) (PIB, 2017)	Capacity building and training to weavers and handloom workers.
Swachh Bharat Mission(SBM)	The mission mandates modern and scientific municipal solid waste management, by promoting	Leh has been declared as Open defecation free city (Leh becomes open	Ministry of Housing and Urban Affairs	9638 crores (nationally)	Promotion of proper waste management



Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
	<p>behavioural change through awareness campaigns about sanitation and its linkage with public health, to ultimately end open defecation and manual scavenging practices. The mandate further includes capacity augmentation for ULB's and creation of enabling environment for private sector participation in Capex (capital expenditure) and Opex (operation and maintenance) to ensure sustainable waste management and sanitation practices.</p>	<p>defecation free, is already 100th cleanest city of India, 2017)</p>			<p>activities in the landscape.</p>
<p>Border Area Development Program (BADP)</p>	<p>The program mandates the provision of required infrastructural facilities (participatory identified) and economic opportunities to communities residing in remote and difficult regions near the international border, to create a sense of security and well-being among them.</p>	<p>Construction of community centres and toilets, sports ground, motorable roads, playgrounds, medical centre, soil and water conservation works.</p>	<p>Ministry Of Home Affairs</p>	<p>78.4 crores for all neighbouring areas alongside China border (Singh, 2020)</p>	<p>Provision of better facilities in the border areas villages.</p>

Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
Members of Parliament Local Area Development Scheme (MPLADS)	The Scheme facilitates Members of Parliament (MPs) to recommend development-related works, based on the local needs of their constituencies, like creation of durable community assets of national priority such as drinking water, primary education, public health, sanitation and roads etc.	Creation and renovation of irrigation facilities, construction of community centres, toilets, roads and pathways etc. in Leh district	Ministry of Statistics and Programme Implementation.	25 crores (Amrut, 2017)	Provision of basic services like drinking water, education and health.
<b>Water Conservation</b>					
Jal Jeevan Mission (JJM)	The policy mandates the development of in-village piped water supply and bulk water transfer infrastructure, new/existing reliable drinking water sources, treatment plants and distribution network, technological interventions (for water purification and contaminant removal). It further mandates management of greywater along with retrofitting of completed and ongoing schemes to provide Functional Household Tap Connection (FHTCs), Capacity	1,437 out of 33,965 individual's household with PWS connections in Ladakh (Jal Jeevan Mission, n.d.)	Ministry of Jal Shakti	11,500 crore (Jal Jeevan Mission to get ₹11,500 crore, 2020)	Provision of water for various needs in villages.  Capacity building and trainings in effective water management techniques.

Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
	building of communities and other stakeholders, and supporting R&D.				
<b>Energy Initiatives</b>					
Prime Minister's Ladakh Renewable Energy Initiative (LREI).	The scheme mandates the setup of small/micro hydel and solar photovoltaic power projects in Ladakh and additionally 10 solar photovoltaic power plants in defence establishments. It also mandates provision of green houses, solar thermal system for water heating (SWH) / space heating and cooking requirements.	Set up of 1.5 MW small hydro power Plant in Biaras Drass, Kargil and 5 kw Pico-Hydro project at Khungru, provision of 2850 dish solar cooker (DSC), 15 steam cooking system, 5500 commercial green house, 400 solar water heating system and 500 dryers were provided in Leh and Kargil district (PIB, 2017).	Ministry of New and Renewable Energy	266.8 crores(Ladakh)	Provision of electricity and different heating systems to rural households.
Remote Village Electrification Programme (RVEP)	The scheme mandates the provision of financial support for lighting/basic electrification, through Renewable Energy (RE) sources in distributed power generation mode, to those unelectrified villages and hamlets	39 remote villages in Leh district and 18 villages and 27 hamlets of Kargil district, were electrified (Bhushan, 2012).	Ministry of New and Renewable Energy	64.32 crore (Jammu and Kashmir during 2007-14) (Remote Village Electrification, 2015)	Provision of electricity and different heating systems to rural households.

Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
	that are located remotely from the grid.				
Jawaharlal Nehru National Solar Mission (JNNSM)	The mission mandates a Renewable Purchase Obligation (RPO) under which power generation utilities need to have a solar power generation component. It further mandates promotion of solar heating systems by certification, upgradation, and mandatory installation in National Building Code. It also specifies provision of solar lights to poor households at subsidized rates and set up of stand-alone rural solar power plants in Ladakh. It further mandates innovation, expansion, dissemination of manufacturing capabilities and setup of a solar research council to oversee the strategy for current and future solar projects in India.		Ministry of New and Renewable Energy (MNRE)	12879.64 crores (nationally) (Lok Sabha Secretariat, 2018)	Provision of solar energy for running different systems.
New National Biogas & Organic Manure Management	The scheme mandates promotion of indigenously developed biogas plants by provision of financial		Ministry of New and Renewable Energy (MNRE)	142 crores (nationally) (PIB, 2016)	Setting up of biogas plants in landscape villages.

Name of the scheme	Mandate	Work done in Ladakh	Sponsor	Funding (INR)	Relevance to the project
Programme (NNBOMMP)	incentives such as central government subsidy to users, turn key job fee to entrepreneurs, service charges to state nodal departments / agencies. The mandate also includes the provision of financial assistance through loans by commercial and co-operative banks for setting up of biogas plants in priority agricultural areas.				



## Chapter 3 Threats and Opportunities

As earlier discussed in the document, especially in Chapter 2, the landscape of Changthang is unique in that the landscape is vast and has wildlife spread across almost across its entirety, which is tremendous. However, this boon comes with high human interface. This Plan recognizes that it needs to be proactive in maintaining wildlife across the landscape, but simultaneously address local needs and especially address conflicts that may arise between people and wildlife.



From the stakeholder consultations, key informant interviews and thorough literature review, there were considerable issues and threats that were identified to the landscape —the biodiversity and the livelihoods of the communities residing in the landscape. The identified threats and issues are discussed in this section.

As mentioned in section 1.3, the issues were identified and placed into seven sectors for ease in identification and discussion—

1. Wildlife, Forestry and Environment
2. Animal Husbandry and Sheep Husbandry
3. Agriculture and Horticulture
4. Tourism
5. Rural Development
6. Socio-Culture
7. Water

### 3.1 Sector-wise Threats Identified

The sector wise threats and issues are mention in the table below.

*Table 23 Sector-wise Threats Identified*

Sector	S. No	Issues and Threats
Wildlife, Forestry and Environment	1	Lack of information and wildlife and vegetation
	2	Inadequate mapping of wildlife
	3	Feral dogs
	4	Human wildlife conflict in terms of livestock and crop depredation

Sector	S. No	Issues and Threats
	5	Solid waste management
	6	Climate change
	7	Habitat degradation
Animal Husbandry and Sheep Husbandry	1	Non-existent value addition of animal products
	2	Livestock depredation/Livestock compensation
	3	Feral dogs
	4	Pastureland degradation
	5	Lack of convergence between the departments in the landscape
	6	Lack of capacity building and skill development
Agriculture and Horticulture	1	Water Management
	2	Loss of Indigenous Species
	3	Capacity building
	4	Lack of techniques and data on MAPs
Tourism	1	Unsustainable tourism
	2	Waste management
	3	Less tourism opportunities
	4	Lack of capacity building and skill development
	5	Education and awareness
Rural Development	1	Lack of infrastructure
	2	Network connectivity
	3	Loss of traditional practices
Socio cultural	1	Migration
	2	Loss of traditional knowledge and practices
	3	Shift to western style
Water	1	Depleting glaciers
	2	Sand mining
	3	Wetland degradation
	4	Groundwater contamination

Many threats are overlapping across sectors. These have been combined and ranked during the stakeholder consultation held (as described in Section 1.3). The detailed ranking and scoring is given in Annexure 11. The results of the ranking are presented as follows.

*Table 24 Ranking of Threats (Margoluis & Salafsky, 2001)*

S. No.	Issues and Threats	Final Ranking
1	Lack of awareness/information on PA boundary	1
2	Feral dog	2
3	Human wildlife conflict	3

S. No.	Issues and Threats	Final Ranking
4	Unregulated tourism	4
5	Habitat degradation-pastureland and wetlands	5
6	Lack of convergence between departments	6
7	Solid waste management	7
8	Lack of value addition	8
9	Lack of capacity building and skill development	9
10	Lack of infrastructure	10
11	Education and awareness	11
12	Lack of information and wildlife and vegetation	12
13	Loss of traditional practices/Migration	13
14	Illegal wildlife trade	14

## 3.2 Details of Issues and Threats of Changthang Landscape

### 3.2.1 Lack of Awareness/Information on PA Boundary

Across the Changthang landscape, local communities and wildlife have shared a space for millennia (Mishra et al. 2016), with scores of multiple use areas spread across the vast area. Unlike other terrestrial landscapes where wildlife is usually restricted inside the boundary of the protected areas, the Changthang landscape is unique in that people and wildlife share the landscapes and wildlife occurs across the landscapes. However, this is now leading to considerable conflict with the wildlife as well as hindering enhancement of local livelihoods due to restrictions within the PA. Additionally there is also the issue of the lack of clarity with the inhabitants and the visitors regarding the PA boundary and sometimes even the existence of it.

### 3.2.2 Feral Dogs

The array of problems caused by free-ranging and feral dogs is the most pressing issue that concerns wildlife, community and their interactions currently in Changthang. The dogs have been reported to have conflict with several other wildlife in the area— Eurasian otter, Tibetan gazelle, Tibetan argali, Tibetan antelope, snow leopard, Tibetan wild ass and black-necked crane (Anoop & Hussain, 2004; Bhatnagar et al., 2007; Chandan et al., 2014; Jamwal et al., 2016; Kruuk, 2006; Namgail, 2004; Naoroji & Sangha, 2011; Watts et al., 2019).

The existing problem with free-ranging and feral dogs may be attributed to the three intertwined reasons as per WWF-India (WWF-India, 2020).

- The primary cause has been found to be the dumping of unconsumed wet ration around the army camps in the landscape, which have led to the presence of dogs in the vicinity. Additionally, army personnel feeding these dogs out of humane values may also be partially responsible for increasing numbers of dogs around armed forces camps. These dogs are often colloquially referred to as sipa-khee, or soldier-dogs.
- Food waste from restaurants and hotels during the summer months that see a large influx of domestic and international tourists is another factor.
- Another reason attributing to the increase in feral dog population has been the guard or village dogs that get separated from or are abandoned by Changpa families and become free-ranging or feral.

The free-ranging and feral dogs are viewed as the biggest threat in most of the regions of Changthang. This was clear from the consultations and the key informant interviews held in the landscape and the inception workshop (Section 1.3). Along with being a threat to livestock, several incidents have been reported of dogs attacking and injuring humans (Gagné, 2019). Respondents mentioned incidents of humans being mauled to death on at least two separate occasions in the last two years across Ladakh.

### **3.2.3 Human Wildlife Conflict**

In Changthang landscape, anthropogenic activities such as agriculture, livestock grazing, and resource extraction overlap with the presence of wildlife, as discussed in the earlier sections. Unlike other terrestrial landscapes where wildlife is usually restricted inside the boundary of the protected areas, the Changthang landscape is unique in that people and wildlife share the landscapes and wildlife occurs across the landscapes. The wildlife occurrence in Changthang is ubiquitous as is the human dependence on the landscapes and use of these areas. This is saying even though populations of wildlife typically occur at lower population-densities outside the protected areas (Mishra et al., 2009).

Predation on domestic livestock by carnivores, agricultural crop damage by herbivores, a decline in pastureland available for livestock grazing due to resource competition with wild herbivores, and human injury or fatality are all instances that disrupt human livelihood sources. Faced with financial loss, threat to food security and mental well-being, communities can be compelled to respond against such wild animals by killing them, which in turn adversely affects wildlife populations and has conservation implications. Such situations have been termed as 'human-wildlife conflicts' (Bagchi & Mishra, 2006; Barua et al., 2013; Bhatnagar et al., 2006; Mishra et al., 2009; Redpath et al., 2015).

In Changthang, in terms of human wildlife conflict, livestock depredation and crop depredation are most prevalent. According to a study by WWF-India, 2020 the Himalayan wolf was reported to be the most prominent livestock predator, as reported by 56.67% of respondents during the study. Feraal dog were also reported to be responsible for livestock predation (35.67%). However, snow leopard were the least reported in terms of livestock predation.

In terms of crop depredation, bharaal was reported to be the most frequent as reported by 48.39% of the respondents while the Kiang was reported to be responsible for pasture loss as well as crop depredation by 38.71% of respondents. Case of crop loss by dogs (9.68%) and bar-headed goose (3.23%) were also reported (WWF-India, 2020).

Temporally, wolves and feral dogs were reported in terms of conflict throughout the year, mostly during the daytime considering most of the attacks on livestock happen in the pasturelands where the livestock are taken for grazing more or less. On the other hand, since feral dogs live in the vicinity of and have access to community settlements throughout the year, the conflict encounter for dogs is reported to be high through the morning to evening (although lesser at night).

For crop-raiding species like bharaal, the frequency of encounter was restricted to the cropping and harvesting season from May to August and the conflict encounters were limited to the daytime, which can be explained by the diurnal behaviour of the species. However, for kiang, although the conflict encounters were highest during the harvest season, encounters were also reported during other seasons all through the year (WWF-India, 2020).

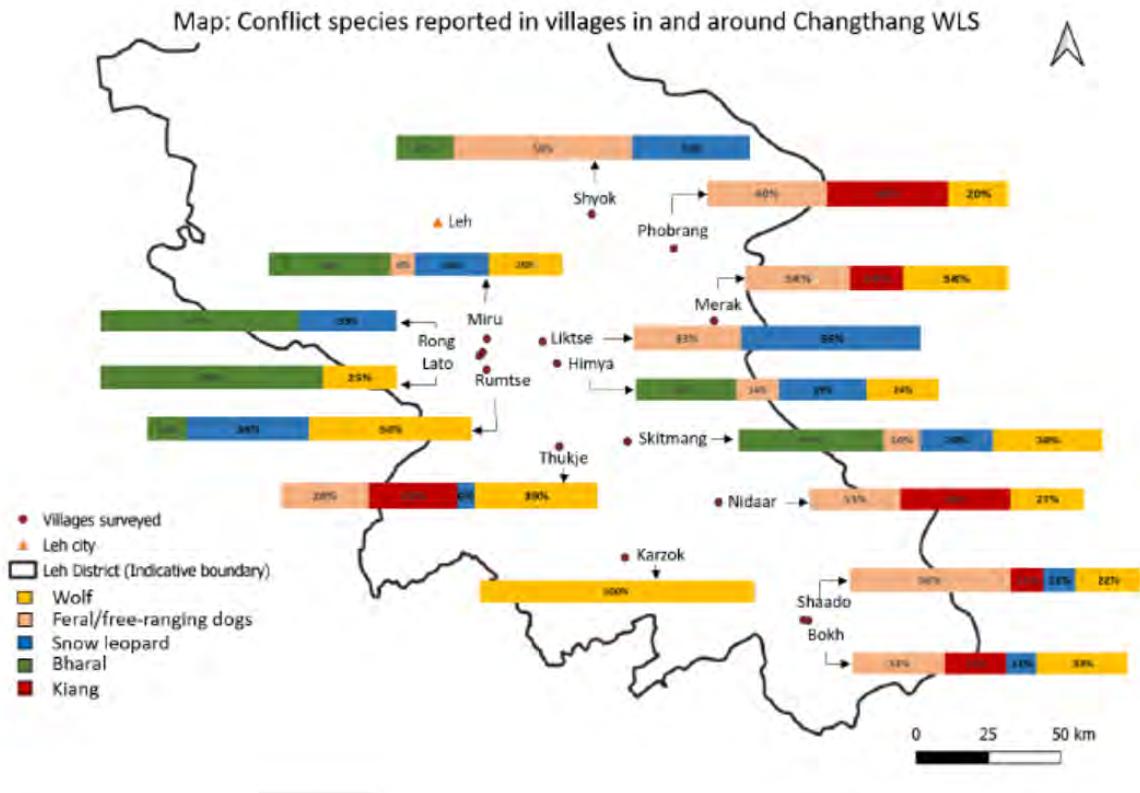


Figure 41 Spatial Representation of Human Wildlife Conflict in Changthang Landscape (WWF-India, 2020)

This could be because there are two types of loss and conflict that is attributed to the kiang—crop loss and pasture loss/grazing competition. Kiangs and livestock graze in conjunction with one another in pasturelands throughout the year. Conflict with Kiang in terms of pasture loss has been reported through the study by WWF-India as well as the consultations and key informant interviews conducted (Section 1.3). Surprisingly, Kiang also had the highest reported frequency of conflict encounters for crop loss during the nighttime (WWF-India, 2020).

In these conflict areas, there is also the case of and the threat of zoonosis. In areas where there is grazing competition between livestock and wild ungulates, there is a chance of transmission of diseases like foot and mouth disease, which may be detrimental for the wild population.

### 3.2.4 Unregulated and Unsustainable Tourism

Due to a sudden growth of tourism in Ladakh, the magnitude of anthropogenic pressure has escalated beyond the natural coping capacity with issues like over-extraction of ground water, enhanced quantity of solid and liquid waste generated, becoming prominent. One of the issues with the emergent tourism in the Changthang landscape is the impact on local flora and fauna and the natural habitat such as Tsokar lake, an important breeding site for the vulnerable Black-necked crane (*Grus nigricollis*) (Bird Life International, 2017). Unfortunately, in Ladakh, the breeding season for several birds and mammals—the summer—coincides with the peak tourism season in the landscape. This brings in visitors to these fragile and biodiverse habitats, who are mostly not aware of the presence of wildlife or even the presence of a protected area. With no fencing and little or no signage, visitors have been



observed walking to the wetlands, trampling nests and habitats, in the process and disturbing all the breeding residents

According to Geneletti & Dawa 2009, off-roading is another issue that is posing a threat to the unique assemblage of flora and fauna species hosted by the wetlands of the area. This also comes with the problem of waste management and that in turn that of feral dogs. Therefore, this is posing to be far-reaching and interrelated issues within the landscape.

Though mountain tourism has become an important source of income, providing a significant contribution to the economic development of the region, it is posing a threat to the conservation of the Ladakh environment, due to the fragility of its ecosystems, as well as the lack of adequate infrastructure, policies and planning mechanisms. Hence, it is imperative to plan low footprint community-based tourism in order to avoid further degradation of the landscape. Wildlife-friendly fences around these sensitive breeding areas must be considered-this can keep off-roaders out while protecting these globally important areas. In addition, income distribution, resource utilisation and other tangible benefits to the local community is a matter of concern, which needs to be addressed. The changing lifestyle of its dwellers and growth of tourist infrastructure has resulted in the exploitation of the environment, and changes in social and cultural values.

Tourism is also impacting ground water levels and its quality. Geneletti & Dawa who conducted a comprehensive analysis of the impacts of tourism in some of the areas in Ladakh in 2009, clearly indicate that tourism is adversely impacting water in the Changthang region and mention that 'the lower part of Changthang wetlands are the areas more vulnerable to groundwater pollution.

### **3.2.5 Habitat Degradation**

Habitat degradation came up to be a major issue and a threat to the landscape of Changthang. Habitat degradation in Changthang has specifically been discussed in terms of wetland and rangeland degradation.

#### **Wetland Degradation**

The recent increase in the tourism activities and unplanned developmental activities in the region are putting adverse impacts on these very fragile and productive ecosystems. One of the characteristics of mountain tourism is high degree of seasonality, which tend to concentrate and enhance its adverse impacts on the environment. This is true for the high altitude wetlands in Ladakh where tourist access is essentially restricted to summer months, which is also the peak period of biological activity and breeding season for much of the fauna (Chandan et al. 2005). This may adversely affect the breeding success of the wetland birds, which use these wetlands as their breeding grounds. In the event of any catastrophic disturbance or habitat degradation and modification, the information generated through various scientific studies would help in conserving these important ecosystems.

Large number of vehicles in the Tsomoriri & Tsokar catchment and in fact in the entire Rupshu and Changthang are often plying outside of the designated road or tracks causing disturbance to wildlife, mortality of lizards and destroying the landscape and thereby decreasing the biodiversity and scenic values of the catchment. The tourist campsites do not have solid waste disposal and sanitation facilities. As a result, the breeding and feeding sites for biodiversity are getting severely affected (WWF-India, 2007).

## **Rangeland Degradation**

The border dispute between India and China in 1962 caused an influx of Tibetan refugees and loss of winter grazing areas, which lead to increased pressure on the rangeland in the Indian Changthang (Namgail et al. 2007). Less than 1% of the geographical area on the plateau is cultivated, and most of the vegetated zone is used by a migratory pastoral community known as the Changpa for livestock (goats, sheep, yaks, and horses) grazing (Adhikari & Rawat, 2006).

However, an increase in the livestock number, limited area for grazing, rapid increase in tourism, and related developmental activities have caused conflicts between herders, wildlife managers, and development agencies in the area (Adhikari & Rawat, 2006).

### **3.2.6 Lack of Convergence between Departments**

An issue that was discussed was the lack of convergence between various line departments present in the landscape. A majority of the issues identified within the landscapes fall across multiple sectors and are interrelated to each other. Thus, there is a dire need to build communication and convergence between the departments functioning within the landscape.

### **3.2.7 Solid Waste Management**

The landscape of Changthang is being crushed under the weight of non-biodegradable waste, particularly in the rural areas where there are no proper mechanisms to dispose of garbage. Due to the rough terrain and weather conditions, transporting large amounts of waste for proper disposal is unfeasible. As there was minimal waste before the tourism industry boomed, there is not much infrastructure in place for the amount of waste domestic and foreign visitors produce, in addition to locals in recent times.

The primary threat that the landscape faces is of waste management. In challenging landscapes like that of Ladakh, proper disposal of waste is often hard and even so in winters when transportation takes a hit as most of the roads are not motorable due to snow. Moreover, tourism boomed in Ladakh at an exponential rate and with not enough capacity to cater disposal of huge amounts of waste, hence the city as well its surrounding areas like that of the Changthang Wildlife Sanctuary are still trying to find solutions for it. The army camps present inside the sanctuary area also generates huge quantities of waste, which has also resulted in an increase in feral dog population. There is a dire need to educate and implement sustainable waste management activities in Ladakh with locals and tourists alike. The pilot project, Project Tsang-da is a one way forward for better disposal techniques but it lacks the inter department support it must have in order to reach out to the masses.

### **3.2.8 Value Addition of Animal Husbandry Products**

At present, most of what is sold from the yak are primary products, or close to primary. Therefore, the economy, benefits little from the added value that is accrued from processing, or from the manufacture of more sophisticated products. Yak fibre, one of the products, has high tensile strength, waterproof nature and capacity to prevent UV rays.

Yaks differ from other domestic cattle in that the hair is of economic use and importance. With the use of yak hair dating back to time yaks were first domesticated, the hair is considered a valuable item and has become

essential to the life of herder households. Since yak products are greatly underutilised in Changthang, there is a need to realise the value and marketability of yak products.

### **3.2.9 Lack of Capacity Building and Skill Development**

There is observed an overall lack of skill development and capacity building activities and efforts in the Changthang landscape across several sectors—wildlife protection, environment, tourism, animal husbandry, agriculture, rural development, etc.

The cross-sectoral training and capacity building needs are discussed in detail in Section 7.3.

### **3.2.10 Research Gap—Lack of Information on Wildlife and Vegetation**

The terrain of Changthang landscape make it is difficult to assess the exact information of many of the wildlife species found in the landscape.

Currently there are no exact estimates for the population of snow leopards, Eurasian lynx and Pallas's cat in the landscape. Neither is there much information known about the habitat use by such species especially of the smaller cats. Snow leopards are known to disperse between the adjoining countries of Pakistan and China but hardly any information is available on their dispersing pattern and wildlife corridors. Such information can only be gathered using radio telemetry.

There is a similar scenario with the population of wild ungulates in the landscape. Blue sheep, ibex, argali are found high up in the mountains and it is difficult to spot them. Assessing the wild population with respect to numbers/ density become even more difficult.

Much of the Changthang landscape or rather undiscovered/inaccessible due to rugged terrain and extreme weather. Therefore, the vegetation diversity is also not known fully. Vegetation only blooms for a very short period during the summers and proves difficult to catalog and study all the different species in such short time.

There is generally lack of data when it comes to landscape occupancy of wildlife and even vegetation. Many agencies are working on collection of baseline data for Ladakh but scaling the treacherous mountains, erratic precipitation and extreme weather conditions makes it difficult.

### **3.2.11 Loss of Traditional Practices/Outmigration**

Currently, throughout Ladakh, migrants are being drawn toward the district capital towards the prospect of “development”—where transport, health care and educational facilities have been focused. The nomadic community have also been subject to this trend. In spite of the great demand for livestock and livestock products (pashmina, meat), there are significant number of the population in Changthang leaving the highlands every year and joining the unskilled, casual labour force in the Indus valley with the prospect of city life and access to schools, medical facilities, electricity, etc. From the stakeholder consultations held in Leh, one of the primary reasons for outmigration was found to be that of the lack of basic infrastructure in harsh conditions in the landscape due to which a majority of the population migrate, seeking for comfort. This has reduced the mobile community in Changthang by more than 80 percent (Dollfus, 2013).

In addition, there has been a gradual demise of the institution of polyandry, with the vast majority of marriages

conforming to the monogamous pattern being practiced elsewhere in Ladakh. This also has a major negative impact on labor availability. In summer 2011, there were only 16 households left on the highlands of Kharnak. Recent policies designed to reverse the population flow and keep shepherds on the highlands to look after pashmina goats have been unsuccessful (Dollfus, 2013).

### 3.2.12 Illegal Wildlife Trade

WTI, 2020 conducted a study to determine the status of the illegal wildlife trade in the landscape. The results showed that the highest priority for the community for hunting was for meat. In terms of animal species, 37% of the respondents hunting for meat, 29% for horn and 19% for the skin. In the case of floral species, 70% prioritised collection of plant species followed by 9% for fodder and 8% for fuelwood.

The key species found to be preferred for hunting in Changthang landscape was found to be Blue sheep (*Pseudois nayaur*) (35% of responses), followed by (23%) Asiatic Ibex (*Capra sibirica*), (20%) Ladakh Urial (*Ovis aries vignei*) respectively (WTI, 2020).

The medicinal valuable plants identified that are traded are *Aconitum heterophyllum*, *Saussurea roylei*, *Inula racemosa*, *Rheum spiciforme*, *Rheum webbianum*, *Delphinium cashmerianum*, *Jurinea dolomiaea*, *Dactylorhiza hatagirea*, *Arnebia guttata*, *Bergenia stracheyi*, *Corydalis* and *Lagotis cashmeriana* etc.

The various method of hunting found to be used in the landscape is that of mass hunting, bow hunting, shooting and snaring. The highest priority of local people for hunting (73% responses) in winter season followed by (15%) in all season, (6%) in summer season, respectively.

The largest proportion (62%) of the respondents collects wildlife products while only a small percentage (4%) inform the enforcement agencies, illustrates the lack of coordination between enforcement agencies and local community in the region (WTI, 2020).

The places around Leh (Shey, Nang, Kharu, Matho, Yintse, Phyang, Sakti, Upshi, Ganglas, Gya, Meru, Runtse, Nyoma, Loomi, Hanle, Chumar, Koyul, korzok, Turtuk, Deskit, Dha, Domkhar, Panikhar, Sankoo, Lamayuru, Nimo, Gurudwara etc) are the hotspots for wildlife crime.

In terms of trade in fauna, it was found that the Tibetan Argali's horns were being collected by herders and were being sold at the rate of Rs. 5000 per horn. The Asiatic ibex's horn is presently much in demand in the Turtuk (Nubra valley) where the horn of the Ibex is modified into beautiful ornamental walking sticks and the black smiths are selling it at a price of Rs. 12,000 to 15,000 per stick per piece. Trade in musk, wild bird meat and feathers, wild ungulate animal meat and bear bile was also recorded.

In terms of trade of plant species, most medicinal plant species are rapidly harvested by the local people both for self-consumption (71%) and for commercial purposes (29%).

The key medicinal plants commonly in trade are *Aconitum heterophyllum*, *Aconitum violaceum*, *Aster flaccidus*, *Arnebia euchroma*, *Arnebia guttata*, *Bergenia stracheyi*, *Corydalis govaniana*, *Colchicum luteum*, *Ephedra gerardiana*, *Ferula joescheana*, *Meconopsis aculeate*, *Picrorhiza kurroo* *Saussurea roylei*, *Inula racemosa*, *Rheum spiciforme*, *Rhodoendron anthopogon*, *Rheum webbianum*, *Delphinium cashmerianum*, *Jurinea dolomiaea*, *Dactylorhiza hatagirea* and *Lagotis cashmeriana* etc.

## Part II

### Chapter 4 Management, Vision and Objectives for the Landscape

#### 4.1 Vision

*Key biodiversity areas in Changthang landscape that are critically important for the conservation of flora and fauna are harmoniously managed with the sustainable use of resources ensuring the well-being of the local communities balancing conservation with development and national security.*



To meet the vision, the following goals and objectives have been proposed. A goal broadly describes the desired result and what needs to be done to achieve the vision, while objectives are specific statements describing how each goal will be achieved. The goals mentioned below are interrelated but are stated separately in the management plan for the purpose of greater clarity in coming up subsequent activities and prescription.

#### 4.2 Goal and Objectives

##### **Goal 1 Habitat and ecosystem conservation is ensured in the Changthang landscape**

###### **Objectives:**

1. To ensure regular monitoring of the high altitude ecosystems
2. To set up measures to halt and reverse habitat degradation, especially of the rangelands,
3. To reduce human wildlife conflict, and
4. To build capacity of local staff and officers of the Wildlife Protection Department and other concerned departments on ecosystem conservation.

##### **Goal 2 Species conservation in the Changthang landscape**

###### **Objectives:**

1. To generate sound information for understanding RET species and their habitat based on both, scientific information and local knowledge,
2. To generate baselines for the wildlife population through periodic census and promote long term research and monitoring of endangered species and their habitat,
3. To undertake measures to mitigate threats posed by resource use by local communities in the area, using participatory approaches,
4. To initiate research for development of agronomic practices of the native medicinal plants and pasture species and



5. To set up targeted conservation awareness programmes for local people, visitors and tourists, government and non-governmental agencies.

### **Goal 3 Local livelihoods are improved maintaining ecological balance in the Changthang landscape**

#### **Objectives:**

1. To ensure sustainable/responsible tourism in the landscape,
2. To improve fodder availability nearby the villages during the lean period,
3. To reduce local peoples' dependency on the natural resources of the sanctuary and enhance enterprise based livelihood opportunities without changing the traditional and cultural values and seek further market linkages, and
4. To ensure skill development of the local youth on alternative livelihoods.

### **Goal 4 Balanced Development is ensured**

#### **Objectives:**

1. To undertake scientific and participatory measures for mitigating threats posed by developmental projects, including the need for protection,
2. To showcase the conservation efforts in the Indian trans-Himalaya and promote Changthang Cold Desert Wildlife Sanctuary as a global eco-tourism destination and thereby harness the support for conservation, and
3. To evolve a system of participatory conservation planning, sanctuary management and implementation.

## Chapter 5 Strategies, Zonation, Ranges and Theme Plans

### 5.1 Strategies



**1) Conserving biodiversity:** It is proposed to ensure the conservation of biodiversity through the landscape management plan. This will be achieved through strategies like protection of high conservation value areas, which will include a biannual census, building extensive databases, and training. Strategies for grassland management and strategies for management of wetlands, marshes and sedges are proposed. Strategies for habitat restoration are also

proposed in the landscape management plan to achieve the goal of conserving biodiversity.

**2) Ensuring sustainable resource use:** It is proposed to ensure sustainable resource use through the landscape management plan. Tourism management, encouraging value addition of products, methods of sustainable collection of NTFP is recommended. There are strategies proposed for the eco sensitive in terms technology on yak rearing. Strategies on sustainable collection of NTFP are proposed in the Changthang landscape.

**3) Harmonising sanctuary – people interface:** The Changthang Landscape is a strategic area from the perspective of national security with international border areas, the grazing communities depends on the area since time immemorial and there are human dominated landuse, primarily including the habitations, towns, agriculture, defence establishments, roads, etc. The inhabitants are economically weaker and depend on the resources of the WLS for their subsistence. The WLS has been facing pressure mainly due to development activities, tourism, increasing feral dog population, grazing competition, etc. It is surrounded by human population and livestock that depend on the resources for livelihood. Therefore, the periphery of the WLS is considerably stressed.

Frequent depredation of livestock by wild carnivore's viz., snow leopard and wolf and occasional crop damage by wild herbivores especially kiangs and blue sheep are major causes of conflict between the local people and sanctuary management. The following table shows the number of livestock killed by wild carnivores in and around CCDWLS during last the few years and amount of compensation paid each year.

*Table 25 Statement showing amount of compensation paid and number of livestock deaths due to wildlife depredation in CCDWLS.*

Year	Number of domestic livestock killed by wild carnivores	Amount of compensation paid (₹)
2007-2008	-	55 sets of home package issued against the depredation of livestock
2008-2009	-	60 sets of home package issued against the depredation of livestock
2009-2010	-	99 sets of home package issued against the depredation of livestock
2010-2011	187	Rs.2,25,000.00 paid against the depredation of livestock
2011-2012	53	Rs.3,59,500.00 paid against the depredation of livestock
2012-2013	52	Rs.5,58,600.00 paid against the depredation of livestock

Formation of Eco-development Committees (EDCs) / Biodiversity Management Committees (BMCs) / Self Help Groups (SHGs) / Community Based Organisations (CBOs) is recommended in order to implement simple eco-development plans or enterprise based livelihoods for the local communities. Schemes such as pasture development around village fringe areas, rotational harvest of medicinal plants and other regulatory activities can best be implemented through such institutions. There is a need to adopt a participatory approach and involve other line agencies and NGOs.

Other issues include inadequate veterinary facilities for livestock and possible chances of disease transmission to wildlife and lack of peoples' participation in the protection and management of the sanctuary. Best strategies to counter these problems could be better animal herding practices, improvement of corral and a more efficient mechanism of compensation in case of livestock damage by wild predators, livestock insurance and better veterinary services. There is a need for the proposed eco-sensitive zone (ESZ) around the WLS to be notified to manage the pressure and maintain the critical balance between conservation and development.

## **5.2 Zonation**

Zones are areas that fall under specific management category distinguishable based on their objectives. In protected areas or landscapes, zones are created because not all management objectives may be compatible to the entire area and allows ease of management. Zones are never managed in isolation but relate to the functioning of other zones (Sarwarkar, 2005). The following section presents the zonation plan proposed for the Changthang landscape.

### **1. Zone 1**

It is proposed that the catchment areas of Tso Kar and Tso Moriri be designated as Zone 1. This zone is spread over about 1,000 km<sup>2</sup>, which forms 25% of the CCDWLS. The area is characterised by vast plain with sparsely rugged terrain with a small proportion of cliffs, screes and exposed rocks. It covers the full range of habitats from valley floor at 3,400m to summits over 6,000m.

### **2. Zone 2**

The second zone to be designated comprises of the Hanle-Kuyul area. This zone is spread over an area of approximately 1,200 km<sup>2</sup>. The area is characterised by vast plain with sparsely rugged terrain with a small proportion of cliffs, screes and exposed rocks. It covers an area of approximately 30% of the total area of CCDWLS.

### **3. Zone 3**

It is proposed that the areas other than mentioned above, which are generally utilised by the local people for be designated as Rong Zone. This zone comprises of 350 km<sup>2</sup>, which is approximately 9% of the total CCDWLS area.

### **4. Zone 4**

Pangong and its nearby areas form the fourth zone of the sanctuary. This zone is spread over an area of approximately 1,450 km<sup>2</sup>. It comprises of about 36% of the total CCDWLS area.

### **5. Zone 5**

Across the unique landscape of Changthang, local communities and wildlife have shared space for millennia (Mishra et al. 2016). Many developmental threats that impact the biodiversity also impact the well-being of people living in this landscape. Considering the unique situation, there is a need to define a separate zone for planned and

regulated anthropogenic activities in order to ensure harmonious and peaceful coexistence. Human settlements have existed in the landscape for centuries. An eco-sensitive zone (ESZ) around the Wildlife Sanctuary has been proposed to manage the pressures and to keep a balance between conservation and development. The proposed ESZ is 0-5 km wide from the periphery of the Wildlife Sanctuary and covers an area of 19720 sq. km.

Figure 45 presents the map for the proposed zones for the Changthang landscape. The zonation boundaries will be subject to ground truthing and subsequent validation.

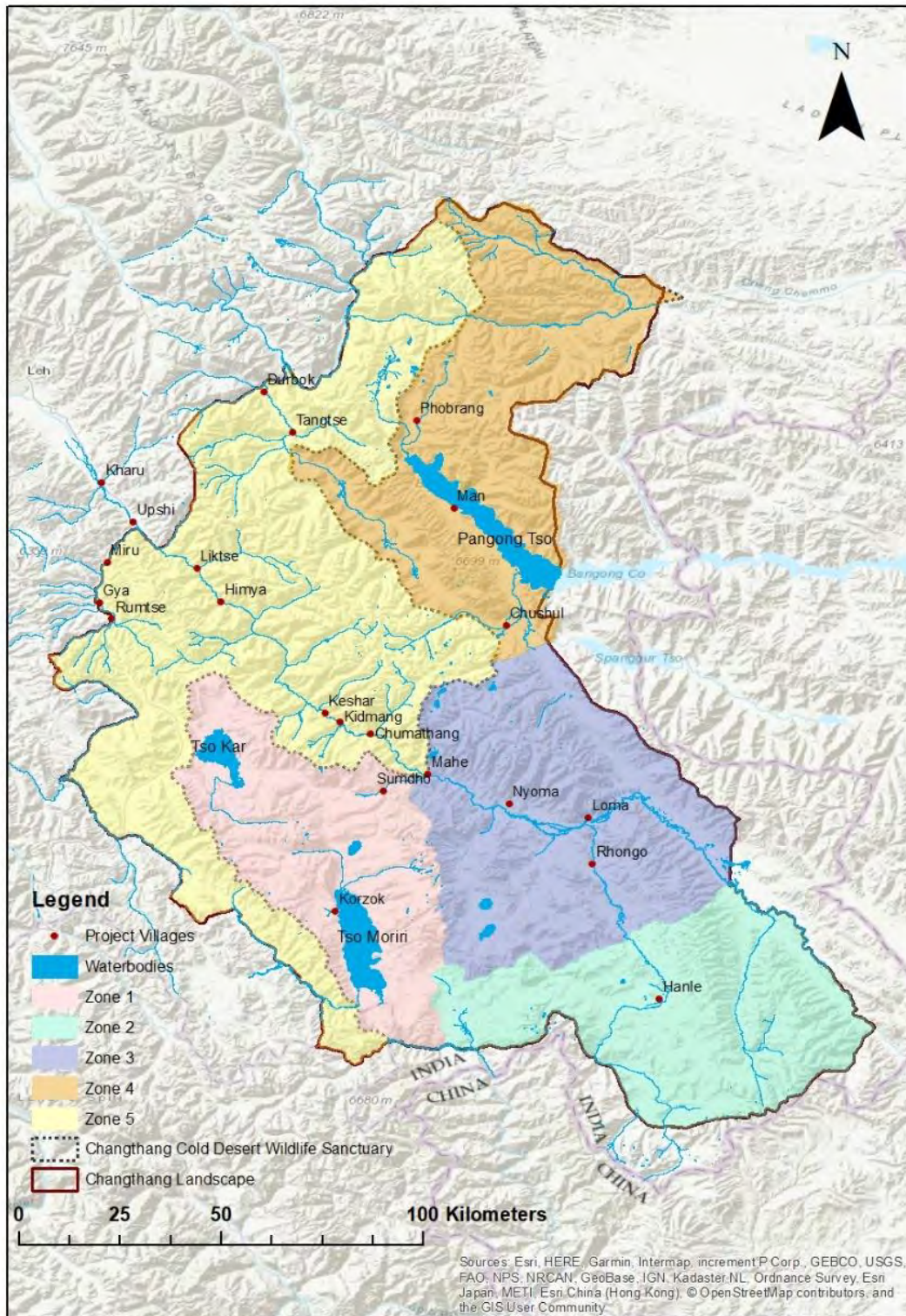


Figure 42 Proposed Zonation Map for the Changthang Landscape

### 5.3 Ranges

Ranges and blocks are proposed for the effective management and control over the whole of CCDWLS. Considering the approach and feasibility of administration, the CCDWLS is proposed to be divided into following ranges of management units:

- 1) **Durbuk Range:** This range comprises the components of the Pangong lake-Chushul up to Tsga La including Phobrang and Chang Chenmo valley with some areas outside the sanctuary. Durbuk Range consists of five blocks viz. Sato Kargyam, Tangtse, Chushul, Man-Merak and Phobrang.
- 2) **Nyoma Range:** This range comprises of four blocks viz. Nyoma, Hanle, Kuyul and Chumur.
- 3) **Chumathang Range:** It comprises of four blocks viz. Chuma-Thang, Tso-Moriri, Tso-Kar, Hemya.

### 5.4 Theme Plans

The theme plans are the result of the threat analysis and of the the in depth stakeholder consultations held in the landscape—with the major line departments and agencies as well as the community members.

#### 5.4.1 High Conservation Value Areas Protection Plan

It is vital to manage, maintain and enhance areas of high value—biological, ecological, social or cultural. The Core Zone will consist of the area that has been reserved for the protection, development and propagation of wildlife and other biodiversity. The total area to be covered under the high conservation value areas plan is 58,692.058 sq kms (WWF India, 2020). No exploitation of any kind will be carried out in the identified HCV areas.

#### 5.4.2 Grassland Management Plan

The grasslands of Ladakh are a highly dynamic ecosystem, which support flora, fauna, and human populations. For the last many years, they are the livelihood resource in the landscape, it being a grazing land ecosystem (Singh et al. 2017). Livestock rearing plays a vital role in the economy of Changthang landscape, where migratory to semi-migratory systems of livestock rearing is followed. These patches of naturally occurring grasslands are areas where there is high instances of human wildlife interaction and where it may result mostly in conflict. This plan will include all naturally occurring grasslands areas where there is high human wildlife interface like that in terms of livestock depredation by Tibetan wolf and snow leopard, crop depredation by Kiang and blue sheep, competition in grazing between Kiang and livestock. However, the vital livestock-livelihood link, a way of life for centuries in this landscape, could come undone as natural processes and human activity combine to threaten the pasturelands as never before. Such grasslands are currently being utilised way beyond their carrying capacity, resulting in their deterioration. 337 patches falling inside the CCDWLS and outside covering a total area of 7019.64 hectares (Annexure 12) is covered under the grassland management plan. Traditional grazing rights will be recognized in patches falling inside the CDWLS and rotational grazing will be facilitated participatorily for all the patches.

#### 5.4.3 Wetlands, Marshes, Moist Sedges and Wet meadows Conservation Plan

The wetlands in the Changthang landscape host many species of fauna and fauna. These sites are key staging posts on the migratory routes of various avifauna. It is no coincidence that most of the biodiversity of this region, a cold desert, is near wetlands and lakes. Changthang wetlands include freshwater marshes, marine marshes, seasonally flooded meadows and valley bogs (Gujja et al. 2003). They feature prime habitats for flora and fauna, and the



adjacent marshes serve as winter pastures for both wild and domestic ungulates. Some prominent wetlands, which have also been designated as Important Bird Areas (IBA) in the Changthang area are Pangong Tso, Chulshul Marshes, Hanle Plains/Marshes, Tso Kar and Tso Moriri (Gujja et al. 2003). The total area under this theme is 285.02 sq kms. which is approximately 0.9% of the total area. No prohibited activities as per the Guidelines for Implementing Wetlands (Conservation and Management) Rules 2017 will be carried allowed in a buffer area of 100 m around this zone. Regulated activities as per the Guidelines for Implementing Wetlands (Conservation and Management) Rules 2017 will be strictly monitored.

#### **5.4.4 Habitat Restoration Plan**

Major activities proposed under this category include increase forage production around degraded areas by pasture development through minimum diversion of stream water and meadow enrichment. Collection of fuel wood in the form of digging out the entire roots and shoots of sedges and other small herbs leads to habitat degradation. It is proposed to initiate fuel wood saving schemes such as distribution of solar cookers.

#### **5.4.5 Tourism Management Plan**

Tourism is considered an important source of employment to a large number of travel agents, local guides, pack animal owners and local communities. But within the CCDWLS tourism will have to be managed in such a way that it does not become taxing on the natural resources of the sanctuary and it does not lead to degradation and littering of camp sites. Large parties of tourists often require equally large infrastructure including camping gear and support staff. Hence, all tourism within the premises of CCDWLS needs to be organised by the management through community-based organisations.

The tourism zone will be demarcated to include Tsokar, Tsomoriri, Hanley, Chumathang hot springs, Pangong Tso areas and tourist spots such as gompas, the observatory, villages, pashmina production areas, and corral pens at villages. The major focus of management prescription will be to 'develop and promote sustainable/responsible tourism and nature education for conservation values among the locals and visitors. The total area to be covered under the tourism management plan is 161.33 sq kms.

Major activities proposed for the management of tourism in the park include identification and designation of camping sites away from sensitive wildlife habitats, better garbage disposal, encouraging CBO's to manage tourism in an organised manner. It is also proposed to establish visitor information centres (preferably at community centres) and develop simple en-route signages without disorienting the landscape for the benefit of visitors.

#### **5.4.6 Development of Master Zonal Plans for the Eco Sensitive Zones**

Considering the unique and interdependent landscape, numerous developmental threats that affect the biodiversity impact the well-being of people within the landscape. There us thus a need to define a separate zone for planned and regulated anthropogenic activities in order to ensure harmonious and peaceful coexistence.

The National Board for Wildlife reviewed the matter on 17<sup>th</sup> March 2005 and recommended that delineation of eco-sensitive zones (ESZs) would have to be site-specific, and relate to regulation, rather than prohibition, of specific activities. The Supreme Court, vide its order on 4<sup>th</sup> December 2006, ordered all states to declare ESZs

around the protected areas. In 2011, the Ministry of Environment, Forests and Climate Change issues guidelines for the demarcation of ESZs around National Parks and Wildlife Sanctuaries. The guidelines proposed that the boundary had to be site-specific, decided in consultation with a field-based team comprising representatives from the forest department, revenue department and Panchayati Raj institution. In addition, a message was sent across through the guideline that ESZs were not meant to be anti-people and does not prohibit everyday activities of people.

The eco-sensitive zone (ESZ) around the Wildlife Sanctuary has been proposed to manage the pressures and keep a balance between conservation and development. The proposed ESZ is 0-5 km wide from the periphery of the Wildlife Sanctuary and covers an area of 19720 sq km. During the tenure of the management plan, it is proposed to initiate procedures for declaration of ESZ from the center and take steps to frame Zonal Master Plans for the delineated ESZs around the CCDWLS for its better management and conservation, in line with the various notifications and guidelines with respect to the declaration of ESZs.

#### **5.4.7 Plan for Sustainable Collection of NTFP**

High Conservation Value Areas will be protected and the buffer areas of the wetlands will be strictly regulated. On the other hand, while sustainable collection may be permitted under the purview of traditional rights outside these and growth of NTFPs will be promoted under ecodevelopment so that villagers earn income without disturbing wildlife and their habitat.

#### **5.4.8 Mitigating Human-Wildlife Conflict Plan**

The following measures are proposed to tackle this challenge. Better livestock herding practices and promotion of improved corral pans to create strong physical barriers to prevent easy entry of carnivores. Construction of rubble wall / stone-wall around village pastures and agricultural fields will be helpful in preventing the damage to crops by wildlife. It is proposed to establish measures to provide some interim relief within 24 hours in case of death of livestock so that retaliatory killing is avoided. Sensitising locals about the behaviour of the snow leopard on ways to avoid conflicts in a long run is helpful in minimizing conflicts. Creating insurance scheme through local institutions in order to settle the compensation cases instantly. Dialogue needs to be initiated between the management and the herders for creation of a fund to mitigate the losses due to livestock and crop depredation. Other activities proposed are to control the feral dog population and strengthening veterinary facilities.

#### **5.4.9 Encroachment Minimising Plan**

Expansion of habitations into wildlife sanctuary areas especially at the periphery of CCDWLS is a concern. Monumentation of ground control points as per the Forest Survey of India norms at selected places will be an effective means of controlling expansion of habitations, etc. inside the CCDWLS area. This will be done on priority. In addition, the use of GIS with satellite imagery will be made to keep a record of the boundary and the encroachments. In order to increase the surveillance and protection of CCDWLS, there is a need to establish system of regular patrols (preferably unannounced) coupled with establishment of a network of informers. As there is hardly any facility for communication inside the park, it is proposed to procure wireless sets / walky talkies for the staff to make the communication network effective especially for dealing with gradual encroachments.

## 5.5 Priority Areas for Conservation

High Priority HCVAs (HPHCVAs) were demarcated by WWF-India that are critical for the landscape. Each of these zones are significant for one or for a combination of the constituent High Conservation Values and they have been ranked based on these threats faced and the protection status. These areas cover approximately 30 percent of the Changthang landscape (WWF-India, 2020). The figure below presents the High Priority HCVAs in the Changthang landscape.

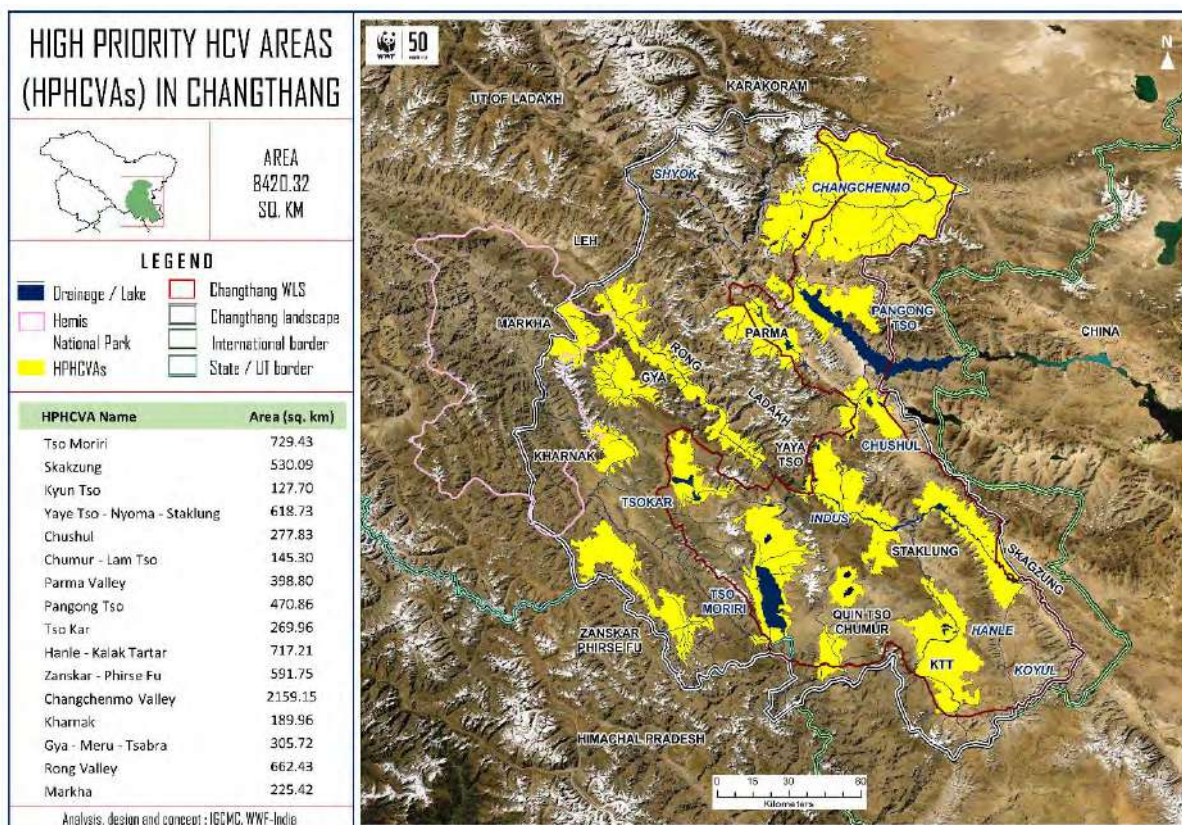


Figure 43 High Priority High Conservation Value Areas in Changthang landscape

The table below presents the list of High Priority HCVAs and their corresponding area in the landscape. Detailed maps for each High Priority HCVa is provided in Annexure 13 (WWF-India, 2020).

Table 26 High Priority HCVAs of Changthang landscape (WWF-India, 2020)

S No.	High Priority HCVa	Area
1	Tso Moriri	729.43
2	Skakzung	530.09
3	Kyun Tso	127.7
4	Yaye Tso - Nyoma - Staklung	618.73
5	Chushul	277.83
6	Chumur - Lam Tso	145.3
7	Parma Valley	398.8
8	Pangong Tso	470.86



S No.	High Priority HCVA	Area
9	Tso Kar	269.96
10	Hanle - Kalak Tartar	717.21
11	Zanskar - Phirse Fu	591.75
12	Changchenmo Valley	2159.15
13	Kharnak	189.96
14	Gya - Meru - Tsabra	305.72
15	Rong Valley	662.43
16	Markha	225.42
<b>Total Area</b>		<b>8420.34</b>

The following figure shows potential sites of conflict between the HPHCVAs and HCVs 5 and 6 by highlighting their location / extent within each HPHCVA. More focus should be on these areas where the possibilities of conflict between local communities and wildlife may occur.

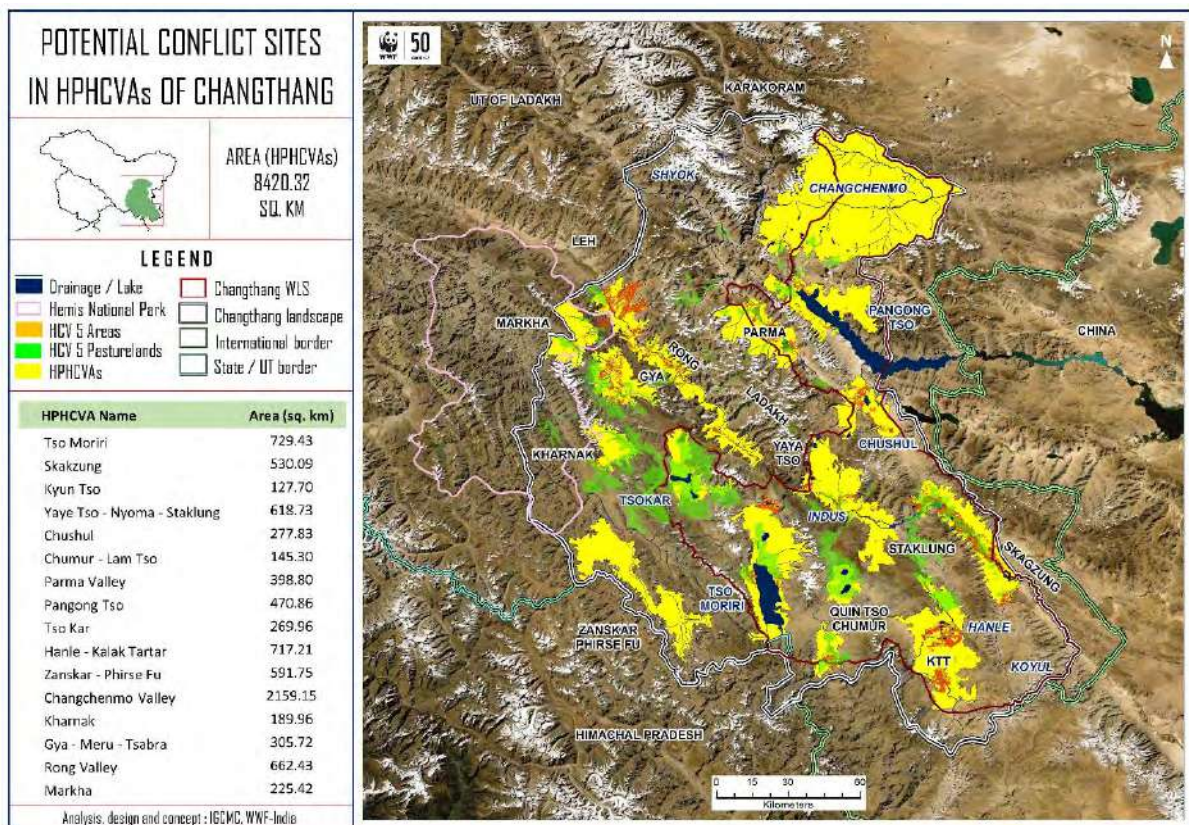


Figure 44 Threats and opportunities, HCV 5 and 6 with High Priority HCVAs

## Chapter 6 Proposed Management Interventions

Based on the theme plans identified in Section 5.4, interventions have been identified pertaining to each theme. The details of the interventions are presented and described in this section. The measures employed to address the threats and issues is tailor made for each identified theme keeping in mind the landscape, ensuring flexibility and achievability. Additionally, the proposed interventions are sensitive to the ecological, cultural, and administrative and socio political context of the landscape. Care has been taken to ensure that the community members and the villagers have a sense of ownership over the management and implementation to ensure longevity and sustainability.

Micro-plans will be prepared for each intervention and within that, for each activity. The proposed microplans for the landscape will be vetted and approved by a high-level committee.

### 6.1 Protection of High Conservation Value Areas

Background Information	Approach	Activities	Line Department/ Organisation	Years										
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Wildlife populations and rangeland condition are likely to change due to human pressures, conservation action and even climate change effects. A constant understanding of these changes is essential to adapt the conservation strategy. Information on rangeland vegetation, when evaluated alongside data on	Developing and implementing long-term inventory and monitoring protocols is thus essential for effective management in the landscape of Changthang. RET species of, both flora and fauna need to be targeted for inventory and long term monitoring activities. Severely threatened species such as the snow leopard,	Biannual census to be conducted for selected RET species in Changthang landscape including both flora and fauna.	Dept. of Wildlife Protection (Wildlife diversity and population estimation) Forest Department (Management of forests and estimation of diversity) WII (Aid in estimation of wildlife and floral diversity)		✓		✓		✓		✓			✓
		Prepare an extensive database and its			✓		✓		✓		✓			✓



Background Information	Approach	Activities	Line Department/ Organisation	Years										
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
socio-economic aspects and population trends of wildlife and livestock, will likely be of key importance for addressing overarching concerns over sustainable use and conservation. Monitoring of biological parameters must also be accompanied by monitoring of threats to the species and the landscape.	Tibetan wolf, Tibetan antelope, Pallas's cat, black necked crane, Saker falcon, and Tibetan argali. Monitoring of rangeland condition would involve studying vegetation communities across gradients of grazing pressures from wild herbivores and livestock. Such continued long-term monitoring will also provide insights into additional aspects such as response to climatic factors including potential changes in precipitation patterns. The following areas have been identified as High Priority HCVA's by WWF, 2020, which may be targeted: Tso Moriri, Skakzung, Kyun Tso, Yaye Tso - Nyoma – Staklung, Chushul, Chumur -	biannual updation for the RET species.	WII (Estimation of faunal and floral diversity)											
		Training programme to be organised for ground staff of the Department of Wildlife Protection regarding survey, monitoring techniques and creating awareness on all HCVs areas from any exploitations.	Wildlife Protection ( Training on techniques)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Background Information	Approach	Activities	Line Department/ Organisation	Years										
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
	Lam Tso, Parma Valley, Pangong Tso, Tso Kar, Hanle - Kalak Tartar, Zanskar - Phirse Fu, Changchenmo Valley, Kharnak, Gya - Meru – Tsabra, Rong Valley, Markha													

## 6.2 Grassland Management

Background Information	Approach	Activities	Line Department/ Organisation	Years										
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
The border dispute between India and China in 1962 caused an influx of Tibetan refugees and loss of winter grazing areas, which lead to increased pressure on the rangeland in the Indian Changthang (Namgail et al. 2007). Less than 1% of the geographical area on the plateau is cultivated, and most of the vegetated zone is used by a migratory pastoral community known as the Changpa for livestock	The overall approach will involve meadow enrichment by way of scientific nursery set up and plantation, pastureland development in pilot sites, fodder plantation, and identification and use of multiple use areas.  There is need to tackle this simultaneously with multiple approaches. It will start with identification of pasturelands in the landscape of Changthang and piloting of	Awareness on the patches of grasslands in the landscape	Wildlife Protection (Identification of ideal grasslands and enhance their protection)	✓	✓			✓			✓			
		Formation of village level committees for ensuring rotational grazing	Wildlife Protection	✓	✓									
		Enrichment of meadows to be done by way of indigenous	Defense Institute of High Altitude Research	✓	✓	✓	✓	✓						

Background Information	Approach	Activities	Line Department/ Organisation	Years															
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10						
<p>(goats, sheep, yaks, and horses) grazing (Adhikari &amp; Rawat, 2006).</p> <p>Competition between livestock and wild ungulates in the landscape</p> <p>Less fodder during the winter seasons. People have to use dry and stored fodder. Lack of pasturelands.</p>	<p>pasturelands development in select villages. However, before that, it is of importance that village level committees be formed for seamless functioning and to build ownership.</p> <p>This will additionally be accompanied with growing and plantation of indigenous varieties of grasses and plant species in the landscape using appropriate scientific techniques with relevant institutions. The medicinal plants recommended for enrichment of meadows are (as per Sowa Rigpa):</p> <ol style="list-style-type: none"> <li>1. <i>Aconogonum tortuosum</i></li> <li>2. <i>Capparis spinose</i></li> <li>3. <i>Rheum webbinanum</i></li> <li>4. <i>Rheum tibeticum</i></li> <li>5. <i>Malva verticillata</i></li> <li>6. <i>Chenopodium album</i></li> <li>7. <i>Cicer microphyllum</i></li> </ol>	<p>grasses and medicinal plants to be grown in the landscape by the Line Department using artificial propagation and root cutting techniques. This will be aided by nursery development and transplantation technology.</p>	<p>(Identification of suitable species of grass for grassland development) and National Research Institute for Sowa-Ripa (for medicinal plants)</p> <p>Wildlife Protection Department (Maintenance and protection of grasslands)</p>																

### 6.3 Conservation of Wetlands, Marshes, Moist Sedges and Wet Meadows

Background Information	Approach	Activities	Line Department/ Organisation	Years										
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
The high altitude wetlands and marshes of the Changthang Landscape are an oasis for many of the avifaunal and faunal species that are present in Ladakh. The three major lakes and their wetland areas- Tsokar, Tsomoriri and Pangong Tso attract many bird species, especially aquatic birds. The endangered black necked crane too nests at such locations. Over the years due to increase in tourism, expansion of	The high altitude lakes, wetlands and marshes of the Changthang landscape are extremely important and vital ecosystems for native wildlife and floral species.  In order to protect such fragile ecosystems, a comprehensive management strategy and action plan needs to come up wherein zonation of wetlands and marshes are suggested. Critical areas must be protected and should not be within easy access of tourists.	Awareness on creating a 100 m buffer around notified wetlands for prohibition activities and regulated activities	Wildlife Protection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Coordination between various line departments for sharing any developmental activities to check if these are unregulated activities around wetlands	Wildlife Protection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

<p>villages and roads, improper waste disposal mechanisms and over all lack of regulations and management strategies have degraded these pristine habitats.</p> <p>Development in Changthang has not been too considerate of the ecological importance of the landscape and have deteriorated the quality of land, surface water and even groundwater.</p> <p>Furthermore, water from the marshes and lakes is often diverted for agricultural and allied purposes. These haphazard channels also affect water quality and affect the habitat of birds and mammals.</p> <p>Unregulated tourism has caused its own set of problem for landscape. Off-roading and irresponsible wildlife tourism often disturbs the habitat of birds and mammals. Excessive</p>	<p>Developmental activities must take place in coordination with various line departments so that ecologically sensitive areas are not harmed and development takes places in a sustainable manner.</p> <p>Tourism too must be promoted in sustainable manner. Village boundaries must be delineated to a fixed length and expansion must not take place beyond village boundaries. Furthermore, the tourism department and the wildlife protection department must limit and regulate the number of tourist entering in the landscape at a certain point of time.</p> <p>Furthermore, biannual checks of habitats must take place which would include quantitative assessments of biotic factors.</p>	<p>Education and awareness among locals and tourist about the fragile ecosystems</p>	<p>Dept of tourism and Dept of Wildlife Protection</p>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
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Background Information	Approach	Activities	Line Department/ Organisation	Years										
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
<p>tourism also leads to production of excessive waste.</p> <p>Climate change is another factor responsible for the degradation of habitats in Changthang. Erratic snowfall and rainfall patterns affect the overall habitat quality.</p>														

#### 6.4 Habitat Restoration

Background Information	Approach	Activities	Line Department/ Organisation	Years										
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
The border dispute between India and China in 1962 caused an influx of Tibetan refugees and loss of winter grazing areas, which lead to increased pressure on the	The overall approach will involve meadow enrichment by way of scientific nursery set up and plantation, pastureland development in pilot sites,	Formation of village level committees for pastureland development	Sheep and Animal Husbandry	✓	✓	✓								

<p>rangeland in the Indian Changthang (Adhikari and Rawat, 2006). Less than 1% of the geographical area on the plateau is cultivated, and most of the vegetated zone is used by a migratory pastoral community known as the Changpa for livestock (goats, sheep, yaks, and horses) grazing.</p> <p>There is also observed conflict between ungulates, especially the Kiang and livestock in terms of competition in grazing and grazing space in the landscape (Bhatnagar et al., 2007)</p> <p>There is less availability of fodder during the winter seasons, where the inhabitants have to use dry and stored fodder.</p>	<p>fodder plantation, and identification and use of multiple use areas.</p>												
	<p>This is need to tackle this simultaneously with multiple approaches. It will start with identification of pasturelands in the landscape of Changthang and piloting of pasturelands development in select villages. However, before that it is of importance that village level committees be formed for seamless functioning and to build ownership.</p>	<p>Forage plantation – initially to start with Chumathang where pastureland development to be carried out in 152 Ha (3000 kanals) of existing pastureland.</p>	<p>Sheep and Animal Husbandry</p>	2 ha	5 ha	10 ha	15 ha	20 ha	20 ha	20 ha	20 ha	20 ha	20 ha
	<p>This will additionally be accompanied with growing and plantation of indigenous varieties of grasses and plant species in the landscape using appropriate scientific techniques with relevant institutions. The medicinal plants recommended for enrichment of meadows are (as per Sowa Rigpa):</p> <p>8. <i>Aconogonum tortuosum</i>  9. <i>Capparis spinose</i>  10. <i>Rheum webbinanum</i></p>	<p>Liasioning with the Animal Husbandry Department for provision of fodder seeds to identified villages and areas.</p>	<p>Sheep and Animal Husbandry</p>	✓	✓	✓	✓	✓	✓	✓	✓	✓	
		<p>Development of Green fodder blocks in Sundo TR covering 5 Ha. (100 kanals) in Rela area.</p>	<p>CAMPA</p>	0.5 ha	0.5 ha	0.5 ha	0.5 ha	0.5 ha	0.5 ha	0.5 ha	0.5 ha	0.5 ha	0.5 ha
		<p>Enrichment of meadows to be done by way of indigenous grasses and medicinal to be grown in the landscape in Line Department using artificial propagation and root cutting techniques. This will be</p>	<p>NRISR and DIHAR</p>	✓	✓	✓	✓	✓	✓	✓	✓		

	11. <i>Rheum tibeticum</i> 12. <i>Malva verticillata</i> 13. <i>Chenopodium album</i> 14. <i>Cicer microphyllum</i>	aided by nursery development and transplantation technology.												
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### 6.5 Tourism Management

Background Information	Approach	Activities	Line Department/ Organisation	Years										
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
There has been significant increase in tourism in Ladakh and in the landscape of Changthang specifically. Due to a sudden outburst of tourism, the magnitude of anthropogenic pressure has escalated beyond the natural coping capacity of the landscape. Though mountain tourism has become an important source of income, providing a significant contribution to the economic development of the region, unregulated tourism is posing a threat to the conservation of the Ladakh (Mishra 2000).	There is a need for studies to determine the carrying capacity for ecologically sensitive areas that are fast developing as mass tourist destinations. Since the current trend in tourism is uncontrolled, there is a need to track the number of visitors every year to the Changthang landscape and put a cap and to impose a pre-determined fee per person depending on the results of the carrying capacity.  The approach will also employ a multitude of signage and information	Monitoring tourism adhering carrying capacity inside CCDWLS.	Dept of Tourism	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Permits to the landscape should have reasons for visit and explicitly mention various categories of visitation such as bird watching/wildlife, trekking/ rallies, motorbike riding, etc. to understand the numbers of visitors in each category. This will help to target	Wildlife Protection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Background Information	Approach	Activities	Line Department/ Organisation	Years												
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10			
<p>One of the issues with the emergent tourism in the Changthang landscape is the impact on local flora and fauna and the natural habitat. The breeding season for several birds and mammals is the summer, which is also the peak tourism season, moreover, several birds are ground nesting. According to Geneletti and Dawa (2009), off-roading is particularly popular, and is posing a threat to the unique assemblage of floral and faunal species hosted by the wetlands of the area. Several species appear in the IUCN Red List.</p> <p>There is a general lack of awareness among tourists and visitors who are travelling across the Changthang WLS. There is very little signage indicating that this area is protected for wildlife and for habitat. It is thus particularly important to investigate the spread of</p>	<p>boards especially close to the fragile lake fronts considering the vast landscape. The intervention should look at high value and high quality tourism products to have lower impact on these fragile areas. Overall, there is a need facilitate inter-sectoral coordination and Line Department with all other relevant departments, and to that end, the establishment of the Inter- Departmental Coordination Committee as mandated by the National Tourism Policy.</p>	specific interventions/awareness raising protocols for visitors.														
		Formation of agreement between the Wildlife Protection Department and the ITBP to check visitation rate and for accurate numbers.	ITBP (Permit check and visitor count) and State Police	✓												
		Signage and will be made and set up at all critical points specifying dos and don'ts, marking wildlife sanctuary areas as well as importance on the habitat and the protected area status	Dep of tourism	✓	✓											
		Checklists of mammals, birds and butterflies of Ladakh as well as information booklets will be prepared with sighting areas and names of sites which will help both guides and tourists. These will be	Dept of Wildlife Protection, Dept of Tourism	✓	✓											

Background Information	Approach	Activities	Line Department/ Organisation	Years											
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
tourism, its economic, ecological and social impacts and give direction to it in the landscape.		left at prominent tourist areas as well as in homestays for better reach													
		Since most visitors have to acclimate in Leh before moving on, an interpretation centre for the wildlife of Ladakh, including Changthang is required, as well as near the most frequented check post to enter the area.	Wildlife Protection	✓	✓										
		Formation of an eco-development committee	Wildlife Protection	✓	✓	✓									
It is acknowledged that tourism models, especially community-based and wildlife tourism, can benefit local community incomes as well as strengthen conservation in the landscape. The extant and potential threats to		This will be followed by setting standards and guidelines for	Dept of tourism		✓	✓	✓								



Background Information	Approach	Activities	Line Department/ Organisation	Years											
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
	<p>wildlife and human society from tourism also need to be understood. It is also important to put in place all necessary measures w.r.t. infrastructure, capacity and monitoring to set up model tourism initiatives that benefit both, the local community and wildlife, and that have minimal damaging impact on the landscape. Strong emphasis should be placed on the need for setting standards and guidelines for home stays, in consultation and agreement with the local communities and the right kind of marketing, to regulate the kind of tourists they receive.</p>	<p>home stays, in consultation and agreement with the local communities and relevant departments. The standard on the right kind of marketing, to regulate the kind of tourists they receive</p>													
		<p>Training programmes will be imparted to interested people on homestays incorporating their traditions and cultures in the way they run the business to promote culture based and sustainable tourism.</p>	Dept of tourism	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		<p>Additional training programmes to be also targeted for a varied group of individuals- tourism service providers, communities, taxi services to analyse and</p>	LAHDC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Background Information	Approach	Activities	Line Department/ Organisation	Years											
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
		discuss on the current tourism scenario and trends in the landscape, the urgent need for responsible tourism, successful case studies of community-based and home stays from Arunachal Pradesh, Sikkim, Kerala and more.													
		Field trip of homestay owners to states where eco-tourism, cultural tourism, homestay culture is well established to exchange knowledge and skills	Dept of Tourism	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Training to be provided for field guides/trek guides	Wildlife Protection and Dept of Tourism	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

### 6.5.1 Dry Waste Management

Background Information	Approach	Activities	Line Department/ Organsation	Conservation Targets for 10 Years											
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
<p>The landscape of Changthang is being crushed under the weight of non-biodegradable waste, particularly in the rural areas where there are no proper mechanisms to dispose of garbage.</p> <p>Project Tsangda was launched on 12th of December 2017 at Choglamsar village. It is an organised effort of the district administration to protect the earth's fragile ecology from serious threats posed by solid waste generated by rapid urbanisation and increasingly growing tourism. Currently, four segregation centres are running successfully in Choglamsar, Disket, Nubra, Khaltse and Nimoo and now newly in Pangong Tso in Leh District.</p> <p>Due to the rough terrain and</p>	<p>The overall approach will be to upscale of Project Tsangda in conjunction with raising awareness. This will aided by a possible collaboration with the army present in the landscape in terms of transportation of non-recyclable dry waste.</p> <p>Awareness camps and training workshops will be conducted in terms of segregation and waste disposal. This will also be followed by the value addition of products made from non-recyclable waste products.</p>	<p>Identification of areas of high tourist activity, which has generation of considerable dry waste in the area.</p>	Dept. of Tourism, Rural Development Department	✓	✓										
		<p>Collaboration with Project Tsangda in upscaling the activities across identified areas to form segregation and resource recovery centres</p>	Project Tsangda	✓	✓	✓									
		<p>Formation of local bodies comprised of local youth in areas of large tourist attractions who will be in charge of coordinating the activities.</p>	Rural Development Department	✓	✓	✓									
		<p>Awareness programmes and workshops with local communities on making products of</p>	Rural Development Department	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Background Information	Approach	Activities	Line Department/ Organisation	Conservation Targets for 10 Years										
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
weather conditions, transporting large amounts of waste for proper disposal is unfeasible and, as there was minimal waste before the tourism industry boomed, there is not much infrastructure in place for waste domestic and foreign visitors produce, in addition to locals in recent times.		value addition from recyclable waste material.												
		For things that cannot be recycled or reused, army may be contacted to aid with the transport of the waste material since there is regular army movement in Changthang landscape.	Rural Development Department	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		A pilot programme to be launched for zero waste programmes in popular tourist attractions and trekking routes. A checkpost can be set up at the key locations for segregated collection and recovery of waste. The tourists may be inspected for the plastic disposable products they are carrying in. An inventory of plastics going into the national park may be kept against a cash deposit,	Rural Development Department	✓	✓	✓	✓							

Background Information	Approach	Activities	Line Department/ Organisation	Conservation Targets for 10 Years											
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
		which will be reimbursed once the plastic items are brought back. Availability of water dispensers with clean filtered water must be ensured in order to reduce use of plastic water bottles.													

## 6.6 Eco Sensitive Zone

Background Information	Approach	Activities	Line Department	Conservation Targets for 10 Years											
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
At present, most of what is sold from the yak are primary products, or close to primary, and so the economy, based on the yak, benefits little from the added value that accrues from processing, or from the manufacture of more sophisticated products.	This approach will involve enhancing the value addition of yak products in the landscape of Changthang, thereby enhancing alternate livelihood opportunities of the local communities. These products may involve yak hair, yak cheese and yak	Dedicated research and dissemination of technology for better return of yaks.	Sheep and Animal Husbandry	✓	✓	✓									



Background Information	Approach	Activities	Line Department	Conservation Targets for 10 Years											
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
<p>Yak fibre has high tensile strength, water proof nature and capacity to prevent UV rays.</p> <p>Yak differ from other domestic cattle in that the hair is of economic use and importance. Use of the hair dates back to the time that yak were first domesticated. Yak hair is a valuable item and has become essential to the life of herder households. Since yak products are greatly underutilized in Changthang, there is a need to realise the value and marketability of yak products.</p>	<p>butter.</p> <p>The approach may also include linking yak husbandry with tourism like cafeteria based on yak products, yak rides, e marketing of yak products aiming to improve livelihoods of yak herders.</p> <p>This will be augmented with skill development and awareness especially among the youth.</p>	<p>Training programmes to be imparted to interested people on to impart information on value addition and for developing skills to make value added products.</p>	Sheep and Animal Husbandry, Handlooms and Handicrafts Department	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
		<p>Simultaneously, a few villages, having substantial population in yak rearing states, will be adopted for as pilot villages for demonstration of technologies and their assessment in terms of their economic impact and improvement of livelihood of farmers.</p>	Sheep and Animal Husbandry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		<p>Field visits will be organised for selected members to visit States and areas where value addition of similar products is established e.g. Sikkim and</p>	Sheep and Animal Husbandry		✓			✓							

Background Information	Approach	Activities	Line Department	Conservation Targets for 10 Years											
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
		Arunachal Pradesh													

### 6.7 Sustainable Collection of NTFP

Background Information	Approach	Activities	Line Department	Years											
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10		
The Changthang landscape houses important high altitude floral species. Most of these species has high content of secondary metabolites. These have medicinal properties not only for humans but also for wildlife. Human beings removes such plants completely from the roots, many such roots are also used as firewood especially during the winter seasons. This has stressed the population base of such species.	Conducting research on sustainable harvesting techniques of locally available NTFPs especially medicinal plants and carrying out extension among the local communities	Research to come out with sustainable harvesting techniques for local NTFPs of Changthang areas	NRISR and DIHAR, Forest Department	✓	✓	✓	✓	✓							
		Education and awareness among local communities on sustainable harvesting of NTFP.	NRISR and DIHAR, Forest Department	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

## 6.8 Mitigating Human-Wildlife Conflict

### 6.8.1 Feral Dogs

Background Information	Approach	Activities	Line Department	Years													
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10				
<p>Feral dogs are ranging free in the Union Territory of Ladakh and have become a major problem for the people of Changthang as well. Feral dogs have been recorded to attack livestock, wild ungulates and birds and even humans in the landscape, The situation is bad for the predators as well, as feral dogs often chase off snow leopards and wolves from their kill.</p> <p>Although most feral dogs are found near the army camps set up in the landscape and mainly feed on the waste that is being disposed off in an improper manner, they have spread across the landscape and have become one of the major issues that the government departments and</p>	<p>The feral dogs have become a major threat in the landscape and are causing concerns for the local communities and wildlife as well.</p> <p>A collaborative effort is required between the various line departments- Wildlife Protection, Animal and Sheep Husbandry and the Rural Development Department to curb the problem.</p> <p>The Army and ITBP also has to step in and manage their waste disposal regimes in a better manner so that population of feral dogs does not get easier access to food.</p> <p>Furthermore, the Army must collaborative the Rural Department's initiative- Project Tsang Da, which is spear heading waste segregation and disposal</p>	<p>Collaborative effort between various government departments and NGOs in the sterilisation of 80% feral dogs in the landscape followed by rabies vaccination adhering The Animal Birth Control (Dog) Rules, 2001, enacted under the Prevention of Cruelty to Animals Act.</p>	Dept. of Sheep and Animal Husbandry, Dept of Wildlife Protection, Rural Development Department	✓	✓	✓	✓	✓									
		<p>Setting up of bio digesters at Army camps for proper disposal of wet waste.</p>	Specific Army regiments	✓	✓												
		<p>Setting up of proper waste segregation and disposal centres in Changthang.</p>	Dept of Rural Development.		✓	✓											

Background Information	Approach	Activities	Line Department	Years										
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
local communities are dealing with. The animal husbandry department does perform sterilizations at the landscape level but catching hold of the dogs present another issues due to the huge expanse of the landscape.	activities across Leh. The army can provide much needed infrastructure support needed in the program. The following areas have been identified as potential conflict sites in the High Priority HCVAs in Changthang landscapes. These areas must be targeted: Tso Moriri, Skakzung, Kyun Tso, Yaye Tso - Nyoma – Staklung, Chushul, Chumur - Lam Tso, Parma Valley, Pangong Tso, Tso Kar, Hanle - Kalak Tartar, Zaskar - Phirse Fu, Changchenmo Valley, Kharnak, Gya - Meru – Tsabra, Rong Valley, Markha	Education and awareness among local communities about proper disposal of wet waste.	Dept of Education	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

### 6.8.2 Livestock Depredation

Background Information	Approach	Activities	Line Department	Years										
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	

Background Information	Approach	Activities	Line Department	Years													
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10				
<p>Among large predators in the Himalayas, snow leopards and wolves often cause great economic losses and face a lot of animosity from local communities in the mountain ecosystems. (Din et al., 2017; Jackson &amp; Lama, 2016; Maheshwari, Takpa, Kujur, &amp; Shawl, 2010; Schaller, 2012). There are many locations in the landscapes where predation of livestock by these carnivores is high due to relatively less density of natural wild prey and their traditional grazing practices in the meadows (Aishwarya Maheshwari &amp; Sambandam Sathyakuma, 2019). Such interactions put extreme financial pressures on the locals, as animal husbandry is the prime economic activity in Changthang where every animal is valuable. Snow leopards often attack a single sheep, goat or yak and often even</p>	<p>In the Changthang landscape, the local communities have been living with wildlife since a very long time and use the same resources. Complete eradication of the conflict between humans and wild carnivores is not possible; however, there are certain ways through which the degree of conflict and its after effects can be minimised.</p> <p>In order to reduce such interactions area with high degree of conflict including their seasonal variations can be identified along with age and type of livestock being killed can be recorded and species causing the conflicts should be identified across the landscape. Furthermore, livestock practices of the areas must also be studied to identify any gaps.</p> <p>Construction of predator proof corrals should take</p>	<p>Identification and mapping of areas with high degree of conflict in the Changthang landscape.</p>	Dept of Wildlife Protection	✓													
		<p>Streamlining the process of compensation and introducing a single window compensation mechanism for communities' ease.</p>	Dept of Wildlife Protection, Sheep and Animal Husbandry	✓													
		<p>Introduction of alternative compensation resources other than monetary support /replacement of livestock lost.</p>	CAMPA														
		<p>Construction of predator proof corrals in regions of high conflict</p>	Dept. of Sheep and Animal husbandry														
		<p>Inter-departmental coordination between Wildlife Protection department and</p>	Dept of Wildlife Protection														

Background Information	Approach	Activities	Line Department	Years									
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
<p>raid the corals meant to protect the livestock from predation. The increasing human and livestock presence in snow leopard habitat with livestock even occupying the grazing pastures of the wild ungulates are a few reasons for such conflicts. Wolves on the hand prefer predating on herding camps and often the pack ends up killing multiple sheep or goat in the process (Dawa Tsering, John Farrington and Kelsang Norbu, 2006). During the field visit, wolves came out as primary species for human-wildlife conflict, followed by the snow leopard. Depleting rangeland resources and inefficient compensation schemes and processes further worsens the issue of conflict with predators.</p>	<p>place wherever feasible in order to minimize losses. Herders across the landscape can also be trained for better practices and trained guard dogs can be used for the purpose. Furthermore, there is a definite need to streamline and ease the process of compensation that is offered against livestock killed by wild carnivores . In addition, it is extremely important that the local communities, the wildlife protection department and the animal husbandry department work closely with each other to solve such issues. Thefollowing areas have been identified as potential conflict sites in the High Priority HCVAs in Changthang landscapes. These areas must be targeted: Tso Moriri, Skakzung, Kyun Tso, Yaye Tso - Nyoma – Staklung, Chushul, Chumur</p>	Animal Husbandry Department											
		Development of comprehensive conflict management and strategy document	Dept of Wildlife Protection , WWF-India, WII	✓	-	-	-	-	-	-	-	-	-



Background Information	Approach	Activities	Line Department	Years										
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
	- Lam Tso, Parma Valley, Pangong Tso, Tso Kar, Hanle - Kalak Tartar, Zanskar - Phirse Fu, Changchenmo Valley, Kharnak, Gya - Meru – Tsabra, Rong Valley, Markha													

### 6.8.3 Crop Depredation

Background Information	Approach	Activities	Line Department	Years										
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
The agriculture season in the Changthang landscape is very small owing to the harsh climatic conditions and altitude of the area. Even the most of the local communities in the landscape depend on animal husbandry for the livelihood, a few does have agricultural lands and grow crops such as wheat, potato and peas. They even cultivate fodder for their livestock. These	Agriculture in the Changthang landscape is extremely difficult due to the extreme climatic conditions, short growing season and water scarcity and crop depredation by these wild ungulates put added pressure on the agricultural communities. In order to understand the reasons for crop depredation, the landscape must be surveyed and proper	Stone-wall/ rubble wall protection of agricultural fields during the lean months.	Sheep and Animal Husbandry, Dept of Wildlife Protection	✓	✓	✓	✓	✓						
		Monitoring of Kiang and Bharal populations near villages.	Dept of Wildlife Protection	✓		✓		✓		✓		✓		
		Crop insurance schemes	Dept of Agriculture	✓	✓	✓	✓	✓						

Background Information	Approach	Activities	Line Department	Years									
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
<p>agricultural fields are often raided by kiangs and bharals, thus causing conflict between the communities and the wild ungulates. In the Hanle valley it was observed that the Kiang density was high, 0.56 per sq. km. and they frequently raided nearby crop fields (Yash Veer Bhatnagar, Rinchen Wangchuk, Herbert H. T. Prins, Sipke E. Van Wieren and Charudutt Mishra, 2006). Chumathang and Kungyam also witnessed a similar problem with blue sheep feeding upon their crops. Due to excessive crop depredation, some communities have stopped cultivation all together.</p>	<p>research must be facilitated to understand the spatiotemporal occurrence of crop damage. It is also important to identify the vulnerable areas and fields that are frequented by kiangs and bharals. Introduction of electric fences in the entire landscape is not feasible; however, options of temporary fences using rubble or stone during the agricultural season can be explored. Introduction of community-based crop insurance schemes and programmes can be introduced in the landscape.</p>												

## 6.9 Encroachment Minimising

Background Information	Approach	Activities	Line Department	Conservation Targets for 10 Years									
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
<p>In India, the protected areas are based on isolationist principles that consider human activities as a disturbance and therefore incompatible with the preservation and conservation of species be it floral or faunal. As seen throughout the nation, populations of human are often relocated outside once a protected area is declared. In Ladakh, alternative models of protection have developed that integrates the local communities inside the protected area rather than evicting them. The main issue however, arises with the exact limits of these protected areas, particularly Changthang Cold Desert Wildlife Sanctuary which has many villages inside it and has a lot of developmental activities and projects going on.</p>	<p>The approach will involve the implementation of the Forest (Conservation) Act, 1980 and the (Forest Rights) Act, 2006 based on the notified boundary of the protected area. This will be carried out in conjunction with awareness and outreach programmes</p>	<p>Implementation of FCA and FRA, based on the notified boundary of the protected area.</p>	<p>Wildlife Protected Department , Rural Development Department</p>	✓	✓	✓	✓	✓	✓	✓	✓		
		<p>Awareness workshops and campaigns to spread information on encroachment</p>	<p>Rural Development Department, Dept of Wildlife Protection</p>									✓	✓

Background Information	Approach	Activities	Line Department	Conservation Targets for 10 Years									
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
<p>The landscape of Ladakh is extremely fragile and with the population expansion, the stress on resources is increasing. The villages present inside the protected area are expanding their reach to newer area especially moist sedges, grasslands and rangelands that are pristine habitat for the wildlife present in the region. This promotes competition for resources amongst the wild ungulates and livestock and even leads to conflict with snow leopards and Tibetan wolves. Furthermore, encroachment of area for mining and other developmental activities is also on the rise, which has led to degradation of many important wildlife habitats and corridors.</p>													

## **Chapter 7 Research, Monitoring and Training**

Research and monitoring are among the weakest areas in wildlife management. The need is acknowledged but the progress is not satisfactory, mainly due to lack of policy, clarity of objectives, priorities and therefore uncertain backing and inadequate funding support. Research need not necessarily be only biological or ecological, the areas of sociology and economics are equally important to highlight the significance of conservation.

### **7.1 Research**

There is a need for research to contribute directly towards the improvement of management for wildlife and its habitat. The term 'research' should to be interpreted in a broad sense that includes management intervention experiments and the priorities need to be recognised on a scale of importance.

Management requires information, knowledge and techniques that can be used to enhance the quality of management and to provide appropriate timely response to management issues. Inventories need to be designed to accord with the various plan objectives, issues and problems.

Research, when done systematically and following contemporary scientific methods, form the backbone of wildlife conservation and management. This can help in finding solutions to an existing problem, help in assessing the current conditions of species and their habitats and in generating baseline information against which impacts of conservation and management efforts undertaken can be monitored.

Therefore, for the landscape, research and monitoring will be planned for the long term and the documents thus generated will be kept in a library that will be maintained for record and ease of management.

It is proposed to constitute a Research Committee to assist with the research and studies in the WLS. Such a committee may be formed at the state level to steer the research and studies in all the protected areas of the UT.

#### **7.1.1 Research Wing**

A research wing will be formulated and it will be headed by a Research Officer. In this research wing, two research assistants – trained in Conservation Biology and Wildlife Management will work in which one may be allocated for research work on wildlife and other on wild plants. Both these JRFs will be assisted by two Technical Assistants (TA) each. The headquarters of the research wing will be at Leh with required basic infrastructure. This research will function as part of the Division office.

The key issue in getting quality research is to engage credible institutions / individuals in order to get outcomes and results that are useful. There is a need for additional support in terms of increased budget required for carrying out the research activities.

### 7.1.2 Research Issues

Research on biological and socio-economic aspects help in arriving at appropriate management decisions. A few ecological studies and floral and faunal surveys conducted in the sanctuary by various agencies have helped in basic understanding of the region. Research activities proposed in the CCDWLS during the tenure of the management plan is shown in Table 27.

*Table 27 Research activities proposed in CCDWLS during the tenure of the management plan*

Sector	Research Issues	Research Description and Activities
Wildlife, Vegetation and Natural Resources	Habitat use of snow leopard and associated species in the Changthang landscape	There is still no concrete information on the number/ density of snow leopards in the Changthang region. In order to gain more insights into the elusive feline, sign surveys/camera trapping surveys must be undertaken for better understanding of the habitat use by the snow leopard. This will also help in study other related species.
		Select snow leopards should be radio collared and their movement be tracked for understanding their range size. It will also help set us any trans-boundary or inter-state research for the species.
		In addition to carnivore sign surveys, detailed assessment for prey species should also be carried out for mapping key areas.
	Lesser known mammals of the Changthang landscape and their distribution	Addition research projects must be carried out for Pallas’s cat and the Eurasian lynx. There is very little information about the two cat species found in the landscape.
	Understanding conflict with kiang in the region.	Proper research must be carried out to understand issue of conflict with kiang. Currently, the kiang population have been on the rise in the landscape and they cause major crop damage to the farmers.
Forestry and nursery techniques for the landscape	Much research is required in the sector of forestry and nursery techniques. Currently, poplar and willow are planted as part of afforestation activities. Nurseries must be	



Sector	Research Issues	Research Description and Activities
		developed for them and for other local species suitable for the landscape.
	Continuous research on biotic parameters	Quantitative assessment of rainfall, snowfall, water resources, winds, soil and land for understanding changes in the landscape and modelling for future predictions.
Animal and Sheep Husbandry	Economic pashmina model	Production of pashmina is the primary economic activity for the people of Changthang. Currently the pashmina model in the landscape is not equitably spread among the different villages. Some villages economically well off than the rest and even get a better price for the raw wool. A more sought after strategy and plan is required so that livelihoods of the locals is enhanced.
	Pasture and rangeland development	Innovative techniques need to be enhanced for the development of pastures and rangelands in Changthang. Livestock are the primary source of income in the landscape and a number of goats, sheep, cattle etc. are lost due to shortage of fodder in extreme winter conditions. Further research is required on species on fodder species in the pasturelands.
	Feral dogs	Currently, only Animal and Sheep Husbandry departments look after sterilisation of feral dogs in the landscape. A comprehensive and collaborative strategy between the Wildlife Protection Department and the Rural Development Departments is required to curb this mammoth issue. The strategy must involve innovative ideas on capturing the dogs and setting up of sterilization camps in the landscape. The involvement of different stakeholders is imperative for the issue.
	Value addition of yak products and market linkages	Research on yak wool and milk products is required in order to enhance their sales in the

Sector	Research Issues	Research Description and Activities
		<p>landscape and improve livelihoods. Strategic development and marketing plans are required for handloom and handicraft products from yak wool along with milk, butter and cheese from yak's milk. Furthermore, research on market links must be determined for value addition of the products.</p>
<p>Agriculture and Horticulture</p>	<p>Green fodder development/ Promotion of stall feeding</p>	<p>Green fodder is not available during the winter months for the livestock of the Changpas and many have to resort to buying of fodder at expensive rates. Effective research must be done on fast growing and high yielding fodder species in the landscape and must be promoted in the landscape. The fodders species should also have high nutrient content.</p>
	<p>High yield varieties of crops, fruits and vegetables</p>	<p>The cropping season in Ladakh is limited to a few short summer months. Effective research is required on high yield varieties of crops, fruits and vegetables so that farmers can make the best out of the little time they have for cultivation. It is also important to understand that the new varieties developed must also be suitable to the extreme conditions at Changthang and do not require much water for growth.</p>
	<p>Greenhouses/polyhouses</p>	<p>The horticulture department provides a subsidy on greenhouses/ ployhouses in the landscape. However, they are extremely short lived due to the extreme weather conditions. Research on sturdier and long-term greenhouses must be done and checked for their suitability in the landscape.</p>
<p>Tourism</p>	<p>Diversification of tourism activities</p>	<p>Currently most tourists coming into Ladakh focus on visiting the high altitude wetlands and the monasteries. Ladakh has potential to diversify its tourism activities. Active research</p>

Sector	Research Issues	Research Description and Activities
		<p>and promotion of wildlife tourism, cultural tourism and adventure tourism must be done. It will bring in a diverse set of tourists and shall be better for the economy as well.</p> <p>Diversification of tourism will also help generate alternative livelihood resources for the people of Changthang.</p>
	Sustainable tourism	<p>With expanding tourism comes with the issue of sustainability. Innovative and sustainable tourism ideas must be researched upon, so that activities are carbon neutral and does not put additional stress on the valuable resources of the landscape.</p>
	Promotion of tourism	<p>Effective strategy should be devised on promotion of tourism. Different platforms for social media must be utilised in to attract more tourists for the landscape.</p>
Rural Development	Waste management	<p>A detailed implementation plan needs to researched and put in use for effective management of both dry and wet waste. The Rural Development Department must coordinate with different Panchayats to implement such plans. A waste management strategy will solve many issues relating to feral dogs and plastic pollution.</p>
	Alternative livelihoods	<p>Sources of alternative livelihoods in the landscapes must be researched upon. Currently, the younger generation of the Changthang landscape realise the economic incentive in the traditional practices of animal rearing.</p> <p>Providing alternative source of income generation will help keep the traditional practices of the locals alive and reduce the occupational shift in the area.</p>

## 7.2 Monitoring

Management prescriptions applied in the field need appropriate monitoring to evaluate their measure of success. Parameters need to be identified, and techniques and processes of analysis need to be laid down. Monitoring change of vegetation change over time and its relationship to change in the key species constitutes an important aspect of monitoring. The baseline provided in the report is to be referred for monitoring. The detailed monitoring plan provided in the following sections.

### 7.2.1 Monitoring Areas

Monitoring will be conducted on the following areas.

**1) Monitoring of selected biological and ecological parameters:** Parameters such as population structures, vegetation types and density, habitat integrity, are to be monitored to assess the impact of the conservation work. Monitoring of flagship species of CCDWLS namely the black necked crane is vital. The ground needs to be prepared in terms effective protection, improving habitats and garnering support of key stakeholders. A close monitoring of the black necked cranes in the wild will be undertaken.

**2) Monitoring of wetlands:** Wetlands are influenced by a range of drivers and pressures that act at multiple spatial, temporal and political scales. Continuous site monitoring and assessment of new information is therefore necessary to understand the dynamic of the wetlands.

**3) Monitoring of institutions such as EDCs, etc.:** Monitoring of the process and impacts of the ecodevelopment activities will be conducted against a set of indicators. The process indicators will include:

### 7.2.2 Monitoring Indicators

Monitoring indicators is described below. While the need based monitoring will be conducted as required, a comprehensive mid-term review of the management interventions and their impacts will be conducted every 3-5 years.

**a) Biological, ecological and flagship species:** Performance indicator for monitoring of biological/ecological/socioeconomic parameters wetlands is shown in Table 28.

*Table 28 Performance indicator against management objectives for monitoring of biological/ecological/socioeconomic parameters in CCDWLS.*

Management objectives	Performance Indicators	Sub-Indicators
Habitats and Ecosystem Conservation	Forests	Mean patch size
		Area of ecosystem
	Marshes	Mean patch size
		Area of ecosystem
	Sedges	Mean patch size
		Area of ecosystem
	Moist meadows	Mean patch size
Area of ecosystem		
Wildlife conflicts	Intensity	
Species conservation	RET flora species	Abundance
	Carnivore census (species wise)	Population
	Ungulates (species wise)	Population
	Avifauna (species wise)	Population

Management objectives	Performance Indicators	Sub-Indicators
	Casualty (species wise)	Number
		Reason of death
	Blacked necked crane	Number of pairs
		Number of chicks
Improvement of local livelihoods	Responsible tourism	Number of youths associated
	Types of locally manufactured products	Number
	Fodder availability during winters	Number of months
Ensuring balanced development	Encroachment	Area
	Physical infrastructures	Area
	Settlements	Area
	Road construction	Area
Minimising human -wildlife conflicts	Incidents of livestock deaths due to wildlife	Number
	Crop damage by wildlife	Area
Reduced wildlife trade	Wildlife trafficking	Number

**b) Wetlands:** Performance indicator for monitoring of wetlands is shown in Table 29

*Table 29 Performance indicator against management objectives for monitoring of wetlands in CCDWLS*

S. No.	Wetland feature	Management Objective	Performance indicator	Means of measurement
1	Area	Maintain wetland area	Wetland area not altered for non-wetland usage	Area estimated from analysis of RS images and ground truthing
2	Catchment	Reduction in silt load from catchment	Silt load	Monitoring pilot watersheds
3	Hydrological regimes	Reduce pollution	BOD, COD	Water quality monitoring
		Enhance hydrological connectivity within wetlands complex	Area of wetland complex inundated during high floods period	Analysis of RS images and ground truthing
4	Biodiversity	Maintain and enhance habitats of wetlands	Area of wetlands used by waterbirds	Physical survey
		Reduce area under invasive macrophyte	Area under invasive macrophyte	Analysis of RS images and ground truthing
		Maintain fish species richness	Fish species richness	Sampling

### **c) Landscape Level Committee**

It is proposed to establish a multi-stakeholder landscape level committee for coordination and implementation of the management strategy and plan. Under the chairmanship of the Chief Wildlife Warden, it is suggested that the executive body of the committee include representatives from the following line departments.

- a. Wildlife Protection Department
- b. Animal Husbandry Department
- c. Agriculture Department
- d. Horticulture Department
- e. Tourism Department
- f. Rural Development Department

The committee should meet quarterly and discuss and review the implementation of the management plan. To cater to the research needs, the committee should also include institutes such as the National Research Institute for Sowa Rigpa and the Defence Institute of High Altitude Research (DIHAR). Credible grassroot organisations actively working in the landscape for at least 5 years should be included in the committee.

Process indicators in the Landscape Level Committee will include the following:

- a. Resolution of formation of the Landscape Level Committee
- b. Registration of the Landscape Level Committee
- c. Representation of various sections of the society in the Landscape Level Committee
- d. Selection of Executive Members of the Landscape Level Committee
- e. Record keeping (Minutes of meetings, resolutions passed, Accounts, Asset etc register)
- f. Annual audits

### **d) Institutions such as EDCs, etc.**

Process indicators in EDC villages will include the following:

- a. Resolution of formation of EDCs
- b. Registration of EDC
- c. Representation of various sections of the society in EDC
- d. Selection of Executive Members of EDC
- e. Record keeping (Minutes of meetings, resolutions passed, Accounts, Asset etc register)
- f. Annual audits

Impacts indicators in EDC villages will include the following:

- a. Number of functional EDCs
- b. Beneficiaries from relevant Government schemes
- c. Alternative livelihoods adopted by EDCs



- d. Beneficiaries from alternative livelihoods
- e. Status of wildlife habitat around villages
- f. Status of natural resources (water, fodder, fuelwood) in and around villages

Independent evaluation of the ecodevelopment measures will be undertaken and its impacts will be analysed every three years.

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# Annexure

## Annexure 1

### MEETING REPORT

#### Stakeholder Workshop under GoI-UNDP-GEF SECURE Himalaya Project in the UT of Ladakh

#### Preparation of Participatory Integrated Landscape Level Management Strategy and Plans in the Changthang Landscape

October 12th 2020 |09:30 AM-12:00 PM| Sumdo TR

Attendees: -

1. 53 Local villagers from Sumdo TR
2. Dr Saurindra Goswami- Vice-President, Forestry, IORA Ecological Solutions
3. Ms Janani Pradhan- Assistant Manager, Forestry, IORA Ecological Solutions
4. Mr Arsh Marwaha- Research Associate, Forestry, IORA Ecological Solutions

#### Points of Discussion

1. There were 53 local villagers involved in the stakeholder meeting at Sumdo TR including the Sarpanch and it was held at the local community hall. The crowd has mixed representation of males and females. The main issues and threats along with their solutions were discussed in length.
2. The local people at Sumdo appreciated IORA's visit to the landscape and the village and told that the consultation was first of its kind to be held at the village.
3. Notable issues in the village included network connectivity, fodder scarcity and conflict with snow leopard. The issues have been discussed in details in the table below:

Table 30 Issues and needs of the villagers in Sumdo TR.

S No.	Issues at Village Level	Description of the Issue	Probable Solutions
1	Network connectivity	The villages does not get cellular reception.	Installation of cellular towers
2	Fodder for livestock	Locals are majorly agro pastoralists and take their livestock to different grazing grounds throughout the year, however, the availability of fodder in winter months is extremely low and fodder has to bought at expensive rates.	Fodder to be made available via animal and sheep husbandry department. Some locals were also interested in growing fodder especially alfa alfa.
3	Conflict with snow leopard and feral dogs	Livestock depredation by snow leopard is common in and around the village. Locals expressed their dissatisfaction with the	Compensation mechanisms to be streamlined and locals should get

S No.	Issues at Village Level	Description of the Issue	Probable Solutions
		current compensation scheme and process. Feral dogs roam in and around the village and often attack livestock.	compensation faster and in an easier manner.
4	Electricity	Erratic electricity	Locals want to be trained in solar energy initiatives.
5	Lack of resources for women SHGs	Women require resources for their SHGs, construction of a small community hall for women.	Capacity building of women in making fine pashmina products.
6	Crop depredation by kiang and hare	Kiangs often raid agricultural fields and cause economic losses to the farmers.	Agricultural field to be fenced.
7	Vegetable farming	Local want to grow local and commercial vegetables in their agricultural fields but lacks funds for greenhouses/polyhouses.	Horticulture department to aid in procurement of polycarbonated greenhouses.
8	Development of Sanitation facilities	Sumdo TR currently have no tourist facilities/ homestays. The locals want tourism as an economic activity.	Sumdo TR has the capacity to become a village for snow leopard tourism; locals have knowledge of treks for spotting Changthang's wildlife. Development of homestays and sanitation facilities needs to be initiated for tourism.





Attendance Sheet

Venue: Gundo TR

Date: 12/10/20

Sl. No.	Name	Designation	Phone No.	Signature
1	RABGYAL DULTIMA	M		[Signature]
2	KARMA TSERING	M		[Signature]
3	TSEWANG GYATSO	M		[Signature]
4	RIGZIN ANGMO	F		R. Wangmo
5	NGAWANG GYATSO	M		[Signature]
6	KARMA DHONDUP	M		[Signature]
7	KARMA SANGPO	M		Ksangpo
8	TSEWANG TOBGYAL	M		[Signature]
9	RINCHEN TSEWANG	M		[Signature]
10	KARMA YOUNTEN	M		[Signature]
11	SONAM WANGCHUK	M		[Signature]
12	RIGZIN TSEPHEL	M		[Signature]
13	KARMA RABJOR	M		[Signature]
14	KUNZANG GYATSO	M		[Signature]
15	YANCHEN BHUTI	F		Yanchen
16	KUNZANG ANGDU	M		[Signature]
17	TSERING YESHI	M		[Signature]
18	GYATSO WANGCHUK	M		[Signature]
19	ANGDUE PHUNTSOK	M		[Signature]
20	TSEDUP DORJEE	M		[Signature]
21	JIGMET DARPA	M		[Signature]
22	NGAWANG SANGPO	M		[Signature]
23	TSERING GYALTSEN	M		T-G
24	GAKAP DORJEE	M		[Signature]

- 25 CHOENING TASHI M
- 26. TSEPHAL LHUNDUP M *Tanda*
- 26. TENZIN TSEPHAL M *Tal*
- 27 KONCHOK GYALTSEN M *འཇམ་མཉམས་*
- 28 MUTUP GYALTSEN M *འཇམ་མཉམས་*
- 29 YESHI GYALTSO M *མཚོ་ལྷོ་མཚོ་*
- 30 TSETAN LHUNDUP M *འཇམ་མཉམས་*
- 31 SONAM TOBQYAL M *འཇམ་མཉམས་*
- 32 TENPA LOBSANG M *འཇམ་མཉམས་*
- 33 KARMA ANGDVE M
- 34 KARMA GYALTSEN M *འཇམ་མཉམས་*
- 35 TSETAN PHUNTSOK M *འཇམ་མཉམས་*
- 36 TASHI BHONDUP M *འཇམ་མཉམས་*
- 37 DORJEE WANGYAL M *འཇམ་མཉམས་*
- 38. DORJEE TSEGYAL M
- 39. THUPTEN TSETHAK M
- 40. GYAL TENPA M
- 41 RINCHEN PHUNTSOK M *འཇམ་མཉམས་*
- 42 KARMA PALJOR M *འཇམ་མཉམས་*
- 43 TSVLRIM SANGPO M *འཇམ་མཉམས་*
- 44 SANGAY DORJEE M
- 45 TSEKYI DOLMA M
- 46 TSEWANG GURMET M *འཇམ་མཉམས་*
- 47 DUGEN DORJEE M *འཇམ་མཉམས་*
- 48 GYALTSEN WANGSUM M
- 49 WANGYAL BHONDUP M *འཇམ་མཉམས་*
- 50 KARMA GYALTSEN'S M *འཇམ་མཉམས་*
- 51 BHONDUP WANGYAL M *འཇམ་མཉམས་*
- 52 THUPTEN KHEVUP M
- 53 Karma JIGMEY M *Karma Jigme*



## MEETING REPORT

### Stakeholder Workshop under GoI-UNDP-GEF SECURE Himalaya Project in the UT of Ladakh

#### Preparation of Participatory Integrated Landscape Level Management Strategy and Plans in the Changthang Landscape

October 13th 2020 |09:30 AM-11:30 AM| Nyoma

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#### Attendees: -

1. Mr Dawa Tashi- Sarpanch, Nyoma
  2. Mr Skarma Choldan- Forest Personnel
  3. Ms Tsewang Yangzin- Women President, Nyoma
  4. Mr Tsewang Norbo, Member
  5. Mr Sonam Dorjay, Member
  6. Mr Tsering Angelus, Nambadar, Nyoma
  7. Dr Saurindra Goswami- Vice-President, Forestry, IORA Ecological Solutions
  8. Ms Janani Pradhan- Assistant Manager, Forestry, IORA Ecological Solutions
  9. Mr Arsh Marwaha- Research Associate, Forestry, IORA Ecological Solutions
- 

#### Points of Discussion

1. There were 6 local villagers involved in the stakeholder meeting at Nyoma including the Sarpanch and Women President held at forest department rest house. The main issues and threats along with their solutions were discussed in length.
2. Notable issues in the village included development of tourism activities, conflict with Tibetan wolves and blue sheep and presence of feral dogs. The issues have been discussed in details in the table below:

*Table 31 Issues and needs of the villagers in Nyoma.*

S No.	Issues at Village Level	Description of the Issue	Probable Solutions
1	Network connectivity	The villages does not get regular cellular reception.	Installation of cellular towers.
2	Conflict with Tibetan Wolves	Livestock depredation by tibetanis common in and around the village. Locals expressed their dissatisfaction with the current compensation scheme and process.	Compensation mechanisms to be streamlined and locals should get compensation faster and in an easier manner.
3	Conflict with Blue Sheep	Crop depredation by blue sheep is prevalent in the village.	Fencing to be installed around the agricultural fields especially at Laphrang.

S No.	Issues at Village Level	Description of the Issue	Probable Solutions
			Crop insurance schemes to be put in place.
4	Feral dogs	There is a good population of feral dogs in and around the village. Primary reason for the increase in population of feral dogs is wet waste disposed off by the army in an improper manner. Local villagers also throw their waste at Army's dumping site further aggravating the problem. There have been instances of feral attacking livestock and even humans.	Villagers want to curb the problem to feral dogs. Some initiatives have been taken by the Animal and Sheep Husbandry department but the population of feral dogs is still increasing.
5	Competition of resources between livestock and wild ungulates	In the summer months the livestock of the village are taken to Taklung wherein they with the blue sheep for grazing pastures.	Development of proper pasturelands and grasslands for village.
6	Development of tourism sector	People at Nyoma want tourism sector to develop as their prime economic activity. Currently there are a limited guest houses / home stays in Nyoma.	Nyoma has the facilities to develop as a tourism centre. It could also house a tourist interpretation centre for the visitors coming into Changthang. There are many tourism opportunities that are yet to be explored around Nyoma such as wildlife tourism and cultural tourism and trekking.



**Attendance Sheet:**

**Attendance Sheet**  
**Stakeholder Workshop**  
**under Gol-GEF-UNDP SECURE Himalaya Project in Ladakh**  
**Preparation of Participatory Integrated Landscape Level Management Strategy and Plans in**  
**the Changthang Landscape**

Date: 13/10/20  
 Venue: NYDMA

Sl. No.	Name	Designation	Phone No.	Signature
01	Dawa tashi	sarpanch	9469734105	
02	Skema chodar	(Tsonstot)		
03	Tsewang yangzin	women leader	9469673162	(F)
04	Tsewang Norbu	labhan	9469019351	
05	Londun Dorjee	namdar	9419372246	
06	Tsering Angchus	Nambadar	948420026	



## MEETING REPORT

### Stakeholder Workshop under GoI-UNDP-GEF SECURE Himalaya Project in the UT of Ladakh

#### Preparation of Participatory Integrated Landscape Level Management Strategy and Plans in the Changthang Landscape

October 13th 2020 |06:30 PM-8:30 PM| Chumathang

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Attendees: -

1. Ms Mantak Lanfez- Sarpanch, Chumathang
  2. Mr Phumtsog Sonam- Ex policeman, resident Chumthang
  3. Mr Tsering Somdup- Nambadar
  4. 44 local villagers
  5. Dr Saurindra Goswami- Vice-President, Forestry, IORA Ecological Solutions
  6. Ms Janani Pradhan- Assistant Manager, Forestry, IORA Ecological Solutions
  7. Mr Arsh Marwaha- Research Associate, Forestry, IORA Ecological Solutions
- 

#### Points of Discussion

1. There were 47 local villagers involved in the stakeholder meeting at Nyoma including the Sarpanch and Nambadar and was held at the local community hall. The main issues and threats along with their solutions were discussed in length.
2. The local people at Chumathang appreciated IORA's visit to the landscape and the village and told that the consultation was first of its kind to be held at the village.
3. Notable issues in the village included development of tourism activities, conflict with Tibetan wolves and blue sheep and presence of feral dogs. The issues have been discussed in details in the table below:

**Table 32 Issues and needs of the villagers in Nyoma.**

S No.	Issues at Village Level	Description of the Issue	Probable Solutions
1	Feral Dogs	There is a good population of feral dogs in and around the village. Primary reason for the increase in population of feral dogs is wet waste disposed off by the three army camps in the village. Local villagers also throw their waste at Army's dumping site further aggravating the problem. There have been instances of feral attacking livestock and even humans.	Villagers want to curb the problem to feral dogs. Some initiatives have been taken by the Animal and Sheep Husbandry department but the population of feral dogs is still increasing. The villagers are in favour of sterilizing and translocating the feral dogs.

<b>S No.</b>	<b>Issues at Village Level</b>	<b>Description of the Issue</b>	<b>Probable Solutions</b>
2	Conflict with Tibetan wolves and snow leopard	Livestock depredation by Tibetan wolves and snow leopard is common in and around the village. Locals expressed their dissatisfaction with the current compensation scheme and process.	Compensation mechanisms to be streamlined and locals should get compensation faster and in an easier manner.
3	Conflict with Kiang and blue sheep	Kiang and blue sheep causes major crop damage in the agricultural fields especially in Mahe.	Villagers want to fence off the agricultural fields in Mahe and Chumathang to prevent further crop loss.
4	Green fodder Scarcity	Fodder for livestock is extremely sparse in the winter months and many villagers have to resort to buying fodder @ Rs 1000/quintal.	Pastureland development for the village of Chumathang. Currently pastureland of around 3000 canal is left barren.
5	Water scarcity in winters	Acute shortage of water during winter months.	Creation of local village ponds.
6	Dormant women SHGs	The women SHG in Chumanthang is dormant due to lack of infrastructure resources, training skills.	Building separate hall for women, introduction of capacity building and training programs in Pashmina and Yak products.
7	Tourism sector	Currently there are few homestays at Chumathang and the village is not fully utilizing the tourism potential it has.	Building of more homestays, introduction of treks- Chokolar trek, YaYa trek and Shildar trek. Tapping into wildlife tourism and hot spring tourism as well.





Attendance Sheet:

STAKEHOLDER CONSULTATION

CHUMATHANG Date 13/12/20

S.NO	NAME	M/F	DESIGNATIONS	PHONE NO	SIGNATURE
1	Jangay Amies		Farmer	0419970503	Jab
2	Skarima Sontan	M	Farmer	940424200	[Signature]
3	Skarima Sigmat	M	Farmer	941111111	[Signature]
4	Nawang Anyau			9416418000	[Signature]
5	Danjang Anycho	M	Farmer	941932791	[Signature]
6	Skarima jimbol	M	Farmer	9419542972	[Signature]
7	Nawang Dama	M	Farmer		[Signature]
8	Kungga. Nartoo	F	Farmer	948409085	[Signature]
9	Tserang. Thaly	M	Farmer	9469673023	[Signature]
10	Tanj Yangkil	M	Farmer	9419999520	[Signature]
11	Padma Chomo	M	Farmer	9419532973	[Signature]
12	patkas. dumeo	M	Farmer	9469274055	[Signature]
13	chemel yandun			9469192125	[Signature]
14	Nawang. Palmo	M	Farmer	9419537190	N. Palmo
15	Skarima Dalma	M	Farmer	9469350261	S. Dalma
16	Dawa Zangmo	M/F	Farmer	9469055713	D. Zang
17	Dalma. tsering	M/F	Farmer	9469739109	Dalma
18	Delen. Diker	M/F	Farmer	9419524052	D. Diker
19	Namkhe Agma	M/F	Farmer	9419840744	[Signature]
20	phunchok Dalma	M/F	Farmer	No	D. Dalma
21	sonam patkil	M/F	Farmer	No	SON
22	Tserang Dalma	M/F	Farmer	No	T. Dalma
23	Tsoing yangkil	M/F	Farmer	No	[Signature]
24	Tsoing yodson	M/F	Farmer	No	T. yodson
25	Thelas Agma	M/F	Farmer	No	T. Agma
26	Tserang yangzi	M/F	Farmer	9469572119	T. yangzi
27	Koungan Tosome	M/F	Farmer	9469517630	Som
28	Palchun Dalma	F	Farmer		P. Dalma
29	Phunchok yangkil	F	Farmer	9419544390	[Signature]
30	sonam yangkil	F	Farmer	No	[Signature]



Date 13/10/20

CHUMATHANG

S.NO.	NAME	M/F	DESIGNATION	PHONE NO	SIGNATURE
31	Sonam Dolke	F	Farmer	9469262060	
32	Spales Angmo	F	F II	9469558923	
33	Kelang Doron	F	F II	9469452896	
34	Padma Langas	F	F II	9469704124	
35	Tsering Anglu	M	F II	9469525567	
36	Tsering Gyetsa	M	F II	9469800501	
37	Lopzang Palgas	M	F II	9469800501	
38	Jigmet Norbu	M	F II	9622989225	
39	Churu Tsering	M	F II	No -	
40	Sonam Tashi	M	Farmer	No -	
41	Tsering Angdu	M	Student	No -	
42	Tsering Kunze	F	Worker	9489130272	
43	Tsering Dorjee	M	Namkadar	9419092374	
44	Padma Tigin	M	Farmer	9419854232	
45	Nawang Dechen	M	Villager	9419866912	
46	maakt Langas	F	Farmer	9469591020	
47	Phuntsoy Sonam	M	Farmer	9419176999	

## MEETING REPORT

### Stakeholder Workshop under GoI-UNDP-GEF SECURE Himalaya Project in the UT of Ladakh

#### Preparation of Participatory Integrated Landscape Level Management Strategy and Plans in the Changthang Landscape

October 24th 2020 |10:30 AM-5:30 PM| The Abduz, Leh

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#### Attendees: -

1. Mr Sajjad Hussain Mufti, IFS- Chief Wildlife Warden , Ladakh
  2. Dr O.P. Chaurasia- Director, Defence Institute of High Altitude Research
  3. Mr Tarvinder Singh- Director Horticulture and Agriculture
  4. Dr Tsewang Rinchen- Botanist, National Institute of Sowa Rigpa
  5. Mr Jigmet Namgail- Additional Director, Tourism Department
  6. Dr Tsewang Dorjay- Veterinary Assistant Surgeon, Animal Husbandry Department
  7. Dr Norreen Fatima- Block Veterinary Officer, Sheep Husbandry Department
  8. Mr Tsewang Phunchok- Chief Horticulture Officer, Leh
  9. Mr Tashi Tsetan- Chief Agriculture Officer, Leh
  10. Mr Jigmet Yonnta- Block Development Chairperson, Rong
  11. Dr Tsewang Namgail- Director, Snow Leopard Conservancy- India Trust
  12. Mr Lobzang Visuddha- Chairman, Wildlife Conservation and Birds Club of Ladakh
  13. Ms Nansel Stobdan- UNDP
  14. Ms Stanzin Namdol- IC, UNDP
  15. Dr Saurindra Goswami- Vice-President, Forestry, IORA Ecological Solutions
  16. Ms Janani Pradhan- Assistant Manager, Forestry, IORA Ecological Solutions
  17. Mr Arsh Marwaha- Research Associate, Forestry, IORA Ecological Solutions
- 

- The Stakeholder consultation was attended by officers from different government line departments and NGOs.
- The Chief Wildlife Warden of Ladakh addressed the gathering in his welcome address and laid stress on importance of bringing together of stakeholders for the Changthang landscape.

#### Points of discussion:

- The vision for the landscape management plan needed to have more focus on wildlife, flora (medicinal plants) and should support overall harmony between various sectors.
- The vision and goals to emphasise more on indigenous community of Ladakh, Changpas.
- Issues such as HWC, Feral Dog, Waste Management and Unregulated Tourism were discussed in detail and effective management interventions were suggested.



- Interventions to include value addition of pashmina and yak products for income generation and improved livelihoods.
- Potential interventions in horticulture and agriculture including introducing drought resistance species, indigenous vegetable cultivation and introduction of polycarbonated green houses were discussed.
- Issues pertaining to habitat degradation especially for rangeland and wetlands were discussed in length and interventions were suggested.
- Socio-Cultural issues and interventions were also discussed.

#### Mitigation Strategies Discussed with the Stakeholders

Sector	Issues	Detail of the issues	Mitigation Strategies
<b>Wildlife, Forestry and Environment</b>	<b>Lack of knowledge-Ethno botany study in the region</b>		Folklore, gathering information on traditional knowledge.
	<b>Mapping of Wildlife and Vegetation</b>	Habitat use by wildlife in the landscape is relatively deficient of data. Detailed assessments are needed to map such areas. Vegetation status and cover maps are also required.	Identification of critical for wildlife areas, mapping of specific habitats, mapping for endangered plant species.
	<b>Feral Dog</b>	Issues of feral dog has become one of the biggest issues in the Union Territory. Feral dogs are known to attack local livestock and humans as well	Detailed census of feral dog population is needed which shall engage a multi stakeholder/departmental approach.  Urgent sterilisation effort also needs an inter department effort.  Army/security forces needs to manage their waste and install waste digestors for proper disposal of wet waste.
	<b>Solid Waste Management- dry waste</b>	Plastic waste can be seen spread across the entire landscape. The landscape require an effective waste management strategy and implementation plan.	Inter department efforts require to cub the problem of waste. Waste from Changthang need to reach proper segregation and disposal centre wherein Army can help with the transport. Installation of garbage bins to remote villages for segregation.

Sector	Issues	Detail of the issues	Mitigation Strategies
			Needs for education and awareness among different people from various sectors
	<b>Climate Change</b>	Climate change has caused abrupt changes in precipitation. There has been a decrease in the snowfall and Ladakh has seen aberrant weather patterns. This caused problems in agriculture and horticulture practices as well as there is water scarcity,	People in Changthang have to adapt to the changing climate and mitigate with various strategies like adoption of drought resistant varieties, drip/sprinkler irrigation, artificial glaciers.
	<b>Habitat Degradation</b>	Lack of departmental coordination, climate change, unregulated tourism and pollution has led to degradation of habitats in the Changthang landscape. This in turn disturbs the wildlife occupying these habitats.	Effective management of key habitat areas using zonation plans needs to be done. Developmental plans and decisions needs to be discussed with all major stakeholders before implementation. Tourism needs to be in check.
	<b>Lack of info on Wildlife and vegetation</b>	Limited data is available on certain wildlife and vegetation species.	Detailed assessments are to be done for information on such species.
<b>Animal Husbandry and Sheep</b>	<b>Value Addition</b>	Yak wool and milk products needs to be marketed and promoted for improving the livelihoods of the local communities of Changthang.	Awareness needs to be generated among the youth regarding the Yak products. Value addition of Yak wool and milk products needs to be done. Introduction of skill development programs for Yak products
	<b>Livestock depredation and effective compensation schemes</b>	Conflict between wild predators and people of Changthang include livestock depredation by the carnivores.  The situation is aggravated when compensations are not provided on time.	Streamlining compensation mechanism and introduction of a single window compensation mechanism.  Provision of alternative incentive such as livestock replacement instead of monetary sum.

Sector	Issues	Detail of the issues	Mitigation Strategies
	<b>Feral Dogs</b>	Issues of feral dog has become one of the biggest issues in the Union Territory. Feral dogs are known to attack local livestock and humans as well	Detailed census of feral dog population is needed which shall engage a multi stakeholder/departmental approach.  Urgent sterilisation effort also needs an inter department effort.  Army/security forces needs to manage their waste and install waste digestors for proper disposal of wet waste.
	<b>Pastureland Degradation</b>	Wild ungulates and livestock compete for pastureland in Changthang which burden the resource. Hence, pasturelands are getting degraded.	Proper fodder development on community land with fast growing species,  Convergence with NABARD/ MGNREGA/ KVK for development of fodder.  Promotion of stall feeding.
	<b>Occupation Shift</b>	Young generation not interested in traditional activities of Changpas due to less monetary benefits and lack of better infrastructure facilities.  They also want access to better education.	In order to provide better monetary benefits value addition of additional products other than Pashmina needs to be done.  Livestock production needs to be more remunerative.  Introduction of mobile schools and inculcate traditional practices in schools.
	<b>Lack of Entrepreneurial Interest in the Local Youth/ Lack of collective interest in handloom and handicraft</b>	Traditional handloom and handicraft practices are getting lost due to loss of interest among the youth population.	Proper awareness and training is needed for revival of the traditional practices.  Credit availability for starting upon on entrepreneurial initiatives.  market linkages, branding and promotion strategies needs to be developed.
<b>Agriculture and Horticulture</b>	<b>Water Management</b>	Ladakh is a relative water scare area and is not easily available during the winter months. Due to this reason	Effective water management strategies to include adoption of drought resistant varieties, drip/sprinkler irrigation, artificial glaciers.

Sector	Issues	Detail of the issues	Mitigation Strategies
		agriculture.becomes difficult.	
	<b>Capacity Building and lack of techniques.</b>	Introduction of newer techniques and mechanisms in agriculture and horticulture are required for better yields in the landscape.	Capacity building of farmers on newer techniques.
<b>Tourism</b>	<b>Unsustainable Tourism</b>	Excessive and unchecked tourism causes problem of waste, degradation of habitats and puts extreme stress of natural resources.	Need for regulation on birding, wildlife and general tourism, bikes, especially in the wildlife sensitive areas.  Proper checks are required at various areas in the landscape.
	<b>Less tourism opportunities</b>	Diversification of tourism is required to reduce the stress of popular tourism sites like Pangong Tso and Tsomoriri.	
	<b>Skill Development</b>	Guides, drivers and locals of Changthang engaged in tourism needs to be educated and trained for better management practices and regarding importance of the landscape.	Training of homestays owners guides, drivers.  Accountability for damage to landscape- fines, licensing system (cancel license), Introduction of penalties for violating environmental rules, codes of conduct.
	<b>Urban Migration</b>	Younger generation not interested in traditional activities of Changpas due to less monetary benefits and lack of better infrastructure facilities.  They also want access to better education hence move to the urban centres.	In order to provide better monetary benefits value addition of additional products other than Pashmina needs to be done.  Livestock production needs to be more remunerative.  Introduction of mobile schools and inculcate traditional practices in schools.
<b>RDD</b>	<b>Lack of infrastructure</b>	Current infrastructure in the landscape are not adapted to the changing climate. Moreover, there are not	Construction of culturally relevant and appropriate structures that can sustain aberrant weather patterns

Sector	Issues	Detail of the issues	Mitigation Strategies
		enough structures for women groups.	
	<b>Loss of traditional practices</b>	Traditional practices of the local communities are getting lost due to change in the lifestyle of the younger generation. They are no longer interested in the trans-humane lifestyle as in elders.	Instil a sense of pride about the culture, traditions, art and crafts.  More lucrative and incentive mechanisms needed to be in place for traditional practices.
<b>Socio cultural</b>	<b>Migration</b>	Younger generation not interested in traditional activities of Changpas due to less monetary benefits and lack of infrastructure facilities.  They also want access to better education hence move to the urban centres.	In order to provide better monetary benefits value addition of additional products other than Pashmina needs to be done.  Livestock production needs to be more remunerative.  Introduction of mobile schools and inculcate traditional practices in schools.
	<b>Traditional Knowledge</b>	Along with traditional practices, traditional knowledge about the rich past of the landscape, people and their livestock are being lost	Proper documentation of the folktales, folklores, songs, traditions and culture needs to be done.
<b>Water</b>	<b>Depleting glaciers</b>	Due to global warming glaciers are being depleted. This has caused major water scarcity in some areas in the landscape and farmers have to find new resources of irrigation.	
	<b>Sand mining</b>	Sand from the rivers are being mined illegally and continuously. This causes alteration of river courses, erodes river banks and can lead to flooding. This also destroys important wildlife habitats.	Proper regulations are needed for sand mining.  Dedicated zones should be developed for sand mining.

Sector	Issues	Detail of the issues	Mitigation Strategies
	<b>Wetland degradation</b>	Excessive tourism and unsustainable agricultural practices are degrading the high altitude wetlands of the Changthang, This in turn affects the many aquatic birds that use them as habitats.	Zonation of important wetland areas.  Interdepartmental coordination between various government line departments for developmental activities.
	<b>Groundwater contamination</b>	Due to climate change, Pest damage has increased in the landscape due to which farmers have to use chemicals. Furthermore, in order to increase productivity of the crop inorganic fertilizers are being added. These harmful chemical leech into the soil and contaminate the groundwater.  Excessive tourism also causes groundwater contamination	Sampling of water needs to be on routinely basis.  Soak pits must be discouraged and installation of sewage tanks should be encouraged.  Effective steps must be taken to combat excessive fluoride in the ground water.



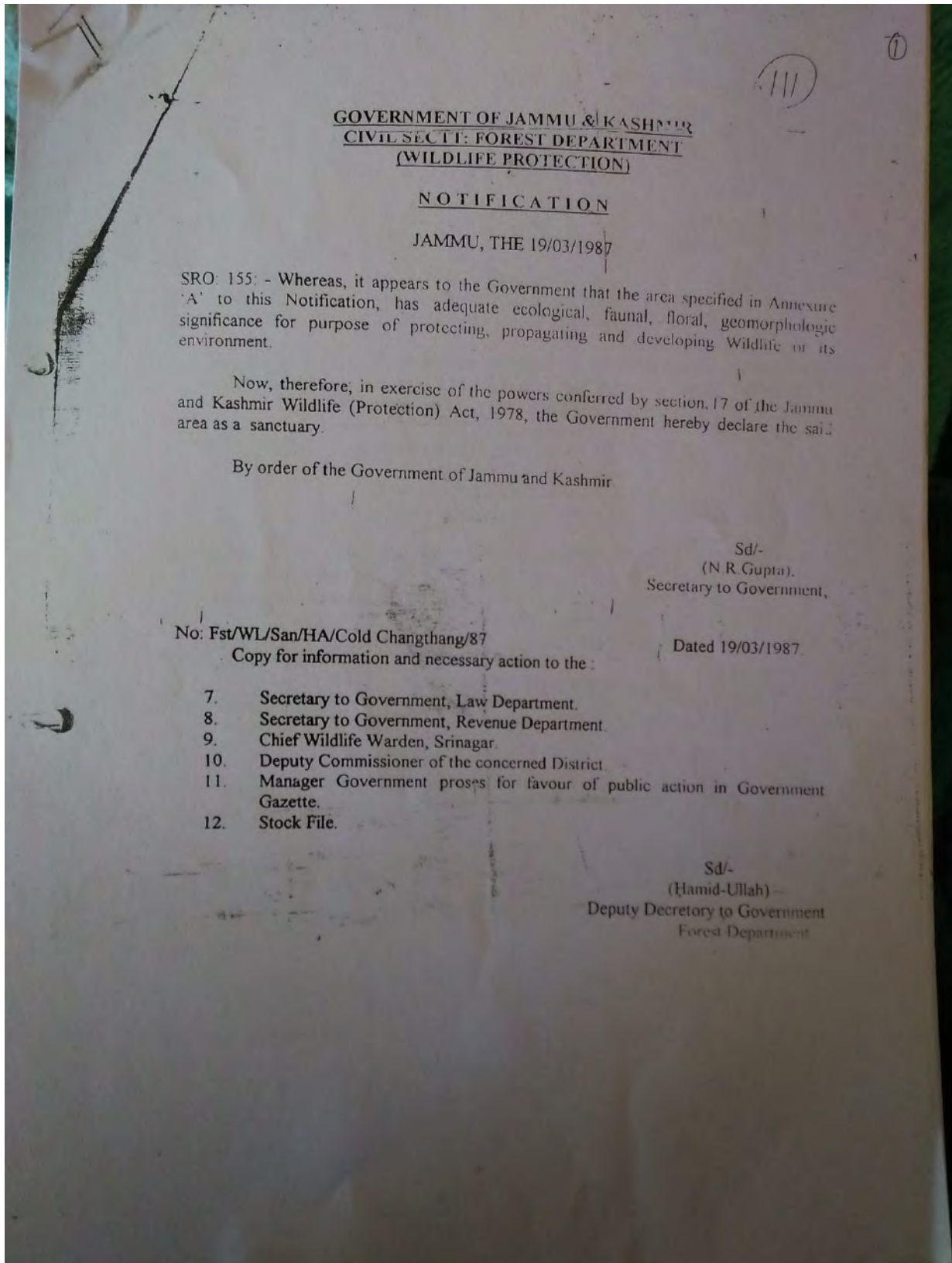


**Annexure 2 Pictures of the Key Informant Interviews and Stakeholder Consultations held in Changthang Landscape**





**Annexure 3 Gazetted Notification for the Changthang Cold Desert Wildlife Sanctuary**



## WILDLIFE STATUS SURVEY REPORT OF HIGH ALTITUDE COLD DESERT (CHANGTHANG WILDLIFE) SANCTUARY

Nomenclature - Apart from holding a few water bodies the proposed area is a barren cold desert but sparsely wooded and experience the severe cold in the region. Thus named as High altitude cold desert Wildlife sanctuary.

Situation :- The proposed Sanctuary is located in the North-east of Leh and constitutes the eastern part of Ladakh region, at a distance of about 130Kms from Leh. The area falls at 34° - 79' north longitude and 33 degree - 79' east latitude.

Boundaries :-  
North - Chilam and Lukoong  
South - Kaigar - Tso and Hanlay  
East - International boundary of China.  
West - Spanger-Tso and Spangong-Tso.

Area :- The area of the proposed High Altitude Wildlife Sanctuary in total is about 4000sq.Kms and includes the water catchment of Indus river Hanlay up to Pongong-Tso enrooting south-eastern catchment uptown China border.

Approach :- The area is easily accessible but the road from Durböck and Karey-Chumathang is rough.

Climate :- Summer is generally cloudless but there is a severe change in temperature during day and night. Temperature from 20 degree C to -40 degree C with annual fall of 76mm.

Configuration :- The topography is conspicuously sloppy and mountains. The fields are thrown into number of inaccessible undulations enclosing narrow galley.

Geology structure and rocks of the area comprising of Himalayan slate, conglomerates, sand stone and lime stone.

The altitude ranges between 14000 to 19000 feet from main sea level.

Human Habitation :- The villages of Nyoma, Nidar, Moodh, Tsaga, Chushul, Hanlay and Kyuual with about 7000 human population living in the heart of the proposed Wildlife Sanctuary.

Rights and concessions :- The inhabitants due indulge in the collection of fuel wood and enjoy the concession of grazing their live stock in the Wildlife sanctuary.



129 (3)

tion - The mountains and river beds are almost barren but sparsely  
ed. Following two biotopes have been identified

- i) Riverian vegetation - The river beds are met with Salix Spp And Myricaria germanica which are scattered in small patches
- ii) Caragana scrub - Small patches of Caragana pyomea are found in the depressions of the area. These bushes become conspicuous on the hill side

Fauna :- The mammals of the area are the Tibetan Wild Ass, the Great Tibetan Sheep, the Bharal, the Wolf, the Red Fox, the Lynx, the Woolly Hare, the Himalayan Mouse Hare etc.

Population estimates of the Tibetan Wild Ass the Great Tibetan Sheep or Nayan and the Bharal in the Proposed Wildlife sanctuary as per the census of 1985 tabulated as under :-

T A B L E -----1<sup>ST</sup>

S.No.	Name of the animal.	Male	Female	Follow-ers.	Total	Add	Grand Total
1	Tibetan Wild Ass or Kiang	228	1316	401	1945	20x 39	1984
2.	Great Tibetan Sheep or Nayan	2	3	1	6	1	7
3.	Blue Sheep or Bharal	15	18	10	43	9	52

Avi-Fauna :- The area harbors unique, rare, endangered and plentiful Wildlife particularly water birds. The main bird species sighted on the inception of winter are the Black-necked Crane. The tibetan sand grouse, the Tibetan partidge, the Bar-headed Geese, the Brahimany Duck, the Chokur the Tibetan Snow cock etc.

Population estimate of the Balck-necked Crane in various water bodies of the proposed Wildlife Sanctuary as per the census of 1985-86 is detailed below :-

T A B L E -----2<sup>ND</sup>

S.No.	Name of the species	Name of the Area	Male	Female	Follow-ers	Total
1.	Black necked Crane	Chushul	1	1	1	3
		Hanlay	1	1	2	4
		Tsobuk	1	1	1	3
		Staklung	-	-	3	3
		TOTAL	3	3	7	13

The estimation of the specie indicated above is incomplete as the census was carried out in the month of November December 1985 when of the crane had already migrated

4

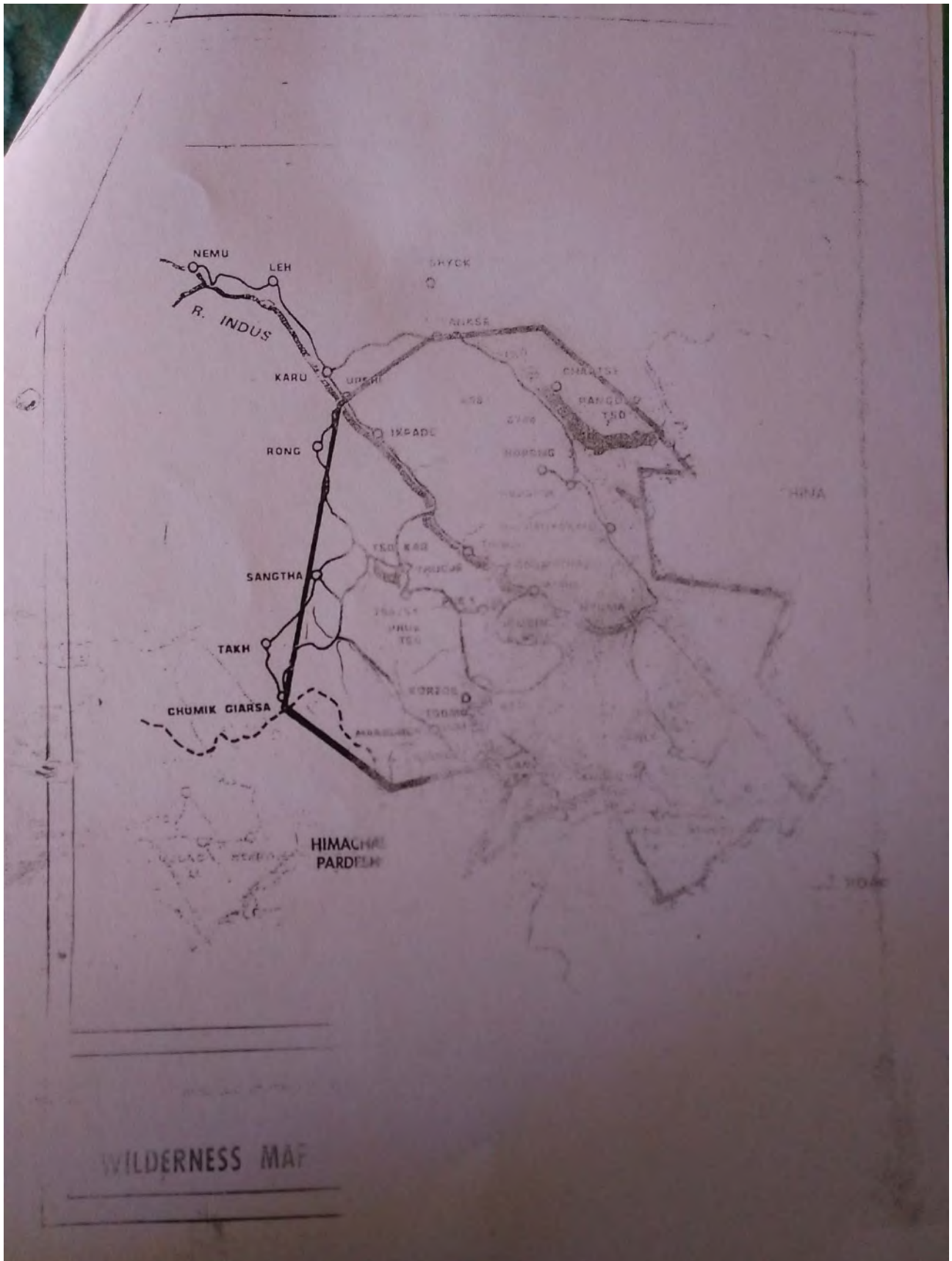
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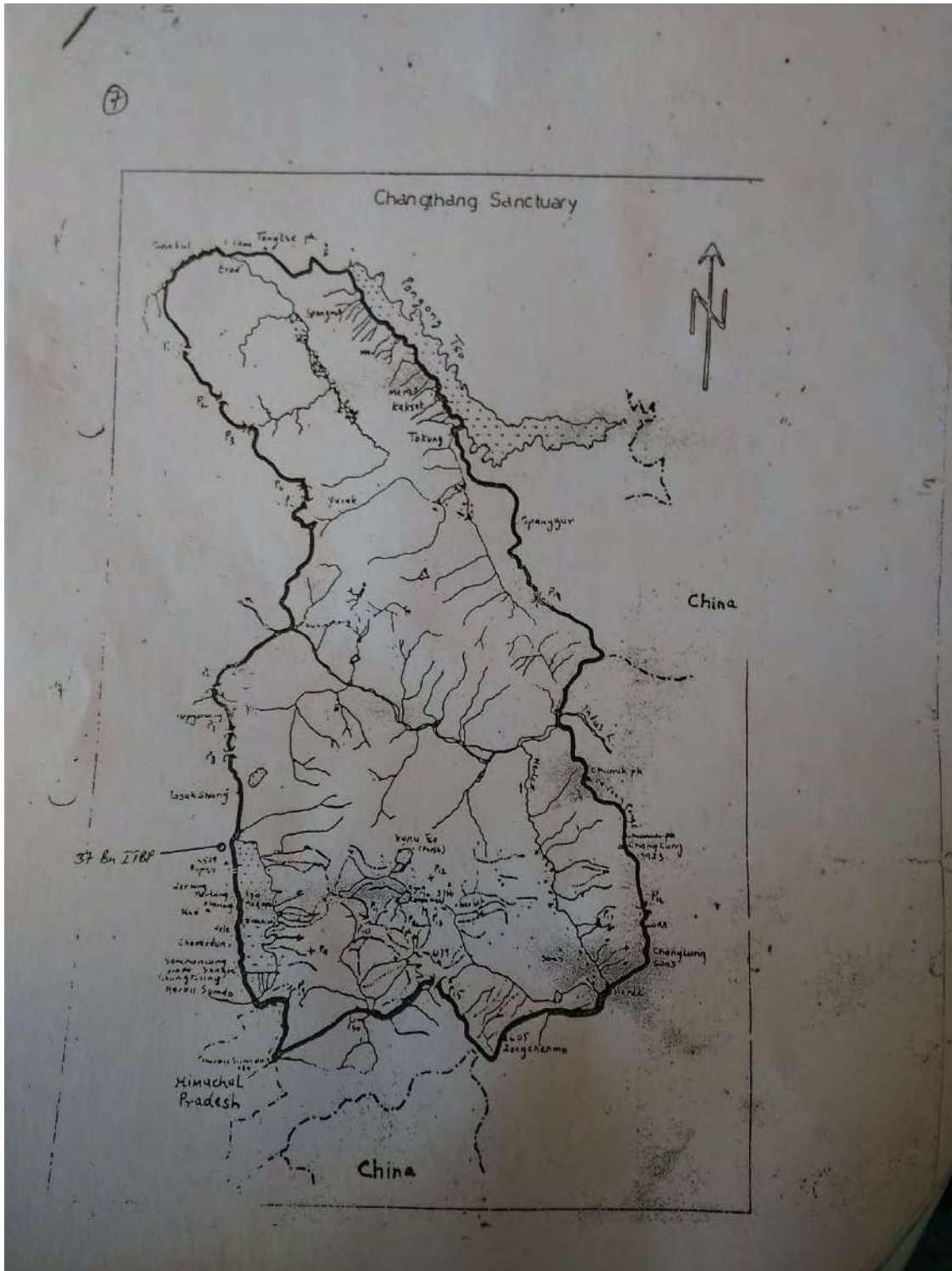
Zonation - The inhabited area including grazing grounds of the proposed Wildlife sanctuary will be designated as the buffer zone when the upper reaches together with the water bodies which are devoid of any human settlement will represent as the core area, to meet the national and international criteria for the establishment of Wildlife sanctuary

Recommendation - The proposed High Altitude Wildlife Sanctuary harbors, unique, rare, endangered and plentiful animal and bird-life such as the Tibetan Wild Ass, the Great Tibetan Sheep, the Lynx, the Himalayan Mouse Hare, the black-necked crane, the Tibetan sand grouse, the Tibetan partridge, the Bar-headed geese, the Brahminy Duck, the Tibetan Snow Cock etc. It is why the area has been recommended to be declared as High Altitude cold desert Wildlife Sanctuary for four principal species viz the Black-necked crane and Tibetan Wild Ass, the Species which are only restricted to this part of the Ladakh region. The area provides the favourable breeding grounds to the resident and migratory mammals and birds in general and the summer migrants in particular. To protect, conserve and multiply the Wildlife species which are native to this part of the Ladakh region viz the wild Ass, The Black necked crane, the Tibetan sand grouse, the Tibetan partridge, the Tibetan snow cock, the Bar headed geese, the Brahminy Duck etc together with their habitat. The project area is proposed to be declared as Wildlife Sanctuary under the section 17 of Jammu & Kashmir Wildlife (Protection) Act of 1978.









**Annexure 4 List of mammals found in the region along with their Conservation status and distribution in Ladakh.**

S.No.	Order	Family	Scientific Name	Common Name	Local Name	Indian Wildlife (Protection) Act 1972	IUCN Status	Distribution in the landscape
1	Artiodactyla	Bovidae	Pseudois nayaur nayaur	Blue Sheep/ Bharal	Napo/ Na	I	Least Concern	Common throughout Ladakh except in its western region. It has an extensive and continuous distribution in Changthang region in the east and covers most of the area upto Zaskar River in the west. Herds of Bharal can be seen in Chumatang-Mahe region, Rupshu, Changthang, including Tsokar, Puga, Tsomoriri and Hanle.
2			Pantholops hodgsonii	Tibetan Antelope/ Chiru	Stzos	I	Endangered	Chiru is distributed in northern and northeastern Ladakh. Daulat Beig Oldi (DBO) in the Karakoram range and Changchenmo valley in Leh re some sites Chiru can be found.
3			Ovis vignei	Ladakh Urial	Shapo, Sha	I	Endangered	Ladakh Urial has a very restricted distribution to valleys of the rivers Indus and Shyok.
4			Ovis ammon hodgsoni	Tibetan Argali	Nyan	I	Vulnerable	The Argali has a minimal and patchy distribution in Ladakh it mostly in the eastern part of Changthang region. Most of its habitat falls along the international border with China near Gya and Meru, upper Rumbak valley, northern slopes towards Taglang-La and above Tsokar basin.
5			Capra ibex sibirica	Asiatic Ibex	Skin	I	Least Concern	In Ladakh it is a common resident throughout western and partly central and southern Ladakh between 3500 and 5200m and can be seen near Lamayuru, Changla and Nubra and Shyok valleys

S.No.	Order	Family	Scientific Name	Common Name	Local Name	Indian Wildlife (Protection) Act 1972	IUCN Status	Distribution in the landscape	
6			<i>Procapra picticaudata</i>	Tibetan Gazelle	Goa	I	Least Concern	The population has been isolated to few spots and were best recorded from Kalak-Tartar plains south of Hanle valley.	
7			<i>Bos grunniens</i>	Wild Yak	Dong	I	Vulnerable	In Ladakh, the wild Yak has been reported from Changchenmo valley at an altitude between 4320-6000m.	
8			<i>Equus kiang</i>	Tibetan Wild Ass	Kiang	I	Low Risk	Kiang is a typical mammalian species throughout eastern and northern Ladakh and can be sighted in Rupshu and Changthang region, including Tsomoriri, Hanle, Chumur, Chushul, Tsokar and upper Markha valley.	
		Perissodactyla							
9		Carnivora	Felidae	<i>Uncia uncia</i>	Snow Leopard	Shan	I	Endangered	The big cat is present throughout Ladakh, mostly in the south and central regions between 3000 and 5000m. In Ladakh it can be best sighted within Hemis National Park and Zaskar valley.
10				<i>Lynx isabellina/ Felis lynx/ Lynx lynx</i>	Lynx	Eeh	I	Near Threatened	The lynx has been recorded from Hunder and Panamik area. It has also been observed in Ladakh and near Gya-Miru area of Leh.
11				<i>Otocolobus manul/ Felis manul</i>	Pallas's Cat	Trakshan	I	Near Threatened	The small cat is found only in eastern Ladakh at an elevation between 3000 to 4800m near Rupshu.
12			Canidae	<i>Canis lupus chanku</i>	Tibetan Wolf	Changu	I	Least Concern	The wolf is found distributed in the eastern and northern region between 3000 and 5000m, around Rupshu and Changthang plains and to some extent in Markha, Upper Suru and Zaskar.
13	<i>Cuon alpinus</i>			Tibetan Wild Dog	Phara	II	Endangered	The wild dog is seen throughout the eastern and northern region upto 4000m or higher and can be sighted in Rupshu, Changthang area, the eastern part of Hemis National Park and eastern Zaskar.	
14	<i>Vulpes vulpes</i>	Red Fox		Whatse	II	Least Concern	It is widespread throughout Ladakh and is best encountered in Suru, Markha, Nubra, Zaskar		

S.No.	Order	Family	Scientific Name	Common Name	Local Name	Indian Wildlife (Protection) Act 1972	IUCN Status	Distribution in the landscape
								Indus valley, and high altitude slopes of Changthang and Rupshu region.
15		Ursidae	<i>Ursus arctos isabellinus</i>	Himalayan Brown Bear	Den-mo	II	Low Risk	It has been reported from south and western Ladakh and can be sighted in upper Suru, Zaskar and Changchu valley.
16		Mustelidae	<i>Mustela erminea</i>	Himalayan Stoat	Lakimo	II	Low Risk	In Ladakh it is distributed around Suru and Zaskar valleys and Markha valley in Hemis National Park.
17	<i>Mustela altaica</i>		Mountain Weasel	Lakimo	II	Low Risk	In Ladakh the animal is encountered in Hemis National Park, Shey, Thikse, Zaskar valley, Tsokar basin and Hanle.	
18	<i>Mustela foina</i>		Stone Marten	Kogar	II	Low Risk	Occasionally sighted in Ladakh, the population of Matrín is limited to Kargil region, lower Indus, Nubra valleys and lower region of Hemis National Park.	
19	<i>Lutra lutra</i>		Eurasian Otter	Chusham	II	Near threatened	In Ladakh otters can be found up to 3700m along the Indus River and its tributaries, including Rumtse and lower Zaskar.	
20	Rodentia	Sciuridae	<i>Marmota himalayana</i>	Himalayan Marmot	Phia	II	Low Risk	Common species found in central-south, the eastern, northern Ladakh, including Upper Markha valley in Hemis National Park, Tsokar, Rupshu, Puga and Tsomoriri in Changthang plains.
21			<i>Marmota caudata</i>	Long tailed Marmot	Phia	II	Low Risk	It is found near the upper Rumbak valley westwards through the Zaskar and upper Suru region around 3500-5000m.
22		Muridae	<i>Alticola argentatus</i>	Silver Mountain Vole	Zabra	IV	Low Risk	The small rodent is found at a height up to 4700m in the Tsokar plains, which lies in the eastern portion.
23			<i>Alticola roylei</i>	Royle's Mountain Vole	Zabra	IV	Low Risk	It is a common species found in Suru Valley, the Zaskar and Chang-chu valley around 3000 to 3300m and above.
24			<i>Alticola stoliczkanus</i>	Stoliczka's Mountain Vole	Zabra	IV	Low Risk	The vole species can be found in Rupshu and Changthang regions like Tsokar, Puga,

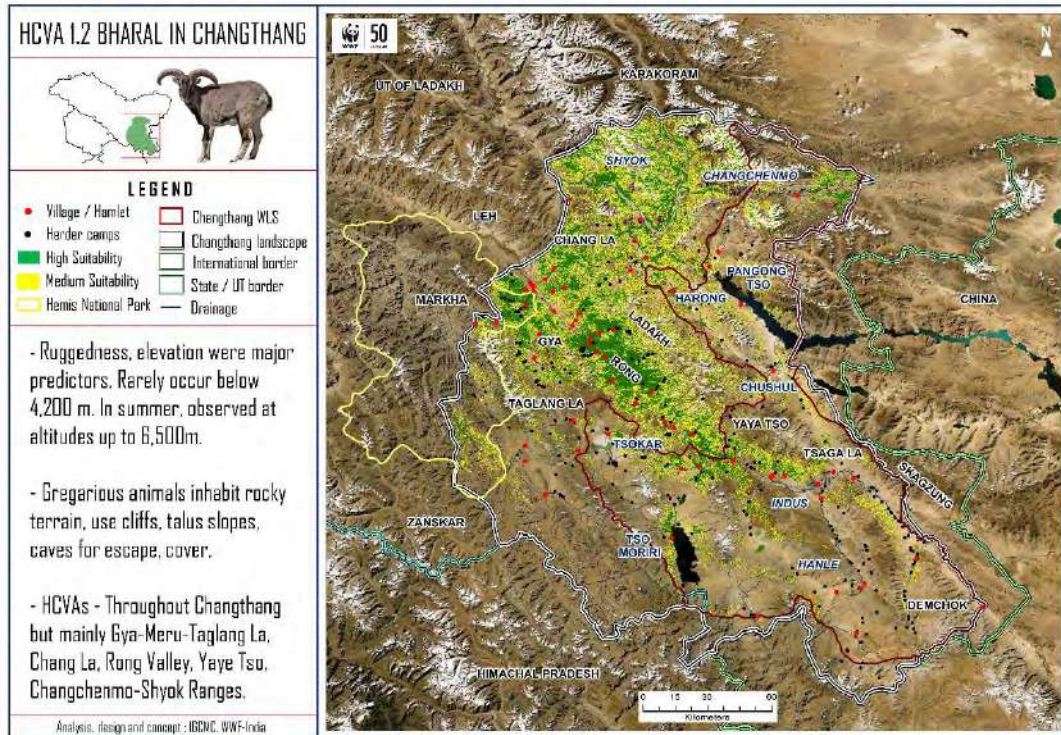
S.No.	Order	Family	Scientific Name	Common Name	Local Name	Indian Wildlife (Protection) Act 1972	IUCN Status	Distribution in the landscape
								Chumur, Hanle and Chushul plains from 4000 to 5500m.
25	Lagomorpha	Leporidae	Lepus capensis	Cape Hare	Ribong	IV	Low Risk	It is found near Nubra and Shayok valleys and is rather common in the north-western and north-central region of Ladakh around 3500m.
26			Lepus oiostolus	Woolly Hare	Ribong	IV	Low Risk	Woody Hare common in the north, east and southern regions around 4000 and 5400m and can be seen in Rupshu and Changthang plains including Tsokar, Hanle and Chushul
27		Ochotonidae	Ochotona curzoniac	Plateau Pika	Zabra	IV	Low Risk	Found in the steppes of east and northern Ladakh between 4100 and 4700m around Changthang and Rupshu, including Tsokar and Chushul plains.
28			Ochotona ladacensis	Ladakh Pika	Zabra	IV	Low Risk	A common species Found in Tsokar and Hanle plains of the eastern and northern Ladakh between 4400 and 5600m.
29			Ochotona nubrica	Nubra Pika	Zabra	IV	Low Risk	Found in the central region of Ladakh between 3100 and 3500m along Indus valley and Shyok River, especially the Hunder, Diskit and Panamik region.
30			Ochotona macrotis	Large-eared Pika	Zabra	IV	Low Risk	Occasionally found in the central region between 3100 and 4200m around in lower Hunder valley and towards Khardungla.
31			Ochotona roylei	Royle's Pika	Zabra	IV	Low Risk	The small Pika is found between 3100 and 4000m around upper Suru and Zanskar valleys and Hanle region to some extent.

Sources: Bhatnagar Y. V., 2011 & Tahir Shawl et al, 2008

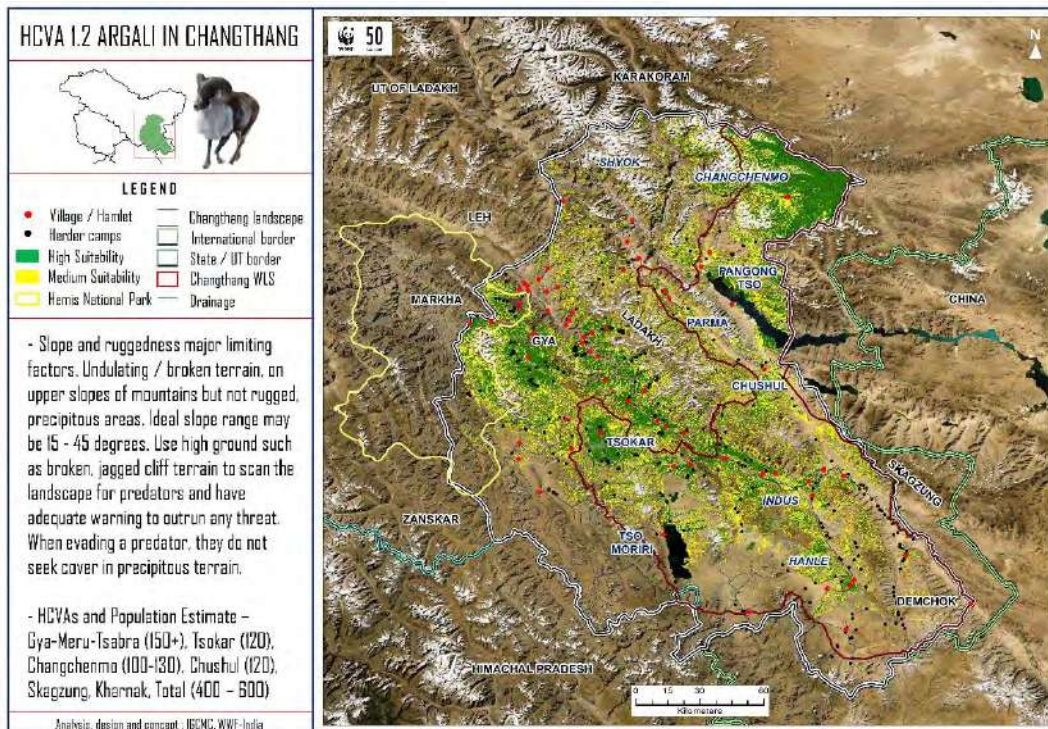


**Annexure 5 Maps of HCV Areas for viable populations of threatened, restricted range or protected species (WWF-India, 2020)**

**1. HCVAs for Bharal**

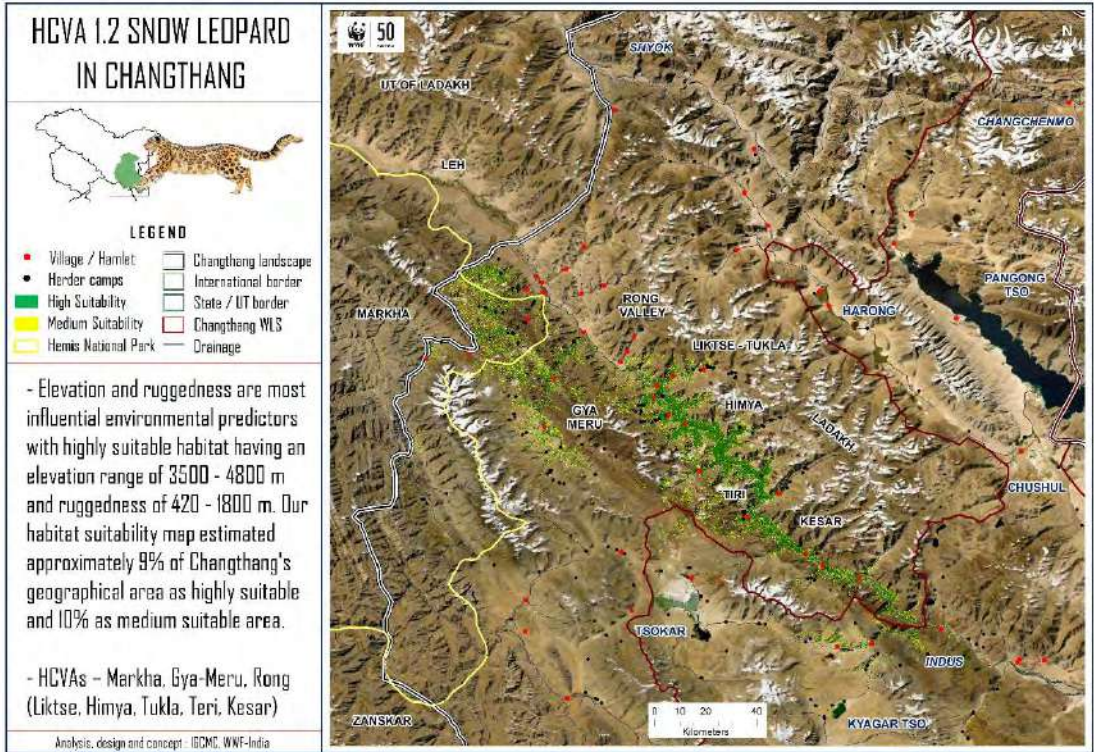


**2. HCV Areas for Tibetan Argali**

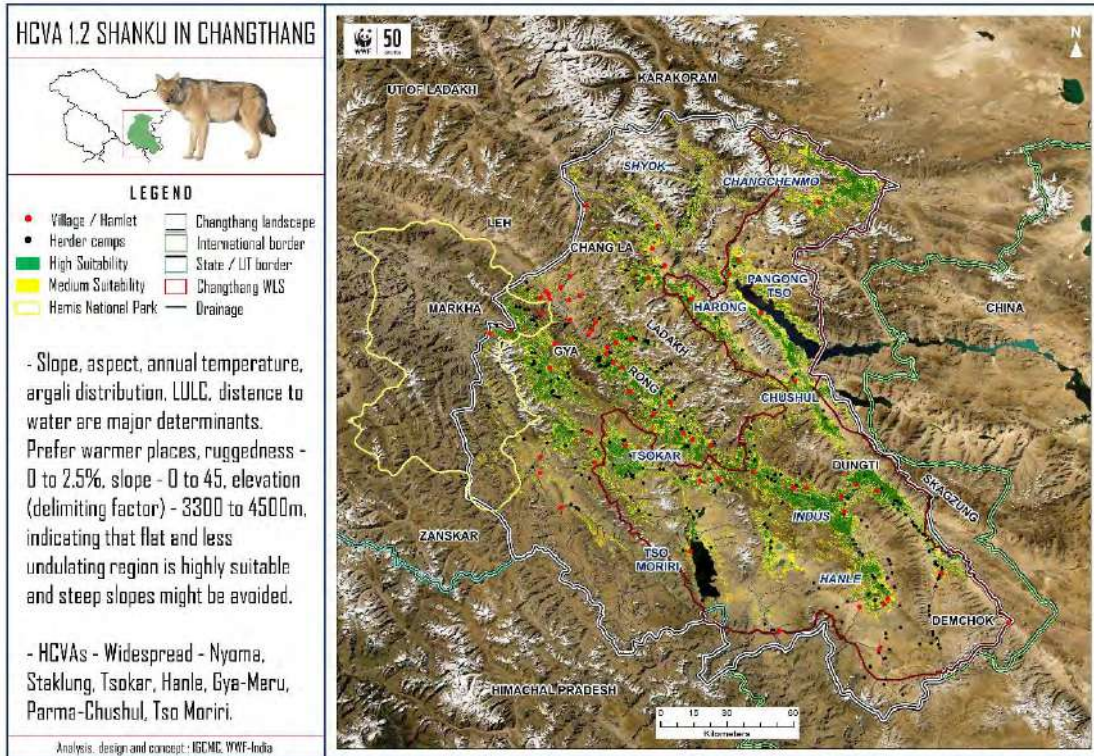




### 3. HCVA for Snow leopard

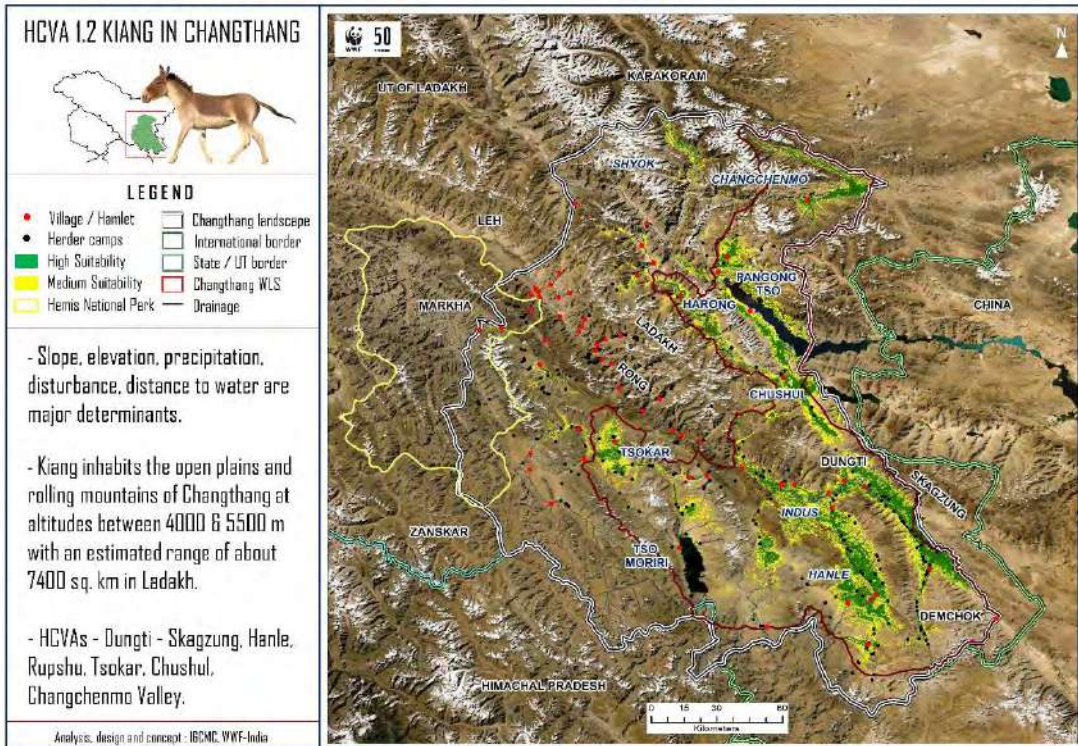


### 4. HCVA for Tibetan wolf

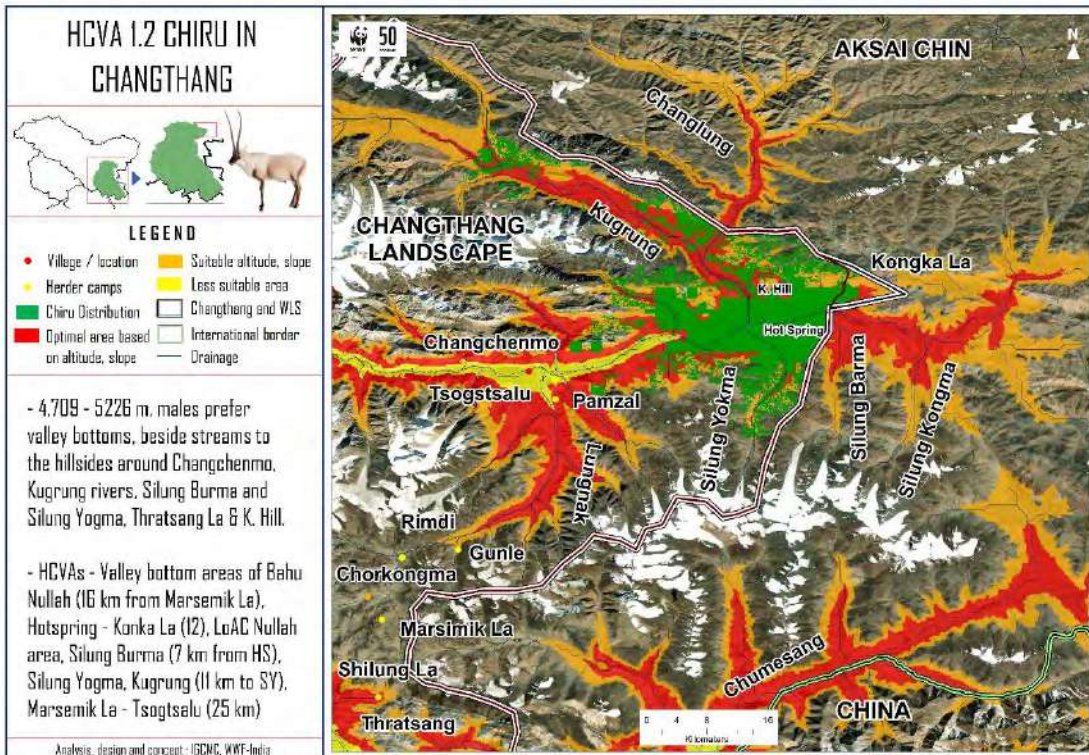




## 5. HCVA for Tibetan wild ass

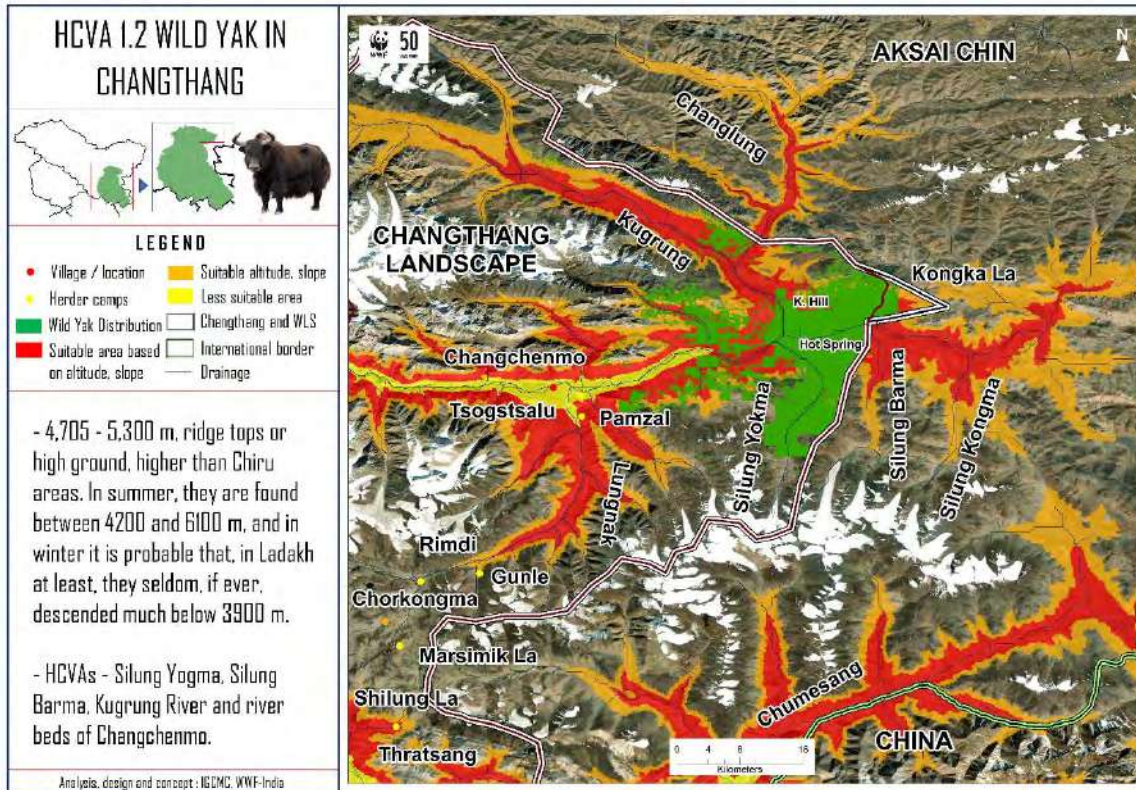


## 6. HCVA for Tibetan antelope (Chiru)

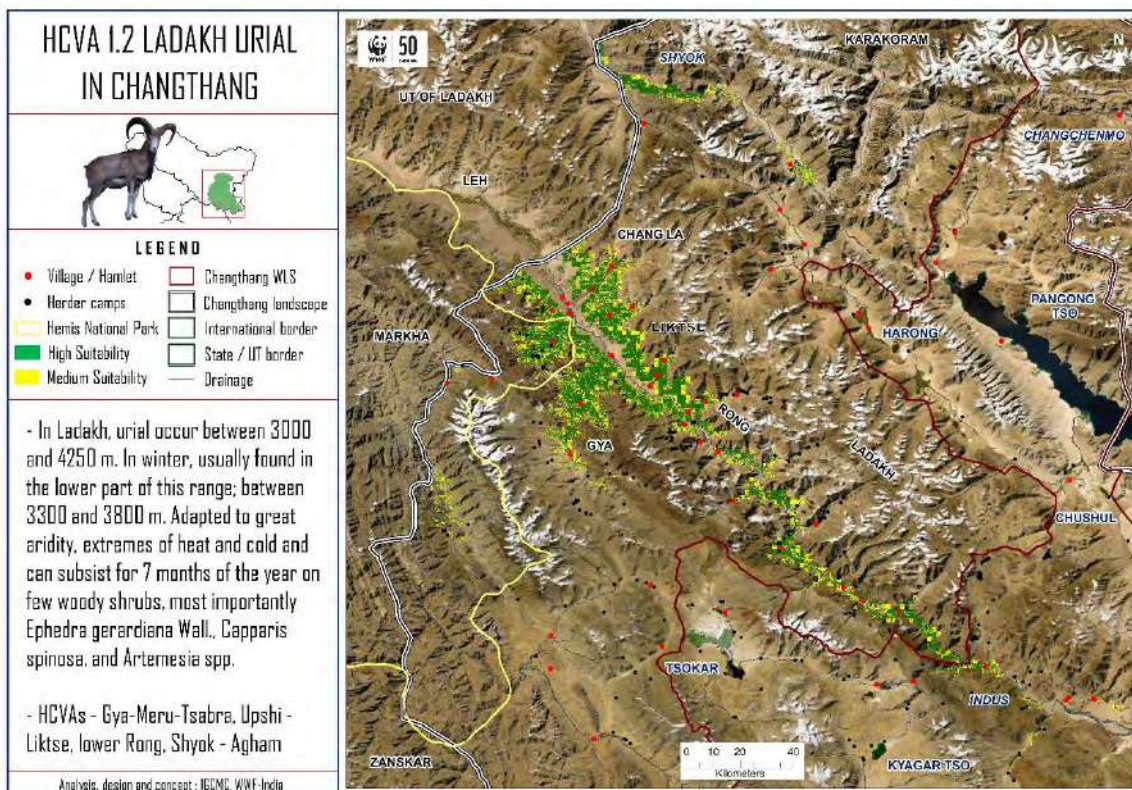




## 7. HCVA for Wild yak

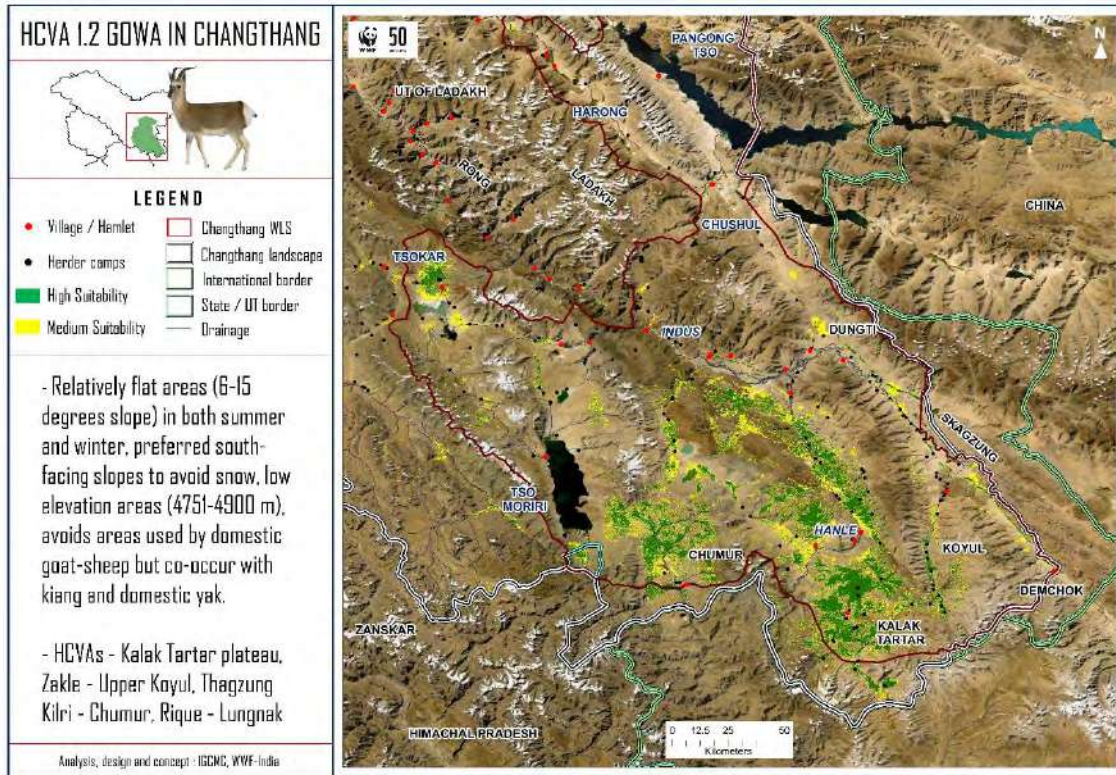


## 8. HCVA for Ladakh urial

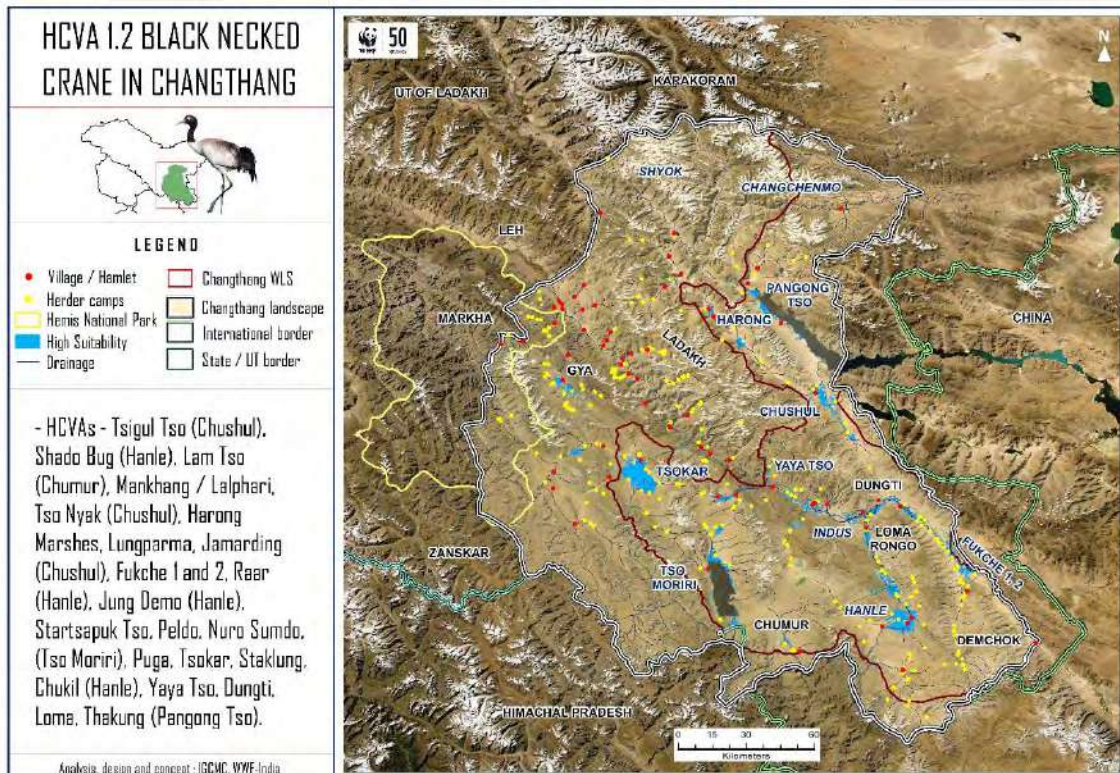




## 9. HCVA for Tibetan gazelle (Gowa)

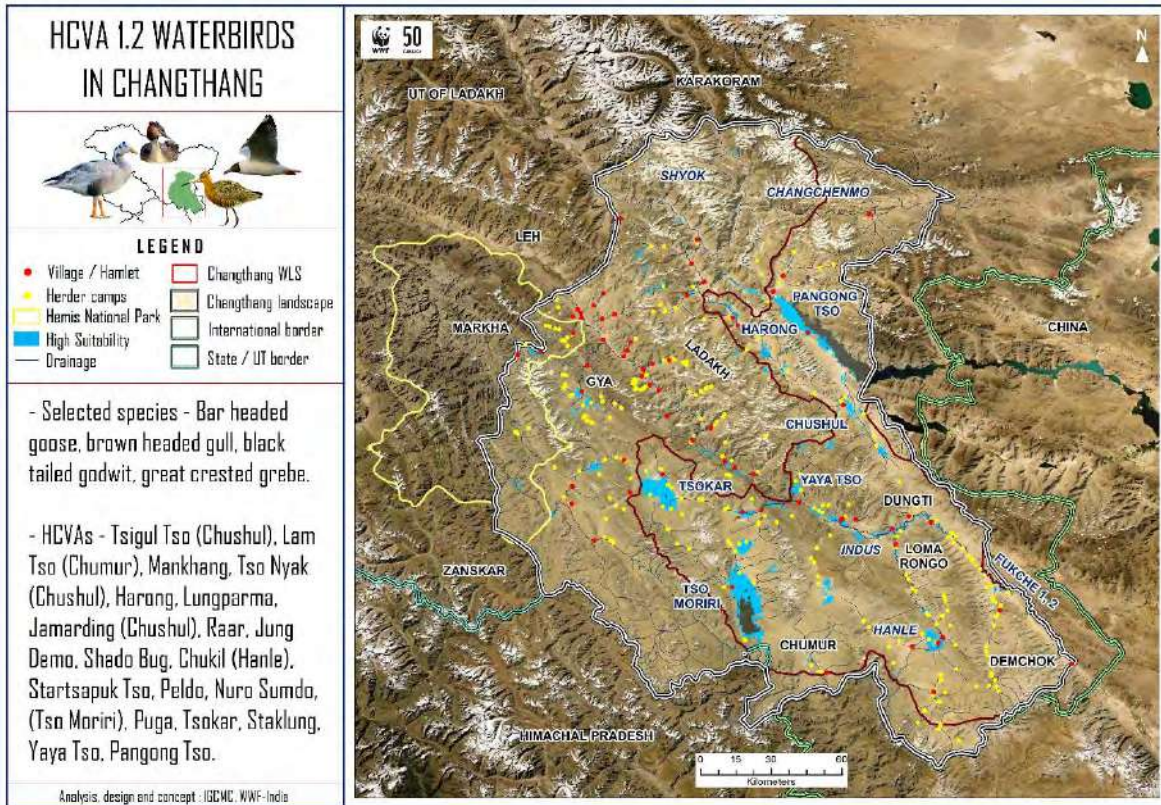


## 10. HCVA for Black necked crane

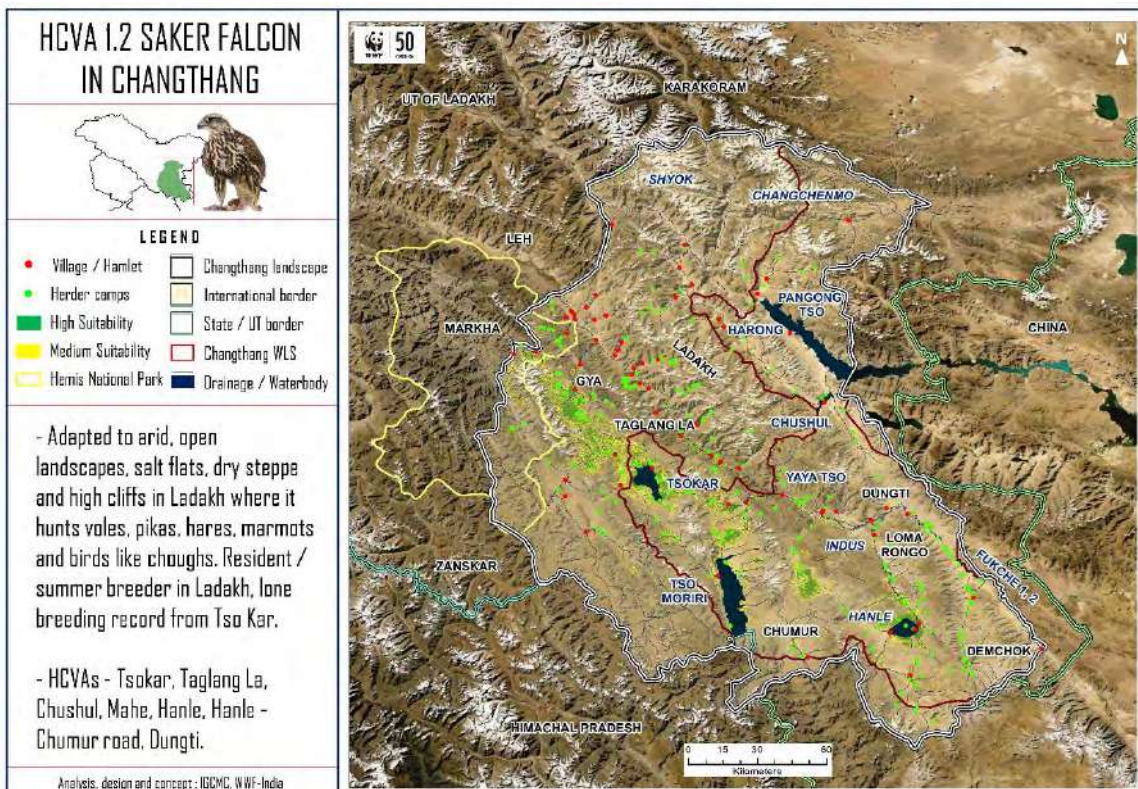




## 11. HCVA for Waterbirds

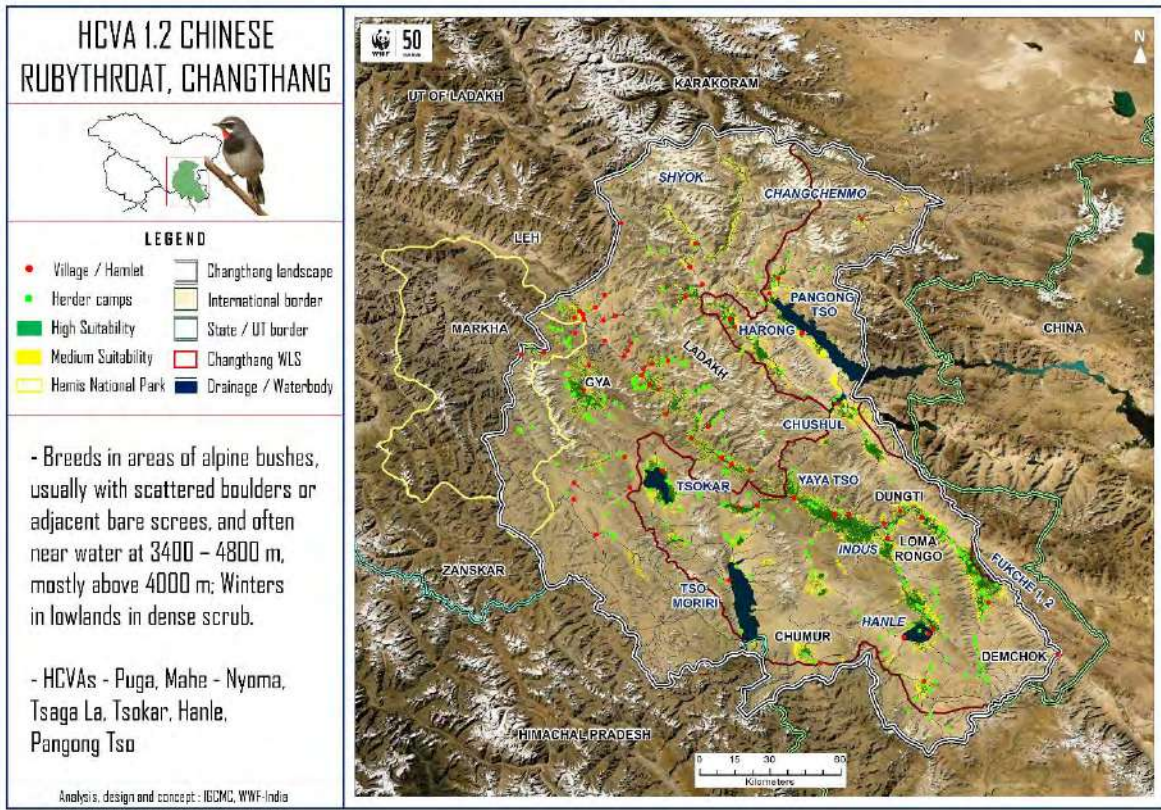


## 12. HCVA for Saker falcon





### 13. HCVA for Chinese rubythroat



**Annexure 6 Area under different crops in Changthang Landscape (hectares)**

Villages	Wheat	Barley	Pulses	Millet	Vegetables	Oil Seed	Fodder	Fruit	Others	Total
Chumathang		26.6	0.1		0.5		10.8		0	38
Chumur	30		4		10	3	30	11.06		88.06
Chushul		8			2		35	0		45
Demchok (Demjok)		6.2					0.8			7
Durbuk		41			3		30	0.76		74.76
Gya		60.9			2	0.5	25.6			89
Hanle		73.5			0.5		31			105
Himya		22.1	0.1		0.5		10.8	1.58		35.08
Kargyam		10	1		0.2		25.8			37
Kerey		24.65			0.2		4.15	0.64		29.64
Kharnak							9			9
Korzok		9.45			0.1		11.45			21
Koyul		12.6			0.3		16.15			29.05
Kungyam		33.75	0.6		0.8		9.85	0.38		45.38
Liktse		17.6	0.6		1.2		2.6	4.3		26.3
Mann		3			0.1		44.9			48
Meru		24			1		9			34
Mood		30.55			0.3		16.15			47
Nyoma		33.6			0.3		16.15			50.05
Samad Rokchen							2			2
Shachukul		32			0.5		23.5			56
Skitmang		15.3			0.2		2.68			18.18
Tarchit		24			0.1		5.9	2.1		32.1
Teri		13			0.3		1.7	0.27		15.27
Tukla		24.75	0.1		0.4		7.75			33
Total	30	546.55	6.5	0	24.5	3.5	382.73	21.09	0	1014.87

**Annexure 7 Chemical Fertiliser Use in Changthang Landscape (Source: Agriculture Department)**

Village	Use (quintals per year)		
	2016	2017	2018
Chumathang	75	75	35.75
Chumur	56.5	51.5	40
Chushul	0	0	0
Demchok (Demjok)	0	0	0
Durbuk	134	134	129
Gya	81	60	80
Hanle	0	0	0
Himya	31	31	31
Kargyam	0	0	0
Kerey	0	0	0
Kharnak	0	0	0
Korzok	0	0	0
Koyul	0	0	0
Kungyam	30	30	30
Liktse	59.5	59.5	25
Mann	0	0	0
Mood	0	0	0
Nyoma	50	50	53.5
Samad Rokchen	0	0	0
Shachukul	67	67	57
Shyok	0	0	0
Skitmang	0	0	0
Sumdo	0	0	0
Tarchit	0	0	0
Tukla-Teri	25.5	25.5	25
Total	609.5	583.5	506.25

**Annexure 8 Animal Husbandry Details for Changthang Landscape (Source: Animal Husbandry Department)**

Villages	Cattle		Yak	Sheep		Goat	Horse/ Ponies	Mules	Donkeys	Camel	Dog	Rabbits	Poultry
	Exotic	Indigenous		Exotic	Indigenous								
Chumathang	0	113	35	74	207	531	14	0	31	0	24	0	0
Chushul	16	681	1043	0	2108	12343	139	0	0	0	94	0	0
Demjok	0	1	155	0	468	4794	24	0	0	0	43	0	0
Durbuk	57	590	490	0	340	1065	362	19	6	0	25	0	1
Gya	0	512	657	0	1483	1678	267	0	0	0	60	0	0
Hanle	2	462	1048	0	5748	16729	311	0	7	0	149	0	0
Himya	2	234	52	0	18	424	0	0	0	0	150	0	0
Kargyam	0	136	1473	0	3114	11198	150	0	0	0	84	0	0
Kerey	8	222	92	0	221	1337	14	0	10	0	11	0	0
Kharnak	0	0	3491	0	1921	7859	82	0	0	0	25	0	0
Korzok- chumur	8	141	1625	0	13918	27791	582	0	98	0	104	0	0
Koyul	5	80	409	0	2818	14807	136	0	3	0	173	0	0
Kungyam	0	217	83	0	6	237	26	0	0	0	14	0	0
Liktse	4	102	17	0	16	0	0	0	0	0	12	0	48
Mann	9	543	663	0	1745	9527	338	0	28	0	77	0	0
Meru	3	115	34	0	181	723	32	0	11	0	9	0	0
Nyoma	39	336	114	0	2425	4840	165	0	64	0	98	0	0
Samad Rokchen	0	0	1152	0	8492	18141	121	0	0	0	84	0	0
Shachukul	38	298	430	0	329	1035	122	1	87	0	47	0	0
Skitmang	0	113	35	0	207	531	14	0	31	0	24	0	0
Sumdo	0	5	148	0	4120	13020	151	0	35	0	86	0	2
Tarchit	6	85	35	0	39	374	0	0	0	0	6	0	0
Tangste	43	454	173	0	121	1004	163	0	24	0	33	0	0
Teri	0	131	89	0	107	776	25	0	51	0	15	0	0
Tsaga	46	120	249	0	4751	18272	280	0	23	0	182	0	0
Tukla	16	165	187	0	74	276	0	0	5	0	16	0	0
<b>Total</b>	<b>302</b>	<b>5856</b>	<b>13979</b>	<b>74</b>	<b>54977</b>	<b>169312</b>	<b>3518</b>	<b>20</b>	<b>514</b>	<b>0</b>	<b>1645</b>	<b>0</b>	<b>51</b>

### Annexure 9 Tourist Arrival Details for Leh

S. No	Nationality	2009	2010	2011	2012	2013	2014	2015	2017	2018
1	Canadian	785	409	585	785	586	1120	564	883	846
2	American	1909	1654	2074	1909	2770	4798	1994	3070	2820
3	French	3677	2974	3715	3677	4913	8110	3842	4825	5067
4	German	1872	1380	2150	1872	2950	4429	2185	2810	2891
5	Swiss	867	770	852	867	1340	2860	1165	1115	942
6	Australian	818	398	565	818	963	1886	948	1261	1317
7	English/British	2605	1272	2099	2605	2639	4301	2419	2351	2784
8	Italian	1980	720	1341	1980	1599	3240	1245	2235	2025
9	Others	16057	12538	23281	23997	14123	28561	15252	28043	30785
10	Indian	48517	55685	142829	140460	107412	121996	116887	230662	277889
	Total	79087	77800	179491	178970	139295	181301	146501	277255	327366

### Annexure 10 Domestic and Internation Tourists Arrival Details for Leh

Year	Indians	Foreign	Total
2002	2959	5109	8068
2003	13031	15362	28393
2004	13483	21608	35091
2005	13444	24536	37980
2006	17707	26114	43821
2007	22007	28178	50185
2008	39023	35311	74334
2009	48517	30570	79087
2010	55685	22115	77800
2011	142829	36662	179491
2012	140460	38510	178970



Year	Indians	Foreign	Total
2013	107412	31883	139295
2014	121996	59305	181301
2015	116887	29614	146501
2016	197693	38005	235698
2017	230662	46593	277255
2018	277889	49477	327366

### Annexure 11 Threat Ranking and Scoring

Threat Identification and Ranking ( Margoluis & Salafsky, 2001)						
S. No.	Threat	Criteria Rankings			Total Score	Final Ranking
		Area	Intensity	Urgency		
1	Boundary issues	14	13	14	41	1
2	Feral dog	13	14	13	40	2
3	Human wildlife conflict	12	12	12	36	3
4	Unregulated tourism	11	10	10	31	4
5	Habitat degradation-pastureland and wetlands	10	11	8	29	5
6	Lack of convergence between departments	9	7	11	27	6
7	Solid waste management	8	8	9	25	7
8	Lack of value addition	7	9	6	22	8
9	Lack of capacity building and skill development	5	4	7	16	9
10	Lack of infrastructure	3	6	5	14	10
11	Education and awareness	4	5	4	13	11
12	Lack of information and wildlife and vegetation	6	3	2	11	12
13	Loss of traditional practices/Migration	2	2	3	7	13
14	Illegal wildlife trade	1	1	1	3	14
	Total	105	105	105	315	

**Annexure 12 Identified Grazing Patches in Changthang Landscape**

Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Dutey	Anlay/Ruqu	Nyoma	Summer	7th April- 27th April /21	13.67	4699	79.0164	32.8847
Palzo/Katlay	-do-	-do-	Summer	21st Aug- 14th Sept/24	7.58	4863	79.0093	32.9167
Gonka maru	-do-	-do-	Summer	28th Apr- 30th May/33	4.86	4856	79.0059	32.9312
Changlung	-do-	-do-	Winter	17th Dec- 5th Jan/19	9.14	4830	79.0017	32.937
Radhar	-do-	-do-	Spring	6th Jan- 6th Apr/91	7.73	4476	78.9981	32.8663
Thara	-do-	-do-	Summer	21st Jun- 20th Aug/60	22.23	4272	78.979	32.8382
Gunlung	-do-	-do-	Summer	1st Jun- 20th Jun/20	10.6	4471	79.0256	32.8321
Manlung	-do-	-do-	Autumn	16th Nov- 16th Dec/31	13.67	4401	79.0439	32.7641
Anlay khaldo	-do-	-do-	Autumn	15th Sep- 15th Nov/61	10.33	4259	78.9791	32.7726
Zaglay, Monmo, Sangnakpo	Anlay/Dequ	-do-	Spring	1st Jan- 15th Apr/105	78.92	4804	79.0072	32.5982
Khaldha, phukthawo	-do-	-do-	Winter	11th Dec- 30th Dec/20	8.9	4761	78.9903	32.5677
Dungung, Phokthawo go	Anlay/Dequ	Nyoma	Spring	16th Apr- 15th May/30	24.83	4761	78.9835	32.5654
Chomek gongma, Naktsang	-do-	-do-	Autumn	21st Nov- 10th Dec/20	125.32	4849	78.9918	32.4877
Chomek gongma, Darlung	-do-	-do-	Summer	16th May- 16th Jun/30	37.69	4849	78.9918	32.4877
Bongnak, Thuklay	-do-	-do-	Autumn	1st Nov- 20th Nov/20	74.41	4962	78.9859	32.4693
Bongnak	-do-	-do-	Summer	16th Jun- 25th Jul/40	74.41	4962	78.9859	32.4694
Lokpuk	-do-	-do-	Summer	26th Jul- 9th Sep/45	48.88	4639	79.0551	32.4312

Name of Pasture	Village	Block	Season	Months / No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Anlay khaldo	-do-	-do-	Autumn	10th Sep- 30th Oct/50	97.42	4326	78.9805	32.7715
Chogam, Zongchano	Anlay/ Ponguk	Nyoma	Summer	26th Jul- 4th Sept/39	10.33	4769	78.8284	32.7027
Tselunk	-do-	-do-	Summer	18th Apr- 18th Jun/61	61.54	4726	78.811	32.758
Dad	-do-	-do-	Autumn	21st Oct- 10th Nov/20	50.7	4813	78.7234	32.848
kongra	-do-	-do-	Autumn	11th Nov- 30th Nov/20	24.01	4758	78.7423	32.8266
Khaptak, Changchek	-do-	-do-	Winter	17th Jan- 17th Apr/91	36.51	4551	78.8492	32.779
kamgar	-do-	-do-	Winter	16th Dec- 16th Jan/31	38.3	4321	78.9277	32.8033
Anlay ponguk	-do-	-do-	Summer	19th Jun- 25th Jul/37	20.01	4333	78.895	32.7582
Anlay ponguk	-do-	-do-	Winter	1st Dec- 15th Dec/15	20.01	4331	78.8946	32.7591
Remo dong	-do-	-do-	Autumn	5th Sep- 20th Oct/46	2.86	4309	78.9517	32.7829
Chomik	Anlay/karluk	Nyoma	Spring	26th Jan- 25th Apr/90	43.37	4585	79.0475	32.6808
Kalak Terter, zadh	-do-	-do-	Summer	11th May- 5th Jun/25	21.18	4818	78.9933	32.6417
Nug tung	-do-	-do-	Winter	11th Dec- 25th Jan/45	13.78	5678	78.9725	32.6077
Chobolay	-do-	-do-	Winter	21st Nov- 10th Dec/20	8.67	4657	78.9657	32.5883
Tsak lay	-do-	-do-	Autumn	21st Oct- 20th Nov/30	63.33	4428	78.9341	32.5373
Taknak po	-do-	-do-	Summer	6th Jun- 5th Aug/60	103.04	5198	78.936	32.5338
Ghaynon	-do-	-do-	Summer	6th Aug- 4th Sep/29	72.18	4681	78.9135	32.4941

Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Khulung	-do-	-do-	Summer	26th Apr -10th May/15	22.05	4905	78.9921	32.659
Anlay khaldo	-do-	-do-	Autumn	5th Sep 20th Oct/46	10.33	4435	78.9799	32.7722
Tsecum	Mahey	Nyoma	Summer	5th Apr 30th Jun/55	9.1	4835	78.5024	33.3612
Yayatso	-do-	Nyoma	Summer	1st Jul 30th Aug/60	2.56	4887	78.4853	33.3374
Kotsa	-do-	Nyoma	Spring	15th Feb 30th Mar/45	0.81	4589	78.5038	33.3051
Chumathang phu	-do-	Nyoma	Winter	1st Jan 25th Feb/45	4.62	4144	78.3534	33.3685
Tsomgo	Mundil kaser	Nyoma	Summer	1st Mar 15th Jun/105	16.82	4183	78.261	33.4073
Sirsi	Skitmang	Nyoma	Summer	1st Jul-30th Sep/90	8.75	4370	78.257	33.3563
Zalung	-do-	Nyoma	Summer	1st Jul 1st Sep/90	6.17	4370	78.2568	33.3556
Tapuk	-do-	Nyoma	Summer	1st Jan 1st Jun/180	12.68	4579	78.2438	33.3582
Tseu	-do-	Nyoma	Winter	1st Nov 1st Dec/60	5.36	4488	78.2506	33.3597
Zershing phu	Mundil kesar	Nyoma	Summer	1st Mar 15th May/75	36.86	4156	78.2308	33.4253
Nyokar	-do-	Nyoma	Summer	1st Mar 15th May/75	0.11	4153	78.2297	33.4226
Katpa thonpo phu	keri sriyoul nee kaser	Nyoma	Winter	1st Dec 1st Jan/30	6.7	4067	78.1297	33.4953
Danggay	Nee	Nyoma	Winter	10th Feb 5th Mar/25	18.83	4756	78.2405	33.471
Gyayekphu	gyayek	Nyoma	Summer	1st Mar 1st Oct/183	7	3891	78.1543	33.5549
Kongma	Chushul	Durbuk	Summer	1st March to 15th June /95	3.86	4743	78.456	33.7174
Kongma	Chushul	Durbuk	Summer	1st July to 1st Sept/60	3.86	4772	78.456	33.7174
Arr	Chushul	Durbuk	Winter	15th Feb to 28th Feb/13	27.89	4971	78.5519	33.6407

Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Mordo Rala Tingrung	Chushul	Durbuk	Winter	31st Jan to 15thFeb/15	21.11	4287	78.724	33.5715
Tsokto	Chushul	Durbuk	Winter	1st Feb to 15thFeb/15	20.1	4432	78.759	33.4911
Chusrak Nyanlung	Chushul	Durbuk	Spring	16th Feb to 15thApril/30	5.26	4478	78.768	33.4606
Chushul village	Chushul	Durbuk	Winter	1st Dec to 31st Dec/31	19.18	4246	78.644	33.6163
Relay	Durbuk	Durbuk	Winter	1st Nov to 1stApril/150	13.45	0	78.027	34.1562
Chortanchn	Durbuk	Durbuk	Summer	1st May to 1st Oct/150	0.17	4529	77.9802	34.15631
Shayok	Durbuk	Durbuk	Winter	7th Nov to 7thApril/150	9.95	3776	78.1426	34.1686
Paktsey	Gia	Kharu	Spring	1st Feb 30th Apr/99	9.55	4521	77.8544	33.6067
Nelung	Gia	Kharu	Spring	1st Feb 30th Apr/100	16.91	4733	77.8767	33.5922
Nayul	Gia	Kharu	Spring	1st Mar 15th May/76	2.77	4347	77.8115	33.6146
Kotsa	Gia	Kharu	Spring	20th Feb 10th May/80	14.39	4531	77.8061	33.6316
Mikpha kyambu	Gia	Kharu	Spring	20th Feb 20th May/90	7.96	4314	77.771	33.61
Kyam	Gia	Kharu	Winter	1st Feb 30th Apr/89	27.14	4446	77.7435	33.6003
Targuk gay lam village pasture	Gia/gia	Kharu	Summer	10th Jul 15th Sep/67	30.09	4807	77.6828	33.6675
Chuwap	Gia/gia	Kharu	Summer	15th May 10th Jul/57	18.4	4749	77.6811	33.6739
Sheyul yerdeb	Gia/gia	Kharu	Autumn	1st Sep 30th Nov/76	11.38	4752	77.6715	33.7078
Sheyul chultichen	Gia/gia	Kharu	Autumn	10th Sep 30th Nov/76	19.54	4572	77.6848	33.7062
Kyamar	Rumtsey, gya, sasoma	Kharu	Winter	1st Dec 25th Feb/87	185.25	4539	77.8373	33.5577
Shakrot	Sasoma	Kharu	Autumn	10th Oct 19th Nov/42	16.6	4609	77.7454	33.5588



Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Kyambu	Sasoma&gia	Kharu	Autumn	16th Sep 30th Nov/76	11.33	4742	77.6734	33.6615
Tari	Sasoma/Gia	Kharu	Autumn	16th Sep 30th Nov/76	30.22	4472	77.6975	33.6339
Norburi villge day pasture	Sasoma/Gia	Kharu	Winter	11th Jul 15th Sep/67	3.82	4428	77.7051	33.6383
Phoo lak	Phuktse / phoo lak	Kharu	Winter	1st Jan 31st Dec/365	21.18	4209	77.9264	33.8347
Domkhar	Himya	Nyoma	Summer	Apr-Oct	1.6	4556	78.20445	33.53279
Kumdok Tso	Himya	Nyoma	Summer	May-Oct	1.6	4903	78.23735	33.56965
Laktse	Himya	Nyoma	Summer	May-Oct	0.3	4919	78.23359	33.56105
Mazur	Himya	Nyoma	Summer	May-Oct	3.5	4633	78.20981	33.54392
Zara	Kargyam	Durbuk	Summer	15th Aug to 5th Sept/20	21.54	4349	78.2564	33.9045
Lalung	Kargyam (Burma)	Durbuk	Winter & Summer	11thNov to 14thAug/273	26.65	4773	78.3144	33.7954
Gedhkarmo	Kargyam (Kherapulu)	Durbuk	Winter	1stDec to 31st Dec/31	14.61	4432	78.3574	33.8374
Balchung	Kargyam	Durbuk	Autumn	1st Sept to 20thOct/ 50	3.26	5236	78.166	33.9006
Kumdok/ Laktse	Rongpa	Nyoma	Summer	4th May 4th Oct/180	10.28	4919	78.2336	33.561
Kumdok Tso	Rongpa	Nyoma	Summer	4th May 4th Oct/180	1.72	4901	78.2371	33.5698
Kumdok mazur	Rongoa	Nyoma	Summer	4th May 4th Oct/180	9.84	4638	78.2098	33.5439
Kumdok Domkhar	Rongpa	Nyoma	Summer	4th Apr 4th Nov/240	12.88	4518	78.2045	33.5328
Tongrophu	keyre	Nyoma	Summer	1st Apr 30th Apr/30	6.81	4060	78.1203	33.472
Pangchan	Kharnak	Pugo	Summer	20th Jul 25th Sep/66	52.65	4634	77.8003	33.3607
Narbu	Kharnak Dry Flock	Pugo	Summer	20th Aug 10th Sep/22	7.69	4626	77.8607	33.4193

Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Zara	Kharnak	Pugo	Summer	6th Jun 20th Jul/45	62.48	4631	77.82	33.4108
Lugmochay	Kharnak Dry Flock	Pugo	Winter	30th Nov 10th Jan/41	69.36	4588	77.6432	33.3844
Tsamartsay	Kharnak	Pugo	Winter	6th Feb 15th Mar/38	154.82	4484	77.5527	33.5212
Dath(shayan)	Shayna	Pugo	Summer	16th Mar 5th Jun/80	200.27	4297	77.5055	33.5097
Dath	Kharnak (shayan)	Pugo	Winter	1st Dec 5th Feb/67	200.49	4273	77.5096	33.5103
dath dango	Kharnak Dango	Pugo	Summer	16th Mar 5th Jun/80	62.03	4312	77.5145	33.5016
Dath Dango	Kharnak Dango	Pugo	Winter	30th Nov 5th Feb/67	62.03	4299	77.5144	33.5016
Zabuk	Kharnak Dry Flock	Pugo	Winter	11th Jan 20th Feb/41	185.44	4312	77.6757	33.2808
Yagang	Kharnak	Pugo	Autumn	20th Sep 30th Nov/72	157.65	4483	77.73	33.3718
Reque	Khatpoo	Nyoma	Summer	Apr-Aug	0.95	4189	77.95918	33.6644
Silung	Khatpoo	Nyoma	Summer	Jul-Aug	2.8	4485	77.94551	33.6566
Nasa Soma	Khatpoo	Nyoma	Summer	Jul-Sep	2.6	4301	77.95312	33.66002
Spangpochey Yokma	Khatpoo	Nyoma	Summer	May-Oct	0.6	4715	77.93173	33.65929
Spangpochey Gongma	Khatpoo	Nyoma	Summer	May-Oct	0.4	4783	77.92749	33.65909
Tagrong	Khatpoo	Nyoma	Summer	May-Oct	0.9	4823	77.92545	33.65875
Tsaba	Khatpoo	Nyoma	Summer	May-Oct	2.5	4913	77.92449	33.6581
Paktse	Khatpoo	Nyoma	Summer	May-Oct	3	4860	77.92424	33.65754
Chumikchan	Khatpoo	Nyoma	Winter	Nov-Mar	0.4	3899	77.97146	33.67082
Tasa	Khatpoo	Nyoma	Winter	Nov-Apr	3	3846	77.97647	33.66995
Karzok Phu	Karzok	Nyoma	Summer	15th Jul- 31st Oct/105	31.72	4593	78.2352	32.9677

Name of Pasture	Village	Block	Season	Months / No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Chatseng	Korzok	Nyoma	Autumn	1st Nov- 30th Nov/30	39.01	4680	78.2755	33.0907
Labgo	karzok	Nyoma	Autumn	20th Nov- 30th Nov/10	36.14	4617	78.3405	32.9806
Baldho	karzok	Nyoma	Autumn	20th Nov- 30th Nov/10	58.99	4541	78.2892	33.0158
karzok	karzok	Nyoma	Summer	8th Jul- 6th Oct/90	2.61	4531	78.2626	32.9667
Tsaghang	karzok	Nyoma	Autumn	2nd Nov- 19th Nov/18	17.2	4674	78.2745	33.0944
Thatsang	TR. Sumdo	Nyoma	Summer	1st Jun- 10th Jul/40	65.84	4678	78.2898	33.1169
Sumdok kongma	Sumdok Kongma	Nyoma	Summer	1st Apr- 31st May/60	51.11	4412	78.3775	33.2153
Sumdok Kongma	sumdok kongma	Nyoma	Winter	1st Dec- 31st Jan/60	51.11	4425	78.3775	33.2153
Gakarsnin	Tr Sumdo/ Tegazong Tr	Nyoma	Winter	1st Dec- 26th Dec/25	9.51	4661	78.3131	33.1245
Chuldy	Sumdo Gongma	Nyoma	Autumn	1st Nov- 30th Nov/30	6.3	4602	78.3546	33.1851
Chuldy	Sumdo Gongma	Nyoma	Summer	2nd Jun- 31st Jul/59	6.3	4536	78.3576	33.1928
Rachungk-aru	Sumdo Tr	Nyoma	Summer	12th Jul- 30th Sep/75	3.89	4954	78.0881	33.2202
Namtser	Tr, Sumdo	Nyoma	Summer	14th Jul- 30th Sep/79	37.66	4821	78.3338	33.2734
Namtser, Bubla	Sumdo Gongma	Nyoma	Summer	15th Jul- 30th Sep/77	37.66	4854	78.3336	33.2736
Tr Sumdo	Sumdo Tr	Nyoma	Winter	1st Dec- 30th Apr/120	4.07	4366	78.3679	33.2332
Rawilpho	Sumdho, Gongma	Nyoma	Spring	1st Mar- 30th Apr/60	12.54	4893	78.4201	33.193
Szabzhy	chumur	Nyoma	Winter	1st Oct- 31st Mar/180	17.5	4490	78.5764	32.6712

Name of Pasture	Village	Block	Season	Months / No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Chumur Tr tegazong	chumur Tr	Nyoma	Winter	1st Dec-31st May/180	19.52	4345	78.5408	32.6944
2nd Rachungk-arru	Tr Sumdo, Tr chumur	Nyoma	Summer	15th Jul-28th Sep/70	1.66	4920	78.0402	33.1689
Gyama, Tagugu	Tr Sumdo, karzok, Tegazong, Tr chumur	Nyoma	Summer	17th Jul-5th Oct/85	4.15	5246	78.0721	33.1177
Gyama	korzo, Tr Sumdo, Tegazong, Tr chumur	Nyoma	Summer	15th Jul-3rd Oct/84	5.1	5163	78.1135	33.1005
Rachungk-aru	sumdo. Tr, chumur	Nyoma	Summer	15th Jul-26th Sep/76	1.7	4890	78.0396	33.1687
Kangdam	karzok / Tegazong	Nyoma	Autumn	20th Nov-30th Nov/10	109.39	4534	78.3071	32.7833
Kangdam	karzok / Tegazong	Nyoma	Summer	30th Apr-15th Jul/45	109.39	4524	78.307	32.7832
Tagezong		Nyoma	winter	1st Dec-31st May/150	54.04	4423	78.5686	32.6712
Chumiksha-de	Tegazong	Nyoma	Autumn	20th Nov-9th Dec/16	109.39	4544	78.3086	32.781
Dongre/chumikshafe	Tegazong	Nyoma	Summer	31st May-16th Jul/46	109.39	4536	78.3086	32.7811
Khamdir	karzok/ tagazong/ Tr Tegazong	Nyoma	Autumn	2nd Nov-30th Nov/30	7.38	4786	78.2584	33.1158
Khada	karok. Tegazong. Tr sumdo	Nyoma	Autumn	26th Oct-30th Nov/36	13.42	5082	78.2492	33.1271
Phirtse	Tegazong, korzok	Nyoma	Summer	1st Aug-30th Oct/90	3.44	4741	77.8181	33.1412
Phirtse	Tegazong	Nyoma	Summer	4th Aug-30th Sep/90	409.99	4754	77.8374	33.1296

Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Phirtse, Numa, Barma	Tegazong, karzok	Nyoma	Summer	4th Sep-30th Oct/90	14.8	4767	77.849	33.1209
Kharchen	Tegazong, phirtse	Nyoma	Summer	4th Aug-30th Oct/90	3.66	4761	77.8412	33.1272
Angkung	Angkung	Nyoma	Autumn	2nd Sep-31st Dec/90	5.52	4556	78.2392	33.2375
Zhokthi	Angkung	Nyoma	Summer	16th Jul-20th Sep/65	15.54	4809	78.1505	33.2726
Chumik Zhara	Angkung	Nyoma	Winter	1st Jan-30th Apr/120	21.06	4649	78.2487	33.2438
Rulungpho	Angkung	Nyoma	Spring	2nd May-30th May/30	8.22	4880	78.1621	33.272
Nerbo	Jigmat Gyatso	Nyoma	Summer	5th Jul-10th Sep/55	3.64	4969	79.1189	32.62
Yeesang	Sherap, Paljor, changpa TR	Nyoma	Summer	5th Jul-10th Sep/55	4.44	4796	79.1612	32.622
Shokpa nagang	Tsering anchok Koyul TR	Nyoma	Summer	5th Jul-10th Sep/55	9.92	4981	79.1946	32.6034
Chumigo-wa	Gatuk Tsering	Nyoma	Summer	5th Jul-10th Sep/55	2.06	4875	79.1873	32.6174
Tobae karu	Tashi Galtion	Nyoma	Autumn	5th Jul-10th Sep/55	1.09	4683	79.1821	32.641
Cheesum	Damdol Dorjey	Nyoma	Summer	5th Jul-10th Sep/55	0.48	4660	79.1692	32.6563
Guendal	Yountan Jungnyes	Nyoma	Summer	5th Jul-10th Sep/55	2.04	4639	79.1689	32.6662
Dharlung	Tsering Angchok	Nyoma	Autumn	11th Sep-10th Oct/33	11.31	4372	79.164	32.7
Serkatha	Padma Ishey	Nyoma	Autumn	11th Sep-10th Oct/33	12.84	4582	79.1549	32.7276
Gyayam	Tashi Raftan TR	Nyoma	Autumn	11th Sep-10th Oct/33	7.37	4544	79.1527	32.7436
Putit	Tsering Angchok	Nyoma	Autumn	11th Sep-10th Oct/33	9.83	4505	79.1535	32.7609



Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Kale	Tashi Tsering	Nyoma	Autumn	11th 5th Dec/54	11.6	4291	79.1784	32.8332
Beamkhar	Skarma Shenon TR	Nyoma	Autumn	10th 10th Nov/31	13.25	4260	79.1854	32.863
Ranthak	Tashi Raftan TR	Nyoma	Autumn	10th 10th Nov/31	2.71	4254	79.1891	32.8649
Lunyon	Skarma Sonam	Nyoma	Autumn	10th 10th Nov/31	2.66	4253	79.1927	32.8749
Lang	Padma Ishey	Nyoma	Autumn	10th 10th Nov/31	1.35	4200	79.196	32.8796
Koyul T.R	Ganga Lamo	Nyoma	Autumn	10th 10th Nov/31	0.69	4234	79.2001	32.8906
Koyul Pharka	Stanzin Tashi	Nyoma	Autumn	10th 10th Nov/31	0.74	4224	79.202	32.9032
Umlung	Tashi gyalson	Nyoma	Winter	10th 10th Dec/31	5.04	4213	79.1848	32.9133
Keley	Tsering Dorjey TR	Nyoma	Winter	10th 10th Dec/31	8.1	4245	79.176	32.919
Tsongo	Lamchen Dorjey TR	Nyoma	Winter	10th 10th Dec/31	1.62	4215	79.1764	32.9282
Phuktse	Tsering Nanmgial TR	Nyoma	Winter	11th 10th Feb/31	14.66	4143	79.2283	32.9484
Changlung Gongma	Rigzen tangay	Nyoma	Winter	10th 10th Dec31	14.02	4235	79.1535	32.9658
Changlung yokma	Urgian Rangdol	Nyoma	Winter	10th 10th Dec31	8.49	4172	79.1678	32.9732
Lungser	tsering sangdup	Nyoma	Spring	15th 15th May/88	29.31	4128	79.1467	33.007
Dole Tamgo	Rigzin Tangay	Nyoma	Winter	10th 10th Jan/31	7.17	4124	79.1312	33.0292
Khangral	Padma Ishey	Nyoma	Winter	10th 10th Jan/31	1.82	4127	79.1311	33.0291
Khangral dongti	Sherap Chopel	Nyoma	Summer	15th 29th Jun/48	7.98	4147	79.1311	33.0291

Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Dongkang Dongti	Skarma Zepa	Nyoma	Spring	7th Mar- 7th Apr/32	3.8	4123	79.116	33.043
Rigthung nana	Sonam Tundop	Nyoma	Winter	15th Dec- 30th May/164	5.73	4084	79.105	33.0581
Kakjung (Dongti)	Thumat Ringchen	Nyoma	Winter	3rd Dec- 28th Feb/57	7.65	4157	79.0914	33.0759
Khangra yokma dongti	Skalzung Tsering	Nyoma	Summer	20th Apr- 20th Jun/62	9.3	4139	79.0668	33.1018
Tobo karbo	Tashi kungkyab	Nyoma	Summer	2nd Apr- 29th Jul/102	10.57	4120	79.0371	33.1215
Sheyta	Skarma Geysey	Nyoma	Summer	20th Apr- 29th Jul/102	14.36	4123	79.02	33.1417
Dongti	Tashi Namgial	Nyoma	Summer	31st May- 28th Aug/89	7.93	4134	78.957	33.1934
Thaknapo	Skarma Geshey	Nyoma	Autumn	10th Sep- 10th Oct/31	32.28	4121	78.8517	33.1629
Rongpa	Khak- ri	Nyoma	Winter	2nd Oct 2nd Mar/180	0	4541	78.1561	33.6509
Rongpa	Fholungla nallah	Nyoma	Summer	2nd May 2nd Jul/90	0	4545	78.1585	33.6493
Rongpa	Kamchar	Nyoma	Winter	2nd Oct 2nd Mar/180	0	4756	78.1718	33.6608
Rongpa	Kamchar II	Nyoma	Winter	2nd Oct 2nd Mar/180	0	4799	78.1752	33.6624
Rongpa	Tunkor valley	Nyoma	Summer	2nd May 2nd Nov/210	0	4875	78.1904	33.667
Rongpa	She- lungpa	Nyoma	Summer	2nd May 2nd Nov/210	0	4306	78.1382	33.6369
Rongpa	Thama / Tsetsa	Nyoma	Winter	2nd Sep 2nd Dec/120	0	4140	78.1134	33.647
Folung Nallah	Kumgyam	Nyoma	Summer	May-July	0.8	4864	78.19136	33.66571
Tsequ	Kumgyam	Nyoma	Summer	Jul-Oct	2.5	4864	78.19136	33.66571
She-lungpa	Kumgyam	Nyoma	Summer	May-Nov	1.5	4341	78.13836	33.63709
Tunkor Nallah	Kumgyam	Nyoma	Summer	May-Nov	1.2	4881	78.19046	33.66703

Name of Pasture	Village	Block	Season	Months / No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Thama / Tsetsa	Kumgyam	Nyoma	Pre-Winter	Oct-Dec	3.5	4146	78.11345	33.64703
Khak-Ri	Kumgyam	Nyoma	Winter	Oct-Mar	3	4542	78.15612	33.65102
Kamchar	Kumgyam	Nyoma	Winter	Oct-Mar	1	4773	78.1722	33.66073
Kamchar II	Kumgyam	Nyoma	Winter	Oct-Mar	1.2	4799	78.1752	33.66244
Kenla	Liktse	Nyoma	Winter	1st Jan 31st Dec/365	0	3546	77.9637	33.7083
Shuklung	Rongpa	Nyoma	Summer	6th May 6th Oct/180	0	4041	78.0246	33.7585
Liku	Rongpa	Nyoma	Winter	6th Dec 6th Mar/120	0	4160	78.0384	33.7575
Aalung	Rongpa	Nyoma	Winter	6th Dec 6th Mar/120	0	4169	78.0451	33.7585
Chuzomsa	Rongpa	Nyoma	Winter	6th Nov 6th Mar/150	0	4201	78.0522	33.7634
Guntsa	Rongpa	Nyoma	Summer	6th Apr 6th Oct/280	0	4247	78.0511	33.7656
Dichey	Rongpa	Nyoma	Summer	6th May 6th Oct/180	0	4236	78.0574	33.7628
Hakki	Rongpa	Nyoma	Summer	6th May 6th Oct/180	0	4300	78.0627	33.7612
Dilchey	Rongpa	Nyoma	Summer	6th May 6th Oct/180	0	4664	78.0979	33.7511
Balmik	Rongpa	Nyoma	Summer	6th May 6th Oct/180	0	4702	78.0982	33.7533
Etta	Rongpa	Nyoma	Summer	6th May 6th Oct/180	0	4759	78.1057	33.7441
Pigo	Rongpa	Nyoma	Summer	6th May 6th Oct/180	0	4756	78.1058	33.7441
Zalung	Rongpa	Nyoma	Summer	6th May 6th Oct/180	0	4771	78.1047	33.7427
Balmik II	Rongpa	Nyoma	Summer	6th May 6th Oct/180	0	4702	78.092	33.7508
Ghun-Tsa	Liktse-Tukla	Nyoma	Summer	Apr-Oct	1.2	4253	78.05115	33.76561

Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Shuklung	Liktse-Tukla	Nyoma	Summer	May-Oct	3.9	4036	78.02459	33.75846
Thasuru	Liktse-Tukla	Nyoma	Summer	May-Oct	1.2	4238	78.05748	33.76284
Dilchey	Liktse-Tukla	Nyoma	Summer	May-Oct	1.2	4660	78.09792	33.75109
Hakki	Liktse-Tukla	Nyoma	Summer	May-Oct	3.2	4314	78.06275	33.76109
Balmik	Liktse-Tukla	Nyoma	Summer	May-Oct	2.6	4705	78.09826	33.75329
Eta	Liktse-Tukla	Nyoma	Summer	May-Oct	3	4737	78.10507	33.75248
Zalung	Liktse-Tukla	Nyoma	Summer	May-Oct	1.8	4741	78.10492	33.74289
Pigo	Liktse-Tukla	Nyoma	Summer	May-Oct	2.6	4757	78.10583	33.74419
Chu-Zomsa	Liktse-Tukla	Nyoma	Winter	Nov-Mar	0.6	4217	78.05219	33.7634
Liku	Liktse-Tukla	Nyoma	Winter	Dec-Mar	3	4155	78.03842	33.75753
Aalung	Liktse-Tukla	Nyoma	Winter	Dec-Mar	1.2	4167	78.04519	33.75855
Tso Farka	Maan	Durbuk	Winter	15th Feb to 15th March/30	16.81	4661	78.3826	33.4948
Thangra	Man Pangong (Man Merak)	Durbuk	Winter	1st Nov to 31st Dec/59	16.58	4298	78.6583	33.6294
	-do-/Hangkar	Leh	Winter	1st Dec 30th Dec/30	22.69	4390	77.5416	33.8107
	-do-/Markha Hangkar	Leh	summer	1st May 30th Oct/180	24.35	4916	77.5949	33.7888
Zakra Skunding Nidder	Nawang Dorjey	Nyoma	Summer	5th May 26th Jul/82	32.78	5028	78.5638	33.0036
Skunding Nenak Nidder	Nawang Dorjey	Nyoma	Summer	5th May 26th Jul/82	61.37	4985	78.5648	32.9785
Nynimaru Nidder	Tashi Tsering	Nyoma	Spring	21st Apr 4th May/14	7.45	4916	78.5504	33.0527
Kyambusuru Nidder	Mutop Tsering	Nyoma	Spring	20th Mar 19th Apr/31	24.66	4690	78.5398	33.0665
Lema Nidder	Skarma Namgial	Nyoma	Winter	17th Jan 18th Mar/60	23.76	4419	78.5603	33.104
Laykaru Nidder	Dawa Tsering	Nyoma	Winter	25th Dec 16th Jan/23	9.17	4362	78.5597	33.1009
Tsongka kharu /Nidder	Stanzin Dolma	Nyoma	Autumn	10th Oct 12nd Nov/33	8.76	4164	78.6062	33.1473

Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Nyoma phoo	tsering lamo changpa	Nyoma	Summer	27th Jul 19th Sep/54	4.72	4718	78.6703	33.2554
Nyoma village	phunchok tashi changpa	Nyoma	Autumn	20th Sep 17th Nov/28	2.9	4244	78.6591	33.2123
Kakjung	Tashi Phunchok	Nyoma	Winter	16th Dec 29th Jan/44	7.72	4116	79.0986	33.0627
Kakjung Tsokhor	Paljor Chukpo TR	Nyoma	Autumn	7th Oct 22nd Nov/46	7.72	4128	79.0915	33.076
Kakjung	Nawang Galisan	Nyoma	Winter	16th Dec 29th Jan/44	7.72	4129	79.0985	33.0628
Longkung	khenrab	Nyoma	Winter	17th Nov 15th Dec/29	5.84	4115	78.957	33.1932
Lukung	Thokmat Denjor	Nyoma	Summer	10th Jun 5th Aug/56	5.84	4123	78.9571	33.1931
Skangchen	Tashi phuntsog	Nyoma	Spring	3rd Feb 4th May/89	22.03	4135	78.8836	33.2192
Skangchu-ng	Tsering lamo	Nyoma	Spring	3rd Feb 4th May/89	14.88	4130	78.8831	33.2187
Changlung	Tsering Gurmat	Nyoma	Summer	31st Jul 19th Sep/62	21.93	4763	78.4735	33.2147
Baljar	Paljor Phunchok	Nyoma	Autumn	1st Oct 15th Nov/46	6.73	4099	78.5512	33.2434
Dekurr	Kunzang Namgail	Nyoma	Autumn	15th Sep 1st Oct/15	0.1	4112	78.5665	33.2335
Chakdal	Tsering gurmat	Nyoma	Autumn	15th Sep 1st Oct/15	6.25	4155	78.5789	33.2275
Talung	Kunzang Namgail	Nyoma	Spring	1st Feb 30th Apr/90	1.13	4383	78.6	33.2522
Pharma	Paljor/phunch ok	Nyoma	Autumn	1st Oct- 15Nov/46	2.81	4287	78.58	33.2522
Rongdo phoo	Others/Truth, Tseti,Rongdo	Panamic	Summer	25th Jun- 15th Oct/77	6.78	4280	77.9029	34.4509
Martsemig la	Phobrang Pangong	Durbuk	Summer	15thJune to 15th July/30	2.93	5562	78.6177	34.0935



Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Martsemig la yok	Phobrang Pangong	Durbuk	Summer	1st June to 2nd July/31	15.27	5106	78.5719	34.0805
Sumdo	Phobrang Pangong	Durbuk	Summer	1st Aug to 15th Aug/15	12.43	4910	78.4794	34.1358
Pangpochay	Phobrang Pangong	Durbuk	Autumn	10th Oct to 28th Oct/18	5.69	4826	78.36765	34.0596
Ko	Phobrang Pangong	Durbuk	Summer	3rd Aug to 10th Sept/36	7.35	5164	78.3511	34.1075
Phobrang	Phobrang Pangong	Durbuk	Winter	3rd Dec to 3rd March/90	6.71	4436	78.4407	34.0584
Yourgo	Phobrang Pangong	Durbuk	Summer	3rd June to 3rd July/30	3.46	4325	78.4286	34.0299
Taknakpo Chakrang	Phobrang Pangong	Durbuk	Winter	1st Dec to 30th Jan/90	1.19	4299	78.3886	33.9633
Loma village	Rongo	Nyoma	Autumn	10th Sep 1st Nov/51	7.78	4125	78.8402	33.143
Shuyong	Rongo	Nyoma	Winter	28th Dec 28th Jan/30	28.69	4637	78.9223	33.0578
Tiling Nala	Rongo	Nyoma	Winter	28th Jan 28th Feb/30	23.8	4559	78.8994	33.0827
Dongbo Nagrang To bokol	Rongo	Nyoma	Summer	17th Jun 17th Jul/30	3.13	4151	78.8786	32.9932
Tara to Dora	Rongo and rongo T. R	Nyoma	Summer	17th Jun 17th Jul/30	4.73	4169	78.9052	32.9519
Marzi. shung	Rongo	Nyoma	Simmer	17th Jul 10th Sep/44	25.89	4196	78.9499	32.8674
Marzi. shung	Rongo	Nyoma	Summer	17th Jul 10th Sep/44	25.89	4192	78.9429	32.8751
Munkhang	Rongo	Nyoma	Winter	1st Nov 27th Dec/57	4.48	4166	78.8936	32.9612
Chipkhang	Rongo T. R	Nyoma	Winter	1st Nov 27th Dec/57	12.72	4171	78.8921	32.9611
Tobo golap	Rongo	Nyoma	Winter	1st Nov 27th Dec/57	12.74	4175	78.8712	33.0099

Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Cholbo	Rongo	Nyoma	Summer	18th Feb 16th Jun/96	20.86	4149	78.8364	33.106
Zomolung Samad TR	Zomolung Samad TR	Rupsho	Spring	20th Mar 25th Apr/35	22.42	4596	78.051	33.315
Thukjai	Thukjai	Rupsho	Winter	15th Dec 27th Jan/43	35.43	4542	78.0235	33.3598
Nigur	Nigur	Rupsho	Spring	20th Mar 25th Apr/35	22.53	4501	78.0391	33.3248
Tokra	Tokra	Rupsho	Spring	20th Mar 25th Apr/35	67.8	4575	78.087	33.2764
Tasabuk	Tasabuk	Rupsho	Winter	27th Jan 20th Mar/52	37.55	4522	78.0505	33.2405
Nangchungrak	Nangchungrak	Rupsho	Winter	27th Jan 20th Mar/52	41.92	4517	78.0226	33.2486
Rigyul	Rigyul	Rupsho	Winter	27th Jan 20th Mar/52	28.32	4550	77.9762	33.2898
Nabokhar	Nabokhar	Rupsho	Winter	15th Dec 27th Jan/43	64.74	4609	78.0185	33.3798
Thukjay	Thukjay	Rupsho	Summer	26th Apr 6th Jun/42	35.43	4538	78.0236	33.3591
Nabokhar	Samad TR	Rupsho	Summer	26th Apr 6th Jun/42	64.74	4555	78.0138	33.3804
ponganagu	Samad with TR	Rupsho	Autumn	16th Nov 14th Dec/29	38.51	4611	77.9631	33.3732
Rena	Samad	Rupsho	Summer	25th Jul 20th Aug/26	30.91	4747	77.8354	33.2777
Taguseru	Samad korpa	Rupsho	Summer	27th Jul 30th Sep/67	45.73	4767	77.8229	33.2046
sNorchung	Samad TR	Rupsho	Summer	25th Jul 20th Aug/26	76.67	4685	77.8579	33.2508
sNorchen	Samad with TR	Rupsho	Summer	21st Aug 30th Sep/40	76.67	4755	77.8861	33.2387
Rokchan	Samad korpa	Rupsho	Summer	7th Jun 25th Jul/49	74.66	4652	77.9104	33.3463

Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Rokchan	Samad with TR	Rupsho	Autumn	5th Nov 15th Nov/11	74.66	4663	77.9104	33.3463
Mangzul	Samad	Rupsho	Summer	7th Jun 25th Jul/49	45.69	4624	77.893	33.4066
Dipring / Taglang	Samad TR	Rupsho	Summer	7th Jun 25th Jul/49	78.45	4609	77.8785	33.4141
Zara do	Samad with TR	Rupsho	Autumn	28th Oct 4th Nov/8	46.31	4624	77.8194	33.4114
Lungkar	Shachukul	Durbuk	Summer	15th June to 15 Sept/90	11.85	5060	78.0125	33.9527
Lenak	Shachukul	Durbuk	Autumn	16 Sept to 30 Nov/74	15.76	4821	78.0285	33.931
Sumdo	Shachukul	Durbuk	Summer	15 June to 15 Sept/90	11.65	4994	77.987	33.9292
Sreplay	Shachukul	Durbuk	Winter & summer	1st Feb to 14th June/134	6.9	4600	78.066	33.9414
Shachukul village	Shachukul	Durbuk	Winter	16th Nov to 31st Dec/45	5.07	4249	78.1037	33.9863
Ketchen phoo	Ketchen	Kharu	Summer	1st Mar 31st May/92	0.98	4225	77.6892	33.8087
Chokdo	Chokdo khangsar	Kharu	Summer	1st Jun 30th Sep/122	0.87	3947	77.678	33.829
Chokdo	Chokdo pharka	Kharu	Winter	1st Jan 31st Dec/365	0.87	3814	77.6699	33.828
Ozang	Sumdo ozang	Kharu	Winter	1st Oct 28th Feb/151	2.6	3735	77.7046	33.8474
Shang phoo	Shang phoo	Kharu	Summer	1st Apr 30th Sep/183	10.05	4315	77.6142	33.8787
Nagdang	Nagdang	Kharu	Winter	1st Oct 31st Mar/182	5.01	3887	77.6598	33.867
Chokdo	Chokdo	Kharu	Summer	1st Apr 30th Sep/183	0.87	3950	77.6805	33.8266
Sumdo	Sumdo	Kharu	Winter	1st Oct 31st Mar/182	0.45	3661	77.6883	33.8386
Nagdan	Nagdan	Kharu	Summer	1st Oct 31st Mar/182	5.01	4026	77.6459	33.8691

Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Nagdan Phoo	Nagdan	Kharu	Summer	1st 30th Sep/183	5.01	4200	77.6273	33.8762
Chotayar Nallah	Tarchit	Nyoma	Summer	Apr-Nov	0.3	4083	77.92989	33.68987
Serpema	Tarchit	Nyoma	Summer	Apr-Nov	0.4	4217	77.92535	33.68972
Chordom	Tarchit	Nyoma	Summer	Apr-Nov	1.2	4278	77.91993	33.6891
Draistan	Tarchit	Nyoma	Summer	Apr-Nov	0.3	4323	77.92531	33.67984
Yang-guk	Tarchit	Nyoma	Summer	Apr-Nov	0.4	4466	77.92354	33.67416
Taknak	Tarchit	Nyoma	Summer	Apr-Nov	0.7	4459	77.91485	33.67798
Shemochey	Tarchit	Nyoma	Winter	Dec-Mar	1.2	3480	77.96613	33.70735
Lenak	Tharuk	Durbuk	Summer	1st May to 31st Oct/180	12.43	4707	78.0235	34.0162
Tharuk village	Tharuk	Durbuk	Winter	1st Nov to 30th April/180	4.43	4054	78.1267	34.0152
Lubum stakna	Stakna/ thiksey	Thiksy	Summer	23rd 22nd Sep/90	8.09	4421	77.656	33.9426
Merutse	Stakna/	Thiksy	Summer	23rd 22nd Sep/90	6.26	3677	77.652	33.9694
Pakraytsay	Tsaga	Nyoma	Autumn	20th 5th Nov/15	4.84	4135	78.9123	33.2489
Long-gong	Tsaga	Nyoma	Winter	5th 5th Jan/30	9.34	4123	78.9764	33.1994
Gakchat	Tsaga	Nyoma	Winter	5th 20th Dec/25	25.4	4125	79.0262	33.1567
Gakchat. kakjung	Tsaga	Nyoma	Winter	20th 1st Feb/31	46.03	4205	79.0463	33.1442
Pelongkokma yokma. longmarpo	Tsaga	Nyoma	Winter	1st 10th Mar/39	33.83	4177	79.0343	33.1545
Tsaga village	Tsaga	Nyoma	Summer	11th 19th Oct/218	2.04	4338	78.8503	33.3322
Taklangla	PGF UPSHi	Kharu	Autumn	28th 28th Aug/1	0	4525	77.7502	33.5633
Shakrot taklang	Taklang	Kharu	Autumn	28th 28th Aug/21	0	4551	77.75	33.5625

Name of Pasture	Village	Block	Season	Months No. of Days	Area (sq. km)	Altitude (m)	Longitude	Latitude
Taklang pasture	PGFUPSHI	Kharu	Autumn	28th Aug- 28th Aug/1	0	4564	77.7495	33.5616
Taklang	PGFUpshi	Kharu	Autumn	28th Aug- 28th Aug/1	0	4543	77.7501	33.5631
Taklang pasture	PGFUpshi	Kharu	Autumn	28th Aug- 28th Aug/1	0	4538	77.7505	33.5628
Taklang	PGF Upshi	Kharu	Autumn	28th Aug- 28th Aug/1	0	4547	77.7505	33.5631
Taklang dendok pasture	UPSHI	Kharu	Autumn	4th Sep 4th Sep/1	0	4941	77.7681	33.5416
Taklang pasture	Taklangla	Kharu	Autumn	4th Sep 4th Sep/1	0	4919	77.7685	33.5418
Dendok taklang	Taklang	Kharu	Autumn	4th Sep 4th Sep/1	0	4964	77.7679	33.5417
Taklang	Taklangla	Kharu	Autumn	4th Sep 4th Sep/1	0	5127	77.7766	33.5396
Taklang	Taklang	Kharu	Autumn	4th Sep 4th Sep/1	0	4916	77.7769	33.5397
Lachlungba taklang	Taklang	Kharu	Autumn	4th Sep 4th Sep/1	0	4761	77.756	33.5472
Shakroot pasture	Taklang	Kharu	Autumn	4th Sep 4th Sep/1	0	4577	77.7535	33.5656
Taklang	Taklang	Kharu	Autumn	14th Sep 14th Sep/1	0	4610	77.7507	33.565



Annexure 13 Maps of High Priority High Conservation Value Areas in Changthang Landscape

