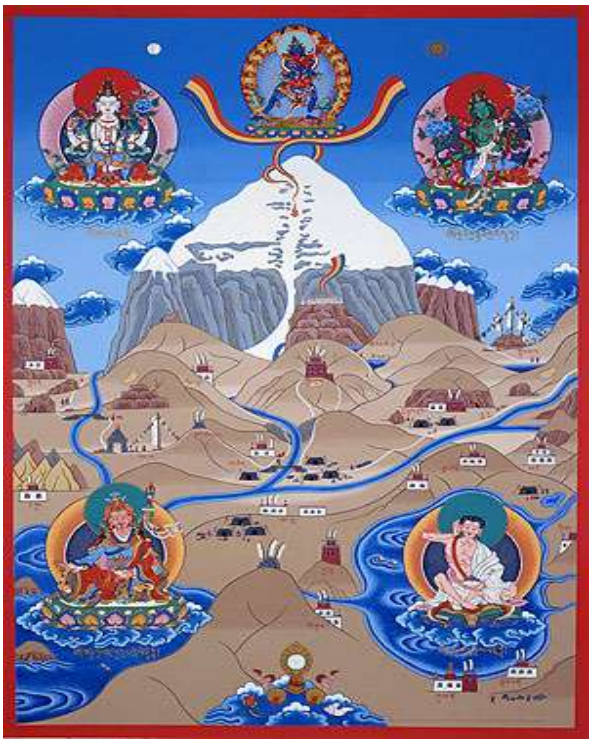

KAILASH SACRED LANDSCAPE CONSERVATION INITIATIVE

Feasibility Assessment Report of China

By

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Contents

1. Description of Target Landscape

Mount Kailash is a peak in the Gangdisê Mountains, which are part of the Himalayas. Mt Kailash and the associated Mansarovar Watershed is located in Burang County[1], Ngari Prefecture, in the western part of the Tibet Autonomous Region (TAR) of China. It is named as Gang Rinpoche གངས་རིན་པོ་ཆེ in Tibetan and "冈仁波齐峰" in Chinese (and hereafter referred to as Kailash). It lies near the source of some of the longest rivers in Asia: Indus River, Sutlej River (a major tributary of the Indus River), Brahmaputra River, and Karnali River[2] (a major tributary of the Ganges River). It is considered as a sacred mountain in five religions: Hinduism, Buddhism, Jainism, Sikh, and the Bön faith. Every year, tens of thousands of pilgrims make a pilgrimage to Kailash, following a tradition dated back to thousands of years. Pilgrims of the above religions believe that circumambulating (walking around) Mt Kailash will remove sins and bring good fortune. Near Mount Kailash, there lie two famous holy lakes, i.e. Lake Manasarovar[3] and Lake Rakshastal[4]. These two lakes are located near each other in the Manasarovar Basin. Therefore, we identified Manasarovar Basin as an important part of Kailash Sacred Landsape (KSL), with the delineation of this part following along the boundary of Manasarovar Basin.

Pulan, known as Burang in Tibetan, is the main township in Burang County. It is situated to the south of Mount Kailash, near the border with India and Nepal. The town lies at an altitude of 3,880m. It is known by Nepalis and Indians as Taklakot (from Tibetan 'Takla Khar'), and is a very ancient trading post and staging point for pilgrims to Mount Kailash. It lies in the valley of the Karnali River (or the Peacock River in Chinese) beside the famous Mount Gurla Mandhata[5]. The Karnali River, literally holy water from the sacred mountain, is a transboundary perennial river which originates in Burang County near Lake Manasarovar. It cuts through the Himalayas from China to Nepal on its way to the confluence with the Sarda River at Brahmaghat in India, where it joins the Ganges River. It is the longest (507 km in length) and largest river in Nepal. The upper reaches of the Karnali River (Chinese section) is about 95 km in length. Due to the relatively better hydro-thermal conditions along the river, croplands, urban areas (Burang town) and villages are concentrated along the riverside. The Karnali Basin represents an important part of the lower Kailash region, and the delineation of this part was along the boundary of Karnali Basin.

For the feasibility assessment of *Kailash Sacred Landscape Conservation Initiative*, and development of the Regional Cooperation Framework (RCF), the technical delineation of the

[1] Burang County is located in Ngari Prefecture of TAR, which is known as Pulan County (普兰县) in Chinese.

[2] Karnali River is known as Peacock River (Chinese: 孔雀河) in Burang.

[3] Lake Manasarovar is known as Mapam Yumco (Chinese: 玛旁雍错) in Tibet (མ་ཡམ་གཡུ་མཚོ).

[4] Lake Rakshastal is known as La'nga Co (Chinese: 拉昂错) in Tibet (ལང་ངར་མཚོ)

[5] Mt. Gurla Mandhata is Memo Nani (Chinese: 納木那尼峰).

area is an essential and critical first step. Following the guidelines of Kailash Sacred Landscape Conseravation Initiative (KSLCI), the criteria applied to delineate the Chinese part of KSL region are mainly considered as below:

- Transboundary ecosystem services and ecosystem contiguity
- Key biodiversity areas, including migratory habitats and biodiversity corridors
- Endemism (biodiversity and culture)
- Indicator/flagship, and rare, endangered and threatened species (and their ranges)
- Protected areas/Ramsar sites and other conservation priority areas
- Cultural heritage sites and pilgrimage routes; and existing and potential ecotourism sites
- Linkages of livelihoods of mountain communities
- Vulnerability of the area (globalization, migration and other change processes)
- Urbanization and infrastructure development
- Watershed and river basin coverage for the headwater areas of major rivers originating from the landscape
- Ecological zones.

In this project, the most important landscape elements considered were the locations of Mount Kailash, Lake Manasarovar, Lake Rakshastal, Karnali River and Burang County town. As a result, the scope of KSL-China is comprised of and contained in Burang County, TAR-China. It is composed of two watershed areas: the Manasarovar Basin (with an area of 7,780.87 km^2) and the Karnali Basin (3,061.89 km^2). The total area of KSL-China is 10,842.76 km^2. The southern portion of KSL-China borders on both Nepal and India (Figure 1).

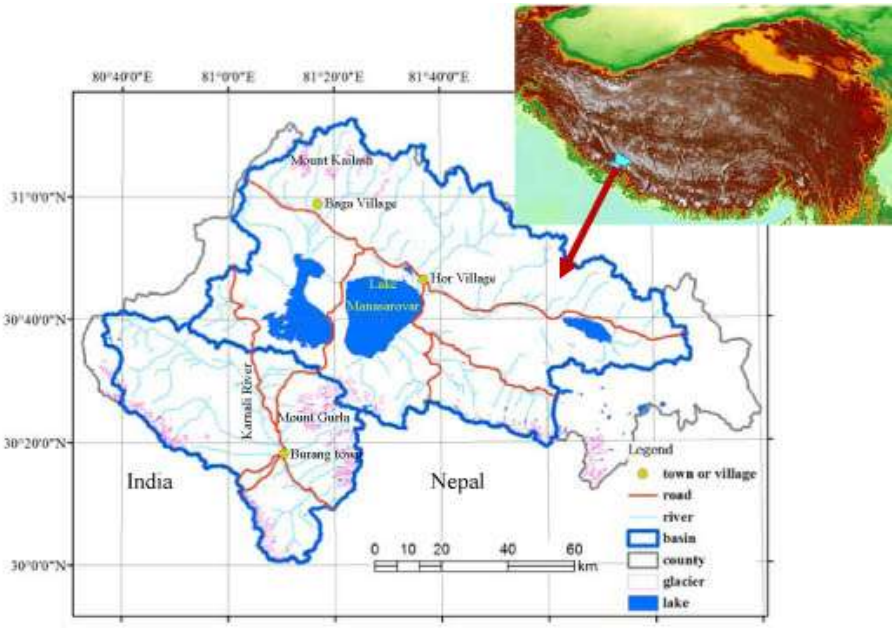

Figure 1. Delineation of Kailash Sacred Landscape in Tibetan Plateau and two watershed components (Manasarovar watershed above and Karnali Basin below).

2. Resource Status of Target Landscape

2.1 Land Cover

1) *Classification of Land Cover in Kailash Sacred Landscape*

Land cover classification is the basis for analysis of land cover patterns and changes. According to land cover classification capability of Landsat images in KSL-China, and using ground data from the field survey in the summer of 2009, land cover was classified into two levels based on the Land Cover Classification System 2.4.5 (developed by FAO), which is the common standard adopted by the KSLCI. The first level is composed of eight major classes: croplands, grasslands, shrublands, wetlands, water bodies, urban areas and villages, glaciers, and barren lands. There is no forest distribution because the minimum altitude of the region (3,630m) is above treeline. The second level is composed of 16 classes. "Grasslands" is divided into three classes in second level: "sparse grasslands" (vegetation cover is between 5% and 20%), "open grasslands" (vegetation cover 20-60%), and "close grasslands" (vegetation cover more than 60%). "Shrublands" is divided into two classes in second level: "sparse shrublands with sparse herbaceous" and "open shrublands with sparse to open grasses". "Wetlands" is divided into two classes in second level: "permanently flooded wetlands" and "seasonally flooded wetlands". "Barren lands" is divided into two classes in second level: "bare rocks" and "bare soils". "Urban area and villages" is divided into two classes in second level: "urban" and "villages". Among the eight first-level classes, grasslands and shrublands are the most important and widely distributed land cover types in Kailash region. Consequently, for the analysis and mapping of the land cover in KSL-China, second-level classes for "grasslands" and "shrublands" were included, while first-level classes were used for other classes. A detailed description of land cover types for the selected classes is given in Table 1.

Table 1. **Land cover classifications for Kailash region**

Code	Type	Implication
1	Croplands	Agricultural lands, including old and new cultivated lands, fallow land, crop-grass rotation field, agro-fruit land and agro-forestry land.
2	Sparse Grasslands	Lands with herbaceous types of cover. Tree and shrub cover is less than 20%. Grassland coverage is between 5% and 20%.
3	Open Grasslands	Lands with herbaceous types of cover. Tree and shrub cover is less than 20%. Grassland coverage is between 20% and 60%.
4	Close Grasslands	Lands with herbaceous types of cover. Tree and shrub cover is less than 20%. Grassland coverage is more than 60%.
5	Sparse Shrublands	Lands with medium and dwarf shrub. Herbaceous cover is less than 20%. Shrubland coverage is less than 20%.
6	Open Shrublands	Lands with medium and dwarf shrub. Herbaceous cover is less than 60%. Shrubland coverage is between 20%.
7	Wetlands	Lands with permanent and seasonal mixture of water and herbaceous vegetation.

8	Water bodies	Lakes and rivers. Can be either fresh or salt-water bodies.
9	Glaciers	Lands under snow/ice cover throughout the year.
10	Urban and village	Land covered by buildings and other human-made structures.
11	Barren lands	Lands with exposed soil, sand, rocks, or snow and never has more than 2% vegetated cover during any time of the year.

2) *Spatial Patterns of Land Cover in Kailash Landscape in 2009*

Because the average altitude of KSL-China is more than 4,500m and the minimum altitude of the region is 3,630m, the climate is cold and arid. Vegetation in the region is very sparse and biomass is very low. From Table 2, Figures 2 and 3, we can see that land cover in KSL-China is primarily barren land (occupying 41.25% of total), sparse shrublands with sparse herbaceous (20.15%), and open shrublands with sparse to open herbaceous (16.98%). These three land cover types represent the most widespread landscapes, indicating the arid environment and severe ecological conditions of this region. Other land cover types only occupy 21% of total area of the region (Figure 2). Natural and semi-natural land cover occupies 99.9% of total area, while approximately 0.1% of total area is classified as cultivated land, i.e. croplands, along with urban areas and villages. Detailed land cover distribution is listed in Table 2.

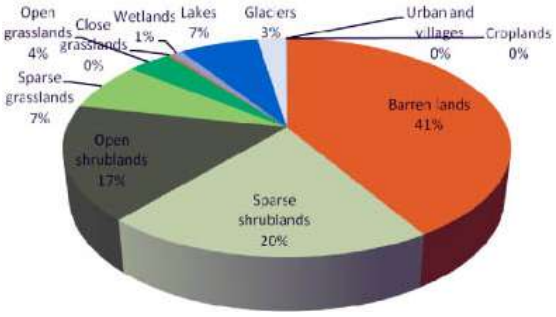

Figure 2. Land cover category and percentage of Kailash Sacred Landscape in 2009

Table 2. **Land cover of Kailash Sacred Landscape in 2009**

Categories	**Manasarovar Basin**		**Karnali Basin**		**Total region**	
	Area (km^2)	(%)	Area (km^2)	(%)	Area (km^2)	(%)
Barren lands	2,673.01	34.35	1,799.22	58.76	4,472.23	41.25
Sparse shrublands with sparse herbs	1,630.13	20.95	554.53	18.11	2,184.66	20.15
Open shrublands with sparse to open herbs	1,422.35	18.28	419.07	13.69	1,841.43	16.98
Sparse grasslands	718.57	9.24	60.30	1.97	778.87	7.18
Open grasslands	396.96	5.10	14.86	0.49	411.82	3.80
Close grasslands	43.78	0.56	0.37	0.01	44.15	0.41
Wetlands	81.35	1.05	14.78	0.48	96.14	0.89
Lakes	734.16	9.44	4.20	0.14	738.35	6.81
Glaciers	79.71	1.02	182.51	5.96	262.22	2.42
Urban and villages	0.63	0.01	1.92	0.06	2.55	0.02
Croplands	0.20	0.00	10.13	0.33	10.33	0.10
Total	**7,780.87**	**100.00**	**3,061.89**	**100.00**	**1,0842.8**	**100.00**

2.2 Land Use and Agricultural Production Systems

1) *Agricultural Land Use*

According to the interpretation of Landsat TM images of 2009, agricultural area in KSL-China is about 10.33 km^2 covering 0.10% of the total Kailash Sacred Landscape. All the croplands are distributed in the Peacock River Valley where hydrothermal conditions are better and suitable for crop growth. The main crop in this area is highland barley, potato, rape and pea. The agricultural system is one crop per year. Water source for croplands is mostly from irrigation as the annual precipitation in this area is only about 200 mm.

Due to the relatively lower altitude, relatively high annual air temperature and better water supplies, almost all croplands (98%) are distributed along the valley floor of the Karnali River basin. Only a few croplands (0.20 km^2) are distributed in Manasarovar Basin, where minimum altitude is 4,470m. The Karnali Basin provides most of the agricultural production in Burang County.

The native resident population in this area is less than 8,000, more than 60% of which is located in Burang town. Urban and village area is only 2.55 km^2, which is about 0.02% of the total area of KSL-China. People prefer to live in areas of lower altitude where there are more comfortable conditions. Consequently, urban and village areas are concentrated in the Karnali River Basin (1.92 km^2), including the town of Burang and most of the villages.

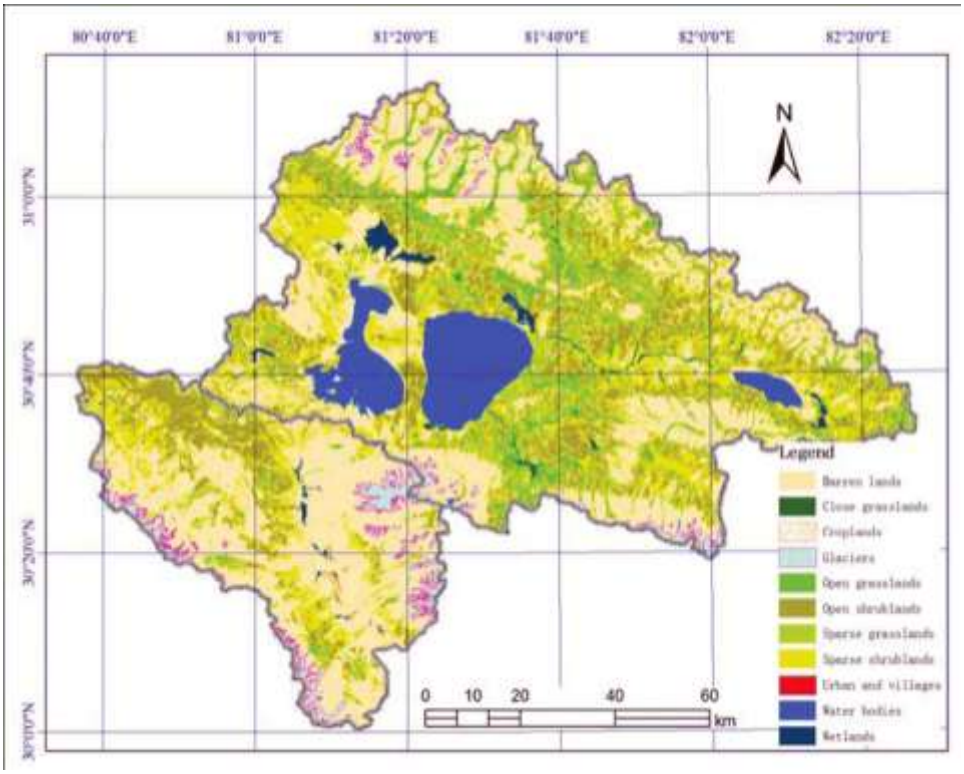

Figure 3. Spatial patterns of land cover in Kailash Sacred Landscape.

2) *Rangelands and High Pastures*

Rangelands and alpine pastures cover about 5,357 km^2, almost half (49.4%) the total area of KSL-China. Rangelands and alpine pastures are mainly composed of six land cover types: sparse shrublands with sparse herbs (occupying 20.15% of total cover), open shrublands with sparse to open herbaceous (16.98%), sparse grasslands (7.18%), open grasslands (3.80%), close grasslands (0.41%) and wetlands (0.89%). Although the total area of rangelands and high pastures is very large, the most widely distributed land cover types, i.e. sparse shrublands and sparse grasslands, produce little biomass for livestock due to low coverage and productivity. Open grasslands, close grasslands, open shrublands and wetlands provide more preferable forage grasses for livestock and native animals than sparse grasslands and sparse shrublands do, but only cover 22% of the area.

From Table 2, it is clear that ecological conditions in Manasarovar Basin are much better than in Karnali Basin. Rangelands in Manasarovar Basin account for about 55.1% of total cover of the basin, while grasslands in Karnali Basin cover no more than 35% of the total area. Although barren lands are the most common land cover in both basins due to the cold and arid climatic conditions, there is an obvious difference between them. The cover of barren lands in Karnali Basin is about 59% of total land cover, which is much more than that in Manasarovar basin where barren lands occupy 34% of total land. In addition, wetlands in the two basins may also implicate hydrological conditions of the region. The area of wetlands in Manasarovar Basin is obviously more than in the Karnali Basin.

Rangeland management is a combination of nomadic and captive livestock breeding. Total livestock population in this area is more than 150,000. Marketing rate of fattened stock is more than 33%.

2.3 Land Use and Agricultural Production Systems

1). *Description and Distribution of Agricultural Production and Cropping Systems*

All croplands are distributed in the Peacock River Valley, which is located in Burang Township. This area has altitude less than 4,000m with hydrothermal conditions in the valley suitable for crop growth (green polygon area indicated in Figure 5). The main crop system is one crop system per year. Highland barley, potato, pea and rape are the main crops cultivated. Winter barley is the main food for local people in Burang Township, although spring barley is also cultivated in some households. Water sources for croplands are mostly from irrigation because annual precipitation in this area is only about 200 mm.

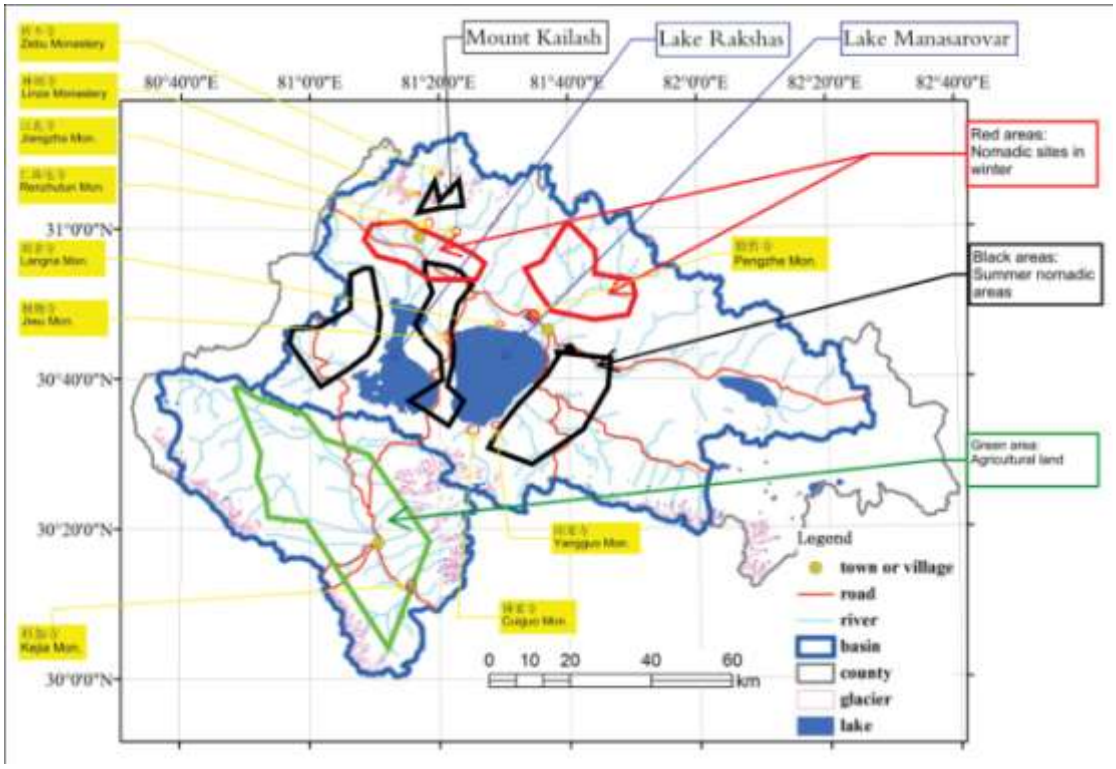

Figure 5. Distribution of agricultural land and nomadic sites in different seasons.

2) ***Role of Livestock, Integrated Farming Systems, Agroforestry***

Livestock husbandry is the main production system in Burang County, although there is irrigated agriculture in lower Burang Township. As formerly mentioned, northern communities of Baga and Hor townships are engaged in livestock husbandry. Milk and meat are the main food for their daily lives. With the development of market economy, barley and rice are also exchanged as supplementary food for people in pastoral areas.

In south Burang Township, integrated farming systems with livestock are popular in some sites. However, livestock husbandry forms only a small part of the agricultural production due to shortage of grassland and the steep landform. Farmland with poplar and willow trees as shelter belt consists of agroforestry system. Tree plantation is in a very small scale in the Karnali River Valley and mostly surrounds villages or households.

3) ***Transhumance and Nomadic Herding Activities***

The north part of KSL, with altitudes more than 5,000m, is the summer nomadic herding site (black circled area in Figure 5), while winter nomadic herding sites are concentrated in Lake Manasarovar Basin and Lake Rakshastal Basin (indicated in red polygon areas in Figure 5).

2.4 Hydrology and Water Resources

1) *Glaciers and Ice*

Due to the wide range of mountains and high altitude in this area, there are numerous glaciers in the region. Total glacial area is approximately 262 km^2, covering 2.42% of KSL-China. More than 80% of the glaciers are oriented to the north. Because of the semi-arid conditions on the plateau, the average altitude of the glacier termini is very high, about 5,200m.

There are two famous glaciers in KSL-China (Figure 6): Gurla Glacier and Kailash Glacier. Gurla Glacier is the largest glacier in Karnali Basin and also the source of Karnali River. Kailash glacier is located in Manasarovar Basin and is one of the sources of Lake Rakshastal. Mount Kailash is famous world-wide because of its unique distinction as the world's most venerated holy site. As a sacred site for at least five religions and more than a billion people, Mt Kailash is visited by more than tens of thousands of pilgrims each year. Despite the Karnali Basin being relatively smaller and having fewer famous mountains, total glacier cover in Karnali Basin (182.60 km^2) is twice more than Manasarovar Basin (79.72 km^2) because there are numerous mountains over 6,000m in this area. As a result, there are also more barren lands in Karnali Basin.

Figure 6. Mount Kailash (left) and Mount Gurla (right).

2). *Water Bodies and Watersheds*

Water bodies in this area are mostly covered by lakes. Total area of water bodies is about 738 km^2, accounting for about 6.82% of total area.

Because Manasarovar Basin is an endorheic drainage basin, the drainage water has formed several great lakes such as Lake Rakshastal (258.5 km^2) and Lake Manasarovar (410.6 km^2). On the other hand, the Karnali Basin is an exorheic drainage basin and its waters flow to Nepal via the Karnali River. As a result, area of water bodies in Karnali Basin is only 4.11 km^2.

Lakes and glaciers are important landscapes in this area for two reasons. First, Mt. Kailash and Lake Manasarovar are religiously holy sites which attract numerous visitors from around

the world. Second, lakes and glaciers supply water for vegetation, animals and people throughout the year (especially during the arid season) because annual precipitation is only ca. 200 mm.

Lake Manasarovar

Lake Manasarovar, Mapam Yumco, (Tibetan: མ་ཕམ་གཡུ་མཚོ།; Chinese：玛旁雍错), is a freshwater lake in TAR of China with 2,000 km (ca. 200 miles) from Lhasa. To the west of Lake Manasarovar is Lake Rakshastal, and towards the north is Mt. Kailash. It is the highest freshwater body in the world. As per Hindu theology, Lake Manasarovar is the abode of purity and one who touches the earth of Manasarovar will go to paradise; one who drinks water from the lake will go to the heaven of Lord Shiva; and s/he will be cleansed of his sins committed over a hundred lifetimes.

Like Mt Kailash, Lake Manasarovar is a place of pilgrimage attracting religious people from India, Nepal, Tibet and the neighboring countries. Bathing in Manasarovar and drinking its water is believed to cleanse all sins. Pilgrimage tours are organized regularly, especially from India, the most famous of which is the Kailash Manasarovar Yatra which takes place every year. Pilgrims come to take ceremonial baths in the cleansing waters of the lake.

Manasarovar Lake has long been viewed by pilgrims as the source of four of the greatest rivers of Asia namely Brahmaputra, Karnali, Indus and Sutlej. Thus, it is an axial point which has been thronged by pilgrims for thousands of years. The region was initially closed to pilgrims from outside and no foreigners were allowed between 1949 and 1980. However, after the 1980s, it was open and has again become a part of the Indian pilgrim trail.

According to Hindu religion, the lake was first created in the mind of Lord Brahma. Hence, in Sanskrit it is called "Manasarovar" which is a combination of the words *manas* (mind) and *sarovara* (lake). The lake, in Hindu religious belief, is also supposed to be the summer abode of swans. Considered as sacred birds, swans (Sanskrit: *hansa*) are an important element in the symbology of the subcontinent representing wisdom and beauty. It is also believed that *Devas* descend to bathe in the lake between 3 and 5 am, the time of the day known as *Brahmhi muhurta*.

Buddhists also associate the lake with the legendary lake known as Anavatapta in Sanskrit and Anotatta in Pali, where Queen Maya is believed to have conceived Buddha. The lake has eight monasteries on its shores, the most notable of which is the ancient Chiu Gompa (Monastery) built right onto a steep hill. The monastery appears to have been carved right out of the rock. Jains and Bonpas of Tibet equally revere this spot with great enthusiasm.

Lake Rakshastal

Lake Rakshastal (officially: La'nga Co; Tibetan: ལང་ངར་མཚོ་; Chinese: 拉昂错) is a lake in TAR, China situated close to the western side of Lake Manasarovar and Mount Kailash. The Sutlej River originates at Rakshastal's northwestern tip. Despite its close proximity to Lake Manasarovar—over the road to Burang County, Lake Rakshastal does not share the lore of worship with its eastern neighbor. Named 'lake of the demon', Lake Rakshastal is considered to be the residence of Ravana, the ten-headed demon king of Ceylon in Hindu mythology. In Buddhism, Lake Manasarovar, which is round like the sun, and Lake Rakshastal, shaped as a crescent, are regarded respectively as 'brightness' and 'darkness'. Its salty water, a stark contrast to the fresh waters of Lake Manasarovar, produce no waterweeds or fish and is considered poisonous by locals.

According to Hindu mythology, this lake was created by the demon King Ravana for the express purpose of garnering superpowers through acts of devotion and meditation to Lord Shiva who was presiding on Mt Kailash. It was upon the banks of a special island in this lake that he would make daily offerings with one of his ten heads as a sacrifice to please Lord Shiva. Finally, on the tenth day, Lord Shiva was moved by his devotion and granted him his wish to obtain superpowers. This demon-created lake is in contrast to the sacred god-created Lake Manasarovar.

However, despite its notoriety, Lake Rakshastal bears no less beauty than other lakes in Tibet. Originally joined with Lake Manasarovar and later separated by geological movements, it is still connected with Lake Manasarovar by a natural channel, Ganga Chhu. It covers a total area of 70 sq.km. at an altitude of 4,752m. Though absent of nearby grasslands, the white cobbles, dark red hills and island, and the deep blue lake water present another distinctive picture absent from many of the places more frequented by visitors.

Karnali Basin

Karnali (or Ghaghara) is a transboundary perennial river originating on the Tibetan Plateau near Lake Mansarovar. It cuts through the Himalayas in Nepal and joins the Sarda River at Brahmaghat in India. Together they form the Ghaghra River, a major left bank tributary of the Ganges. With a length of 507 km, it is the largest river in Nepal and one of the largest tributaries of the Ganges. The total length of Karnali River up to its confluence with the Ganges at Doriganj in Bihar is 1,080 km.

Karnali River is called Peacock River in Chinese; Kauriala, Manchu and Karnali (meaning Turquoise River) in Nepali. In Uttarakhand, Pilibhit and Shahjanpur Districts of Uttar Pradesh, India it is spelled Gogra, Ghaghra or Ghagraand Khakra, literally translating to holy water from the sacred mountain. It rises in the southern slopes of the Himalayas in Tibet, in the glaciers of Mapchachungo, at an altitude of about 3,962m. As the Karnali River, the river flows south through one of the most remote and least explored areas of Nepal. The 202 km

Seti River drains the western part of the catchment and joins the Karnali River in Doti District, north of Dundras hill.

The Karnali River Basin lies between the mountain ranges of Dhaulagiri in Nepal and Nanda Devi in Uttarakhand, India. In the north, it lies in the rain shadow of the Himalayas. The basin formed by the river has a total catchment area of 127,950 km^2, of which 45% is in India. The population of the Basin districts in Nepal increased from 1.9 million in 1971 to 4.7 million people in 2001, almost a 250% increase over three decades.

2.5 Biological Diversity of Flora and Fauna

1) *Overview of biodiversity*

There is abundant biodiversity in Kailash-China. Vegetation is composed of north-temperate flora. Dominant communities are alpine steppe, shrubs and desert. Dominant steppe or meadow communities are *Stipa purpurea*, *Stipa purpurea* var. *glareosa*, *Carex moorcroftii* + *Leymus secalinus*, and *Stipa purpurea* + *Kobresia pygmaea*. Some alpine shrubs are dominated by *Caragana versicolor* and *Potentila fruticosa* var. *pumila*. Wetland vegetation surrounding Manasarovar Lake area is dominated by communities including *Triglochin maritimum*, *Carex cryptostachys*, *Kobresia pygmaea*, *Carex moorcroftii* + *Polygonum sibiricum* var. *thomsonii*. Hydrophyte community is mostly dominated by *Potamogeton pectinatus*.

There are more than 100 species of vertebrates belonging to 77 genera and 40 families of fishes, amphibians, reptiles, birds and mammals in Burang County.

2) *Spatial Distribution of Biodiversity by Ecozones, Altitude and Geographical Location*

The northern part of Burang County, i.e. Kailash Mountains, is dominated by cushion plants, shrubs and meadow, and alpine steppe. The middle part of the county surrounding Manasarovar Lake is dominated by hydrophytic vegetation (Figure 7). South Burang is at lower altitude and has agricultural lands with temperate or subalpine shrubs on sloping areas. The distribution map of community associations is indicated in Figure 8.

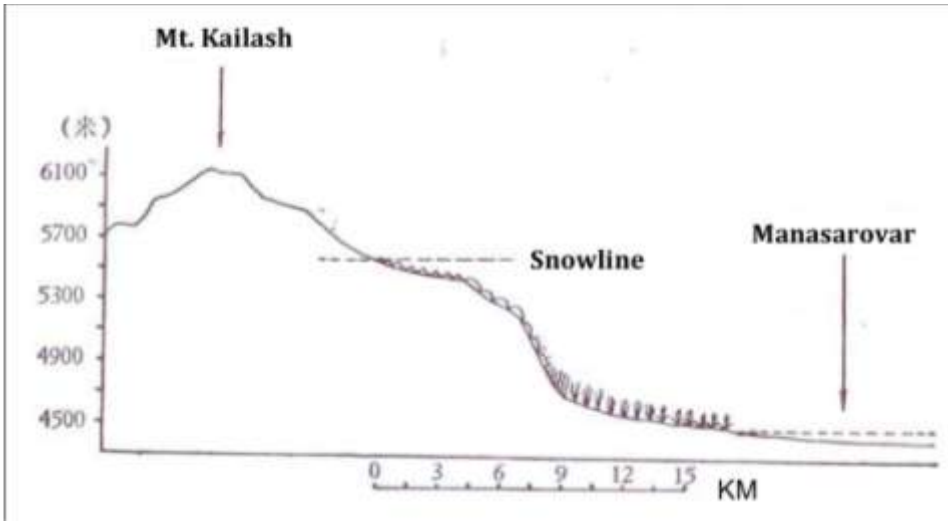

Figure 7. Altitudinal distribution of vegetation in KSL-China.

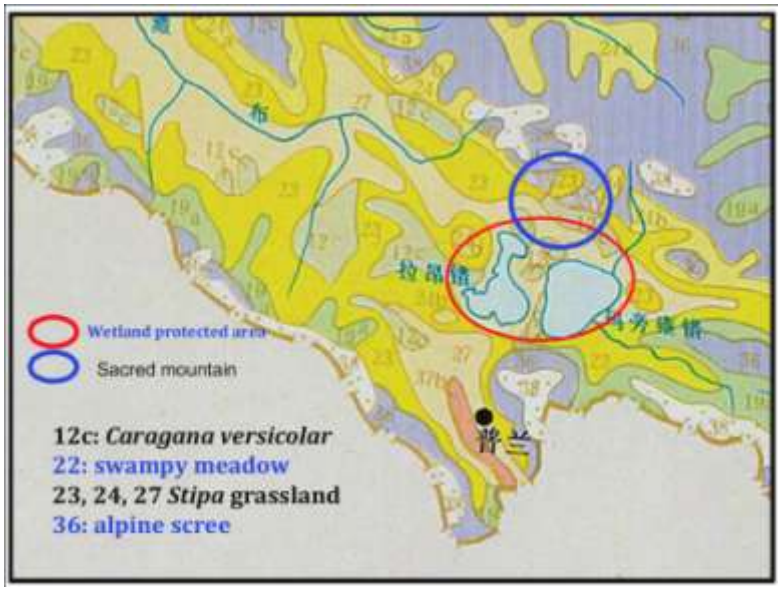

Figure 8. Vegetation map of different associations in KSL-China.

There are 268 plant species (varieties) in KSL-China. The species are distributed in various families: Compositae (32 species), Gramineae (31), Leguminosae (22), Cruciferae (17), Ranunculaceae (17), Polygonaceae (16), Caryophyllaceae (15), Gentianaceae (15), Cyperaceae (11), Rosaceae (11), and Saxifragaceae (10). The landscape is also habitat for Western Himalayan flora. There are eight endemic plant species in this area:

1. *Berberis pulangensis*
2. *Arenaria puranensis*
3. *Silene puranensis*
4. *Cremanthodium petiolatum*
5. *Arabis attenuata*
6. *Kobresia burangensis*
7. *Swertia ciliata*
8. *Regneria pulanensis*

Fauna in KSL-China are of the Changthang Plateau sub-region of the Palaearctic region. Wildlife is mainly distributed in the north and middle alpine areas of Burang County. More than 20 species of animals are listed in national protected animals and CITES lists.

Seven fish species of two families and three genera are found in Lake Manasarovar. Among these, *Schizopygopsis stoliczkae maphamyumensis* subsp. nov. (Figure 9) is endemic to Lake Manasarovar.

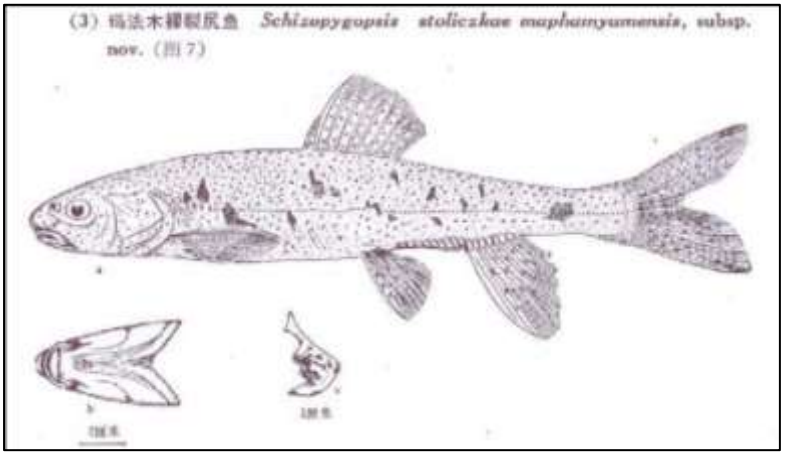

Figure 9. Endemic fish in Lake Manasarovar.

There are 65 bird species in KSL-China. Major bird species are listed below:

1. Falco t. tinnunculus	*17. Cephalopyrus f. flammiceps*
2. Grus nigricollis	*18. Tichodroma muraria nepalenisi*
3. Galllinula c. chloropus	*19. Passer domesticus parkini*
4. Charadrius dominicus fulvus	*20. Montifringilla a. adamsi*
5. Chardrius mongolus atrifrons	*21. Montifringilla taczanowskii*
6. Ibidorhyncha struthersii	*22. Montifringilla r. ruficollis*
7. Syrrhaptes tibetanus	*23. Montifringilla b. blanfordi*
8. Athene noctua orientalis	*24. Serinus passillus*
9. Eremophila alpestris argalea	*25. Carduelis carduelis caniceps*
10. Alauda gulgula ihamarum	*26. Leucosticte branditi haematopygia*
11. Ptyonoprogne rupestris	*27. Emberiza cia stracheyi*
12. Motacilla alba alboides	*28. Oriolus oriolus kundoo*
13. Motacilla citreola calacrata	*29. Luscinia pecoralis*
14. Phylloscopus collybita sindianus	*30. Chaimarrornis leucocephalus*
15. Phylloscopus affinis	*31. Oenanhe deserti oreophila*
16. Phylloscopus inornatus	32. *Monticola slitaria longirotris*

3) *Endangered, Threatened and Rare species* (Red List species)

There are 24 protected wildlife species including 8 species of first class (I) and 16 species of second class (II) important species in China. Among these, 9 species are listed under Appendix I of CITES and 14 species as Appendix II (Table 3).

Table 3. Protected animals in Manasarovar wetland protected area

SN	Protected Animals	National class	CITES class
1	*Panthera uncial* (snow leopard, 雪豹)	I	I
2	*Equus kiang* (Kiang, 西藏野驴)	I	
3	*Bos mutus* (Wild yak 野牦牛)	I	I
4	*Pantholops hodgsoni* (藏羚)	I	I
5	*Aquila chrysaetos* (金雕)	I	II
6	*Gypaetus chrysaetos* (胡秃鹫)	I	II
7	*Haliaeetus leucoryphus* (玉带海雕)	I	II
8	*Grus nigricollis* (黑颈鹤)	I	I
9	*Ursus arctos* (棕熊)	II	II
10	*Lutra lutra* (水獭)	II	I
11	*Lynx lynx* (猞猁)	II	II
12	*Procapra picticaudata (*藏原羚)	II	
13	*Pseudois nayaur* (岩羊)	II	I
14	*Ovis ammon* (盘羊)	II	I
15	*Milvus korschun* (鸢)	II	II
16	*Buteo himilasius* (大鹭)	II	II
17	*Aquila rapax nepalensis* (草原雕)	II	II
18	*Aegypius monachus* (秃鹫)	II	II
19	*Gyps himalayensis* (高山秃鹫)	II	I
20	*Falco cherrug milvipes* (猎隼)	II	II
21	*Falco tinnunculus* (红隼)	II	II
22	*Tetraogallus tibetanus* (藏雪鸡)	II	I
23	*Bubo bubo* (雕鸮)	II	II
24	*Athene boctua orientalis* (纵纹腹小鸮)	II	II
25	*Canis lupus* (Wolf, 狼)	II	

Uncia uncia (snow leopard) is a moderately large cat native to mountain ranges of central and south Asia. It lives between 3,000 and 5,500m in the rocky mountain ranges of Central Asia. Their geographic distribution runs from the Hindukush in eastern Afghanistan and the Syr Darya through the mountains of the Pamir , Tian Shan, Karakoram, Kashmir, Kunlun, and the Himalaya to southern Siberia. Their range habitat is about 1.1 million km^2. In Tibet it is found up to the Altyn-Tagh in the North. In 1972, IUCN placed the snow leopard on its Red List of Threatened Species as globally "Endangered." The same threat category was applied to the species in the assessment conducted in 2008. Total wild population of the snow leopard was estimated at only 4,080 to 6,590 individuals. However, their secretive nature means that their exact numbers are not known.

Equus kiang (kiang) is the largest of the wild asses. This equine is native to the Tibetan Plateau, where it inhabits montane and alpine grasslands from 4,000 to 7,000m. Its current range is restricted to Ladakh, plains of the Tibetan Plateau, and northern Nepal along the Tibetan border.

Bos grunniens, wild yak, is a long-haired bovine found throughout the Himalayan region of south Central Asia, the Tibetan Plateau and as far north as Mongolia and Russia. In addition to a large domestic population, there is a small, vulnerable population of wild yaks. Wild yaks usually form herds of between 10 and 30 animals. Their habitat is treeless uplands such as hills, mountains and plateaus between 3,200 and 5,400m. Yak physiology is well adapted to high altitudes, having larger lungs and heart than cattle found at lower altitudes, as well as greater capacity for transporting oxygen through their blood. They are insulated by dense, close, matted under-hair as well as shaggy outer hair. Yaks secrete a special sticky substance in their sweat which helps keep their under-hair matted and acts as extra insulation. This secretion is used in traditional Nepalese medicine. Many wild yaks were killed for food by hunters in the past. They are now a vulnerable species.

Pantholops hodgsonii (Tibetan antelope or Chiru, Chinese 藏羚羊), the sole species in the genus *Pantholops*, is a medium-sized bovid which is about 80 cm in height at shoulder-level. It is native to the Tibetan Plateau in China's Tibet Autonomous Region, Qinghai Province and Xinjiang Province; and Indian occupied Kashmir near Ladakh. The Tibetan antelope is also known commonly by its Tibetan name Chiru. Its coat is grey to reddish-brown with a white underside. Males have long, back-curved horns which measure about 50 cm in length. There are less than 75,000 individuals left in the wild, down from a million only 50 years ago.

Aquila chrysaetos (Golden eagle) is one of the best known birds of prey in the northern hemisphere. Like all eagles, it belongs to the family *Accipitridae*. Once widespread across the Holarctic, it has disappeared from many of the more heavily populated areas. Despite being locally extinct or uncommon, the species is still fairly ubiquitous, being present in Eurasia, North America and parts of Africa. Golden eagles use their speed and sharp talons to snatch

rabbits, marmots and ground squirrels. They also eat carrion, reptiles, birds, fish, and smaller fare such as large insects. They have even been known to attack fully grown deer. Golden eagle pairs maintain territories that may be as large as 155 sq.km. They are monogamous and may remain together for several years or possibly for life. Golden eagles nest in high places including cliffs, trees, or human structures such as telephone poles. They build huge nests to which they may return for several breeding years. They are found from Southern Kazakhstan to Manchuria and south-west China, and also in northern Pakistan, Kashmir and western India.

Gypaetus barbatus (Bearded vulture-eagle) is an Old World vulture, the only member of the genus *Gypaetus*. It breeds on crags in high mountains in southern Europe, Africa, India and Tibet, laying one or two eggs in mid-winter which hatch at the beginning of spring. The population is resident. Like other vultures it is a scavenger, feeding mostly from carcasses of dead animals. It usually disdains rotting meat, however, and lives on a diet that is 90% bone marrow. It will drop large bones from a height to crack them into smaller pieces. Its old name of Ossifrage (bone breaker) relates to this habit. Live tortoises are also dropped in similar fashion to crack them open.

Haliaeetus leucoryphus (Pallas's fish-eagle) is a large, brownish sea-eagle. It breeds in Central Asia, between the Caspian Sea and the Yellow Sea, from Kazakhstan and Mongolia to the Himalayas, Pakistan, northern India and Bangladesh. It is partially migratory, with central Asian birds wintering among the southern Asian birds in northern India, and also further west to the Persian Gulf. The conservation status of Pallas' fish-eagle is Vulnerable, with a population of about 2,500 to 10,000 remaining. Besides direct persecution, humans contribute to the decline of this species through habitat degradation, pollution, and draining or overfishing lakes. In India, the species is also threatened by water hyacinth (*Eichhornia* spp.) which spreads over lakes and makes finding prey difficult. Their large range is deceptive, as Pallas's fish-eagle is rare and isolated throughout its territory and may not breed in large areas of it.

Grus nigricollis (Black-necked crane or Tibetan crane) is a medium-sized crane native to Asia. It is distributed in Pakistan, China, Himalayan regions of India, Bhutan and Vietnam. It breeds on the Tibetan Plateau, with a small population in adjacent Ladakh and Kashmir Valleys. It has therefore been designated as the "State bird of Jammu and Kashmir". The Black-necked crane is one of the spiritual creatures for people of the area and is pictured alongside many of their deities in the region's monasteries. The Black-necked crane is listed as Vulnerable on the IUCN Red List of Threatened Species. It is listed on Appendix I and II of CITES. The estimated population of Black-necked crane is between 5,600 and 6,000 individuals. The major threat to its survival is cultivation on its breeding grounds. Also the opening up of Ladakh Valley to tourism has directly affected the crane's population over the last few years. It is legally protected in China, India and Bhutan.

Ursus arctos (brown bear) is a large bear distributed across much of northern Eurasia and North America. While the brown bear's range has shrunk, and it has faced local extinctions, it remains listed as a species of least concern by IUCN with a total population of approximately 200,000.

Lutra lutra, also known as Eurasian otter, is a European and Asian member of the *Lutrinae* or otter subfamily and is typical of freshwater otters. The European Otter declined across its range in the second half of the 20th century primarily due to pollution from pesticides. Other threats include habitat loss and hunting, both legal and illegal. They are listed as Near Threatened by the 2001 IUCN Red List.

Lynx lynx (Eurasian lynx) is a medium-sized cat native to European and Siberian forests, where it is one of the predators. The European lynx is native to the Chinese provinces of Gansu, Qinghai, Sichuan, and Shaanxi, as well as to Iran, Mongolia, Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan, Tajikistan, and to Ladakh region of Jammu and Kashmir.

Procapra picticaudata (Tibetan gazelle) is a species of antelope that inhabits the Tibetan Plateau. They are grayish brown in color with a short, black-tipped tail in the center of a heart-shaped white rump-patch. The thin and long legs of this elegant animal enhance its running skill, which is required to escape from predators. Mating season is in December, with young born the following May. Presently, gazelles are suffering not only from poor pasture conditions, but also from problems associated with small populations such as lack of genetic diversity, which makes them less resistant to diseases. Populations in both Ladakh and Tibet seem to be declining precipitously and are threatened with extinction, at least in some regions. Within India, a small population of gazelles also exists in northern Sikkim, at the border between India and Chinese-controlled Territory, thus moving back and forth between India and Chinese Territory.

Pseudois nayaur (bharal or Himalayan blue sheep) is a caprid found in the high Himalayas of Nepal, TAR-China, Kashmir, Pakistan, Bhutan and India. It has horns that grow upwards, curve out and then towards the back, somewhat like an upside down mustache. The bharal is a major food species of the snow leopard. The Dwarf blue sheep (*P. schaeferi*) is sometimes considered to be a subspecies of the bharal.

Aquila nipalensis (Steppe eagle) is a bird of prey. It is about 62–81 cm (24–32 inches) in length and has a wingspan of 165–200 cm (65–79 inches). Females, weighing 2.3-4.9 kg (5-10.8 lbs), are slightly larger than males, at 2-3.5 kg (4.4-7.7 lbs). Like all eagles, it belongs to the family Accipitridae. It was once considered to be closely related to the non-migratory Tawny eagle, *Aquila rapax*, and the two forms have previously been treated as co-specific. They were split based on pronounced differences in morphology and anatomy; two molecular

studies, each based on a very small number of genes, indicate that the species are distinct but disagree over how closely related they are.

Aegypius monachus (Cinereous vulture) is also known as Black vulture, Monk vulture, or Eurasian black vulture. It is a member of the family *Accipitridae*, which also includes many other diurnal raptors such as kites, buzzards and harriers. It breeds across southern Europe and Asia from Spain to Korea, but is endangered throughout its European range. It is resident except in those parts of its range where hard winters cause limited movement. It has the typical vulture unfeathered bald head (actually covered in fine down), and dark markings around the eye giving it a menacing skull-like appearance. The Cinereous vulture has declined over most of its range in the last 200 years due to poisoning by eating poisoned bait put out to kill dogs and other predators, and to higher hygiene standards reducing the amount of available carrion. It is currently listed as near threatened. The decline has been the greatest in the western half of the range, with extinction in many European countries and northwest Africa. Trends in the small populations of Ukraine and European Russia, and in Asian populations, are not well recorded. In the former USSR, it is still threatened by illegal capture for zoos, and in Tibet by rodenticides.

Falco tinnunculus (Common kestrel) is a bird of prey belonging to the kestrel group of the falcon family, *Falconidae*. It is also known as the Eurasian kestrel or Old World kestrel. This species occurs over a large range. It is widespread in Europe, Asia, and Africa, as well as occasionally reaching the east coast of North America. But although it has colonized a few oceanic islands, vagrant individuals are generally rare; in the whole of Micronesia for example, the species was only recorded twice each on Guam and Saipan in the Marianas.

Tetraogallus tibetanus (Tibetan snowcock) is a cock in the pheasant family Phasianidae of the Order Galliformes. This species is found in the Western Himalayas of the Kashmir region of Pakistan and India.

Bubo bubo (Eurasian eagle-owl) is a species of eagle owl resident in much of Europe and Asia. It is also one of the largest types of owls. The Eagle owl is a large and powerful bird and sometimes titled the world's largest owl, but so is Blakiston's fish owl which is slightly bigger on average. It mainly feeds on small mammals, but can kill prey up to the size of foxes and young deer.

4) Medicinal and Other Important Species

National Ministry of Forestry specially protects *Pantholops hodgsoni* and *Grus nigricollis* in the Kailash region. In addition, there are more than 30 species with economic, scientific or profitable value, and are listed below.

Amphibians (1 species):

1. *Altirana parkeri*

Reptiles (1 species):

1. *Phrynocephalus theobaldi*

Birds (30 species):

1. *Podiceps cristatus*
2. *Phalacrocorax carbo*
3. *Anser indicus*
4. *Anas strepera*
5. *Todorna ferruginea*
6. *Aythya ferina*
7. *Aythya fuligula*
8. *Mergus merganser*
9. *Perdix hodgsoniae*
10. *Charadrius mongolus*
11. *Numenius arquata*
12. *Numenius ochropus*
13. *Tringa tetanus*
14. *Capella stenura*
15. *Calidris temminckii*
16. *Ibidorhyncha struthersii*
17. *Larus brunnicephalus*
18. *Sterna hirundo*
19. *Syrrhaptes tibetanus*
20. *Columba leuconota*
21. *Columba rupeatris*
22. *Upupa epops*
23. *Alauda gulgula*
24. *Eremophila alpestris*
25. *Motacilla alba*
26. *Motacilla cinerea*
27. *Motacilla citreola*
28. *Motacilla flava*
29. *Phylloscopus affinis*
30. *Carpodacus rubicilla*

Mammals (3 species):

1. *Vulpes vulpes*
2. *Vulpes ferrlata*
3. *Mustela altaica*

The following five species are listed as second grade protected animals of TAR-China:

1. *Anser indicus*
2. *Anas stepera*
3. *Todorna ferruginea*
4. *Mergus merganser*
5. *Vulpes ferrlata*

2.6 Wildlife and Wildlife Habitats

1) *Habitat for Migratory Species and Migration Corridors*

As mentioned in 2.4, there are more than 30 wildlife species with economic and scientific value. There are also 25 species of nationally and CITES protected animals.

KSL-China provides important habitats for wildlife, especially the wetlands of Lake Manasarovar for migratory birds such as Black-necked crane (*Grus nigricollis)*. Manasarovar Lake is one of the western migration corridors of Black-necked crane. In winter, these cranes migrate from southeastern Xinjiang Autonomous Region-China to western Qinghai and Changthang, in north Tibet and then to Yalungzangbo River. A few cranes also cross the Himalayas to Bhutan.

2) *Wildlife Management*

Environmental protection measures are adopted by China and TAR, China to protect wildlife in Changthang National Protected Area. In 2008, Lake Manasarovar was established as wetland protected area of TAR, China.

Vegetation and Wildlife Protection: Vegetation and wildlife protection measures are in place to protect wildlife habitats and breeding sites, to increase forest coverage rate by choosing the right seeds, to provide fuel to local residents so that deforestation and grass-cutting can be avoided, and to build the ecosystem around the Peacock River Watershed.

Constructing Manasarovar Wetland Natural Reserve*:* Manasarovar, the world's largest high-altitude freshwater lake, is also a globally renowned sacred pilgrimage site and tourist destination. In 2008, the Manasarovar Wetland Natural Reserve was declared. Meanwhile, various measures have been taken to protect this wetland environment. For example, wetlands which were once pastures have been reverted to wetlands and bars have been constructed to protect small lakes and some environmentally sensitive wetlands.

3) *Existing Local, National /Sub-national or International Conservation or Management*

i. Environmental conservation and management measures adopted by Central Government and Tibet Autonomous Region

The Standing Committee of the People's Congress of TAR, China and the people's government of the Autonomous Region have published a series of local laws and regulations, as well as administrative rules and systems, covering the protection of environment and natural resources in line with actual local conditions. Examples are "Regulations for the Protection of Forests in the Tibet Autonomous Region", "Provisional Regulations of the Tibet Autonomous Region on Administration of Grasslands" and "Notice of the People's Government of the Tibet Autonomous Region on the Protection of Aquatic Resources". In the field of wildlife protection alone, there are more than 20 documents on related regulations and systems.

Tibetan Eco-security Shelter Construction: In February 2008, the Standing Committee of the State Council discussed and approved 'the program for Tibetan eco-security shield construction (2008-2030)' which provides an overall 15.5 billion RMB investment to fulfill 10 eco-environmental protection projects within 5 "5-year Plans" and a national arrangement for Tibetan eco-environment improvement and response to global warming. Key eco-environmental projects of the program include natural grassland conservation, forest fire prevention, pest control management and wildlife protection. Meanwhile, great attention has also been paid to construction of shield forests and artificial pasture system, improvement of natural pastures, and soil retention.

Firewood Replacement Strategy: Firewood replacement strategy attempts to solve energy deficiency and to improve the Tibetan eco-environment. By adopting the strategy, it is expected that by 2015, reliance on traditional firewood will be reduced significantly and new or renewable energy sources, such as solar power, hydro-power, bio-power, wind power, geothermal power and so on, will be utilized to a larger extent. '*The research on firewood replacement strategy in Tibetan Autonomous Region*' has proposed a detailed plan to harness new and renewable energy in the region and provided financial subsidiary for firewood replacement strategy.

Pilot Project on Grassland Ecological Efficiency Compensation Fund: In 2009, the Tibetan Autonomous Region, as the first in China, allocated 200 million RMB in five counties to pilot the Grassland Ecological Efficiency Compensation Fund project, which aims not only to improve per capita income of the region, but also to protect grasslands and eco-environment through building of the compensation mechanism. At the same time, people benefiting from the mechanism will increase their awareness of environmental protection.

ii. Environmental Protection Measures adopted by Burang County

Strengthening Environmental Protection in Scenic Spots: Dustbins, garbage treatment stations and outdoor toilets have been built to respond to junk littering and other polluting behavior around scenic spots. Protection of scrubs has been a part of work of county and village government. Also, regulations have been stipulated to prevent wood from being cut while providing only for dung to be used as fuel by tourists and farmers. All these measures have paved the way for future environmental protection.

Improved Grassland Management: Rest-grazing and grazing rotation have been adopted in this area. Other measures to improve the quality of grasslands include quarrying and mining prohibition, stock number control, artificial grass planting, comprehensive management of deserted pastures, and irrigation improvement.

Protecting Environment by Promoting Tourism: Environmental pressure caused by over-grazing and tourism garbage can be lessened by adjusting industrial structures of surrounding areas. In practice, people living in this area can operate their own tourism businesses, such as operating home inns, mom-stores, and transportation business, so as to weaken their reliance on traditional ranching while providing services to tourists and pilgrims.

2.7 Protected Areas

1) *Existing Protected Areas Within or Nearby KSL-China*

The Changthang Protected Area, with an area of 298,000 km^2 covering part of Burang County, was established in 1993 and upgraded in 2000 as a national protected area in order to protect important animals such as Tibetan antelope (*Pantholops hodgsonii*), Tibetan wild ass (*Asinus kiang*), wild yak (*Bos mutus*), Tibetan gazelle (*Procapra picticaudata*), brown bear (*Ursus arctos*), snow leopard (*Uncia uncia*) and black-necked crane *(Grus nigricollis)*. In 2008, Manasarovar watershed was established as a wetland protected area of TAR, China in

order to protect Lakes Manasarovar and Rakshastal and their wetland vegetation, fishes and wildlife.

2) Potential Conservation Corridors linking Protected Areas

There is a potential corridor linking Changthang National Protected Area in the north to Lake Manasarovar Wetland Protected Area in the south. Large animals and migratory birds can freely migrate through this corridor in KSL-China.

3) ***Local, National or International Conservation Efforts or Organizations Active in KSL-China***

The Changthang Protected Area was established in 1993 and upgraded to a national protected area in 2000 in order to protect important wildlife. Similarly, in 2008, Manasarovar watershed was established as a wetland protected area in order to protect Lakes Manasarovar and Lake Rakshas and their wetland ecosystems.

2.8 Forest Development, Utilization and Management

There are no natural forests in KSL-China although there is afforestation around villages along the Peacock River bank and in Burang County town (Figure 10). The main species for afforestation are aspen and willow. The growing stock is ca. 1,500 m^3 in the whole county. In addition there are 197,718 hm^2 of scrubs mainly distributed south of Burang County. The scrub cover is nearly 16% in the scrubland.

Figure 10. Forest patches surrounding villages in Burang County town.

2.9 Rangelands and Rangeland Management

There are 757,440 hm^2 of rangeland in Burang County, in which 630,400 hm^2 are available rangelands for livestock use. According to remote sensing analysis, rangelands and high pastures in KSL-China is about 5,357 km^2 and covers almost half (49.4%) the total area. Rangelands and high pastures are mainly composed of six land cover types: sparse shrublands with sparse herbaceous (20.15% of total area), open shrublands with sparse to open herbaceous (16.98%), sparse grasslands (7.18%), open grasslands (3.80%), close grasslands (0.41%) and wetlands (0.89%). Although the total area of rangeland and high pastures is very large, the widely distributed land cover types, i.e. sparse shrublands and sparse grasslands, can produce only little biomass for livestock due to low coverage and productivity. Open grasslands, close grasslands, open shrublands and wetlands provide more preferable forage grasses for livestock and wildlife, but they cover only 22% of the area.

Dominant vegetation types are alpine steppe dominated by *Stipa purpurea* and *Kobresia pygemeae*. Production of rangelands is less than 800 $kg.hm^{-2}$. In Lake Manasarovar Basin, vegetation is dominated by shrubs and the area is usually used as summer pastureland. In winter, herding activities are concentrated in lower altitudes in the northern mountains of Baga and Hor Townships.

2.10 Settlements and Demographic Patterns

1) *Spatial Distribution of Settlements*

According to Burang County Annals, infant death rate before 1959 was very high. Most families had only one or two children and the population had low growth rate. From 1960 to 1980, Burang County experienced stable political situation along with economic development and improvement in living and sanitary conditions, thus population increased. After 1980, family planning was brought into practice; population growth was gradually restricted and was transformed to 'low birth rate, low death rate, and low growth rate'. Population growth can indirectly reflect progress on quality of life, medicine, epidemic prevention, etc.

Population of Burang County increased from 4,000 in 1960 to 8,839 in 2008 (Figure 11). The population is mainly concentrated in Burang Township, located south of Burang County, and accounts for 61% of the total population. Population in Baga and Hor Townships, located north of Burang County, account for 16.9% and 22.1%, respectively.

2) *Population Density, Distribution and Demographics*

The population density of Burang County is 0.63 person per sq. km. and is mainly distributed in the south Peacock (Karnali) River Valley. The population of agriculture and pasture accounts for 58% and 42%, respectively. Population growth rate is 0.41%.

3) *Gender and Migration Patterns and Issues*

According to the 2008 population survey, there are 8,839 persons in Burang County. Males account for 4,224 persons, while females for 4,616; gender ratio between males and females is 0.92:1.

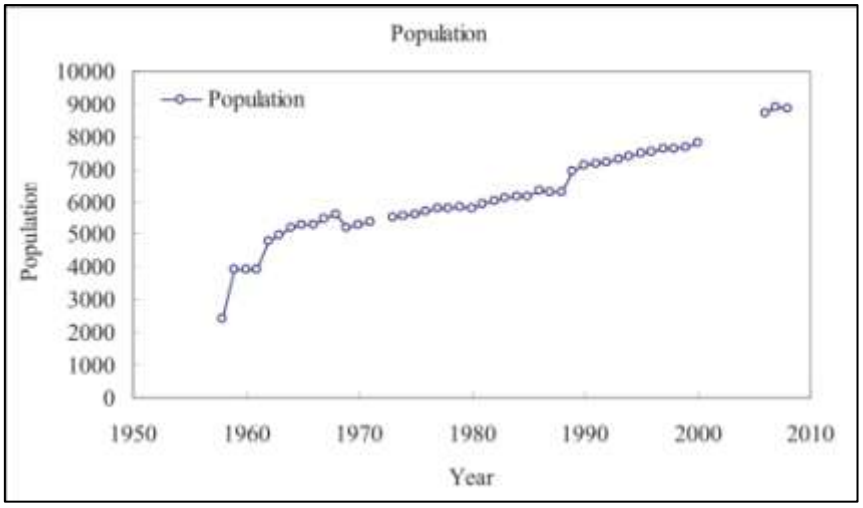

Figure 11. Population dynamics of Burang County since 1958.

2.11 Socio-economic, Livelihood, Poverty and Gender Issues

1) *Main Sources of Livelihood*

From 2001 to 2008, gross earning for farmers and herdsmen has been increasing continuously, but income per capita is still low. Income structure for farmers and herdsmen in Burang County indicates that their incomes are relatively stable. The dominant income is from livestock husbandry, accounting for almost 50% of total income. Transportation and supplementary occupations are playing a significant role in income generation.

Burang County has cultivated land of 9,551 ha[6], while grassland area is 946 million ha[7]. It is also a resource base for grand and edible oil in the Ngari region. Grand and edible oil productions have occupied 60 percent of the whole province. Burang County also hosts several tourism resources including sacred Mt. Kailash, Manasarovar Lake, and the famous Khorzhak Monastery among others.

In recent years, along with implementation of supportive policies, Burang County also achieved distinct economic development (Table 4). Between 2000 and 2008, gross product in Burang County increased from about thirty million to more than one hundred million. During this period, average growth rate of gross products increased to 17.2% which is higher than the GDP average rate of the nation.

[6] This data is provided by Burang County Government.
[7] Data from http://baike.baidu.com/view/142038.htm?fr=ala0

Table 4. Index of economy in Burang County (×10^4 RMB Yuan)[8].

Indicator	2000	2001	2002	2003	2004	2005	2006	2007	2008
Gross Product	3,189.7	3,674.0	4,698.1	5,973.3	6,715.3	7,464.5	8,365.0	9,870.7	11,228.3
Primary Industry	1,806.9	1,756.9	1,739.0	1,443.0	1,660.4	1,243.0	1,813.7	2,385.5	2,719.5
Secondary Industry	605.6	605.1	630.0	1,835.2	2,301.5	1,679.1	1,104.7	1,723.9	1,170.8
Tertiary Industry	777.3	1,267.0	2,428.4	2,695.1	2,753.4	4,542.4	5,446.7	5,761.3	7,337.7
Fixed asset investment	1,340.0	1,578.0	2,110.0	14,424.0	11,888.0	1,160.5	3,792.0	3,282.9	1,507.5
Total Retail Sales of Consumer Goods	226.1	984.0	987.0	1,014. 4	1,061.0	1,252.0	1,427.0	1,652.7	1,385.7

Burang County also has a mature industry structure in the Ngari region. There are primary, secondary and tertiary industries in the region (Figure 12). From 2000 to 2008, primary and secondary industries developed steadily, with secondary industry fluctuating slightly in 2004. However, the tertiary industry grew remarkably from less than ten million RMB in 2000 to seventy million RMB in 2008. This was mainly because of construction of the Beijing-Tibet Railway in July 2006.

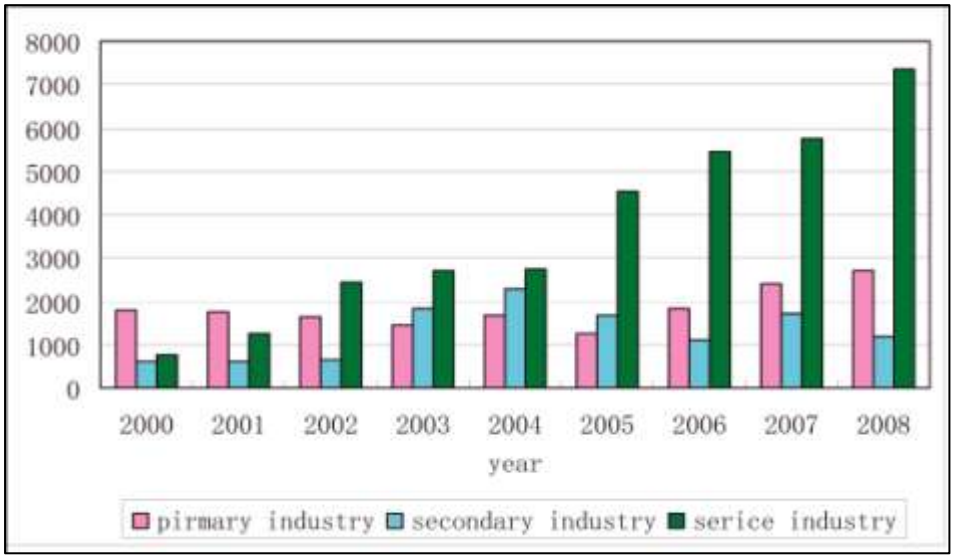

Figure 12. Industrial structures in Burang County.

There has been a change in the economic structure of Burang County from primary industry to the service sector. Moreover, changes in economic structure have made far-reaching impacts on the population of Burang County. However, in general, Burang County has low

[8] This data is provided by Burang County Government, 100 RMB Yuan = 14.7 US$.

income that is steadily growing every year, but it is also receiving increasing subsidies every year from the government.

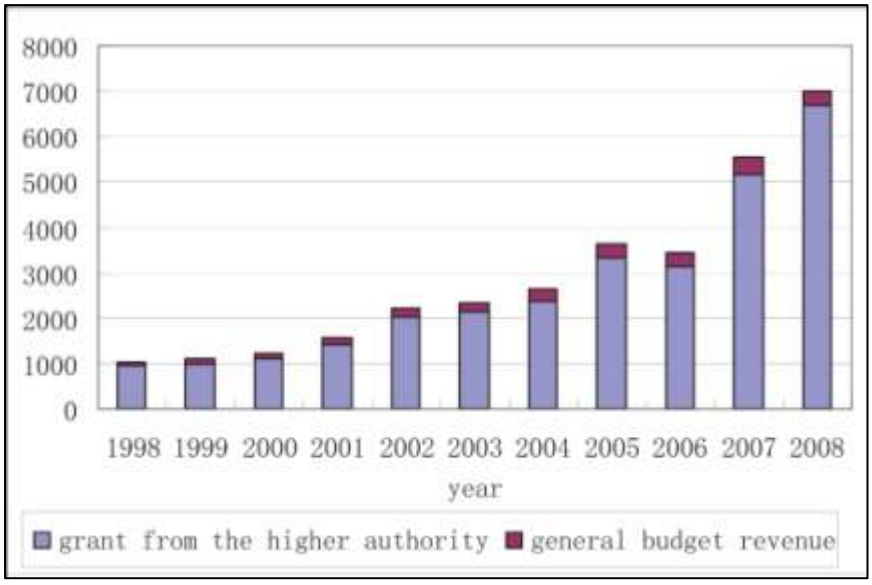

Figure 13. Comparison of subsidy income by government and budget income in Burang County (1998-2008)

2) ***Farmers and Herdsmen Earnings in Burang County***

The population of farmers and herdsmen occupy 95% of the total population in Burang County. Most of them still maintain their traditional life customs. Many of them are only 50% self-sufficiency[9] and they live by means of cropping and animal husbandry (Table 5 and Figure 14).

Table 5. Status of farmers and herdsmen's earnings (Units: RMB yuan).

Year	Gross Earnings	Operating Costs	Net Income	Income per Capita
2001	18,169,046.3	5,477,083.6	12,691,962.7	1,745.68
2002	20,906,913.4	6,817,625.3	14,089,288.6	1,927.40
2003	21,660,691.2	7,955,879.5	13,704,811.6	2,115.92
2004	24,505,564.0	8,978,253.2	15,527,310.7	2,339.86
2005	27,061,110.8	9,924,911.8	17,136,199.0	2,575.32
2006	20,992,604.5	7,717,003.2	13,275,601.2	2,009.02
2007	24,582,199.1	9,004,670.5	15,577,528.6	2,330.22
2008	29,276,638.4	10,727,517.0	18,549,121.5	2,749.00

[9] "a half self-sufficiency condition" is compared to traditional self-sufficiency in terms of economy. Farm machinery, household appliances and other consumer goods, which are used by local farmers and herdsmen, are subject to production levels. With increasingly specialized divisions of labor, the degree of self-sufficiency among farmers and herdsmen will be further reduced.

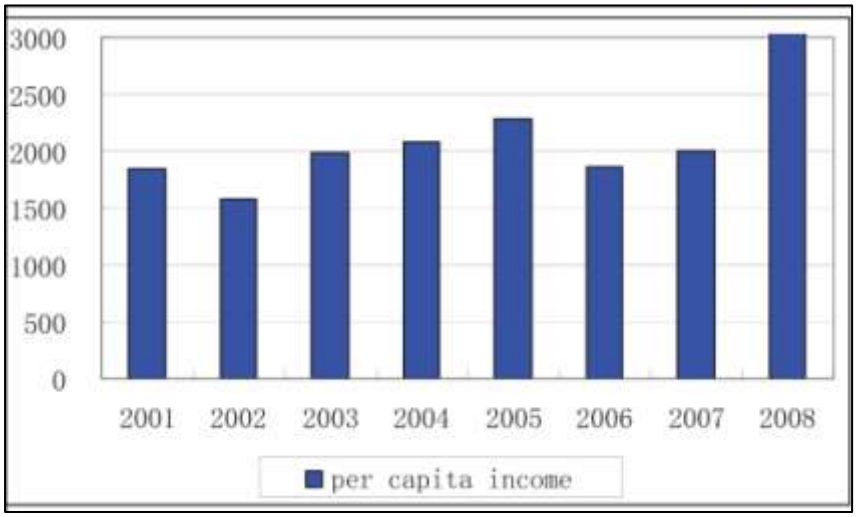

Figure 14. Status of farmers and herdsmen's earnings.

From 2001 to 2008, gross earnings for farmers and herdsmen grew steadily, but income per capita is still low. On the other hand, the income structure for farmers and herdsmen are relatively stable in Burang County (Figure 15). The dominant income is from animal husbandry which accounts for about 50%. Transportation service for tourism and subsidiary occupation are increasingly becoming important sources of income.

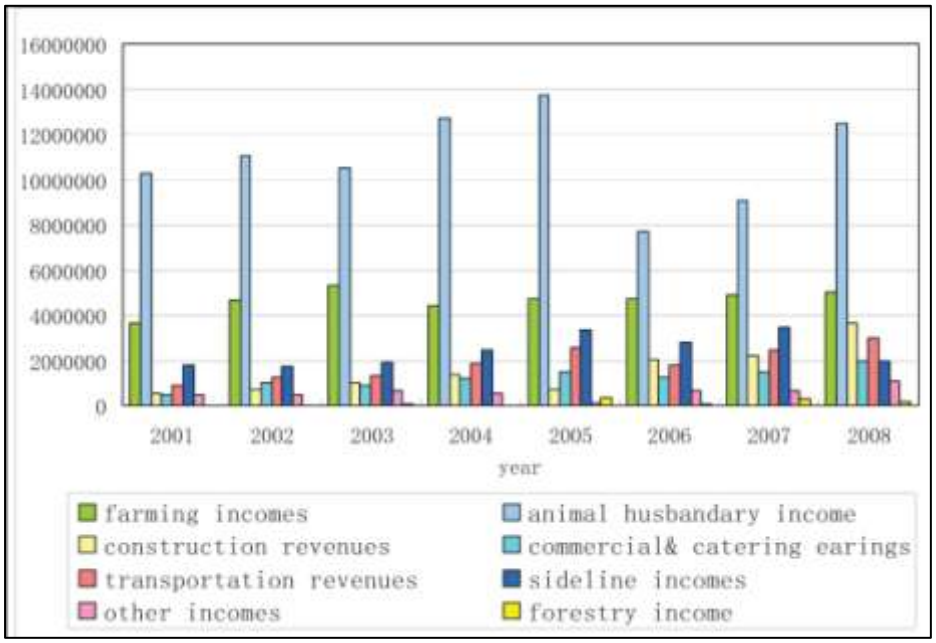

Figure 15. Income structure for farmers and herdsmen in Burang County.

In the future, farming will continue to be the major source of income for local population in Burang County, but its proportion will decrease as more people choose other livelihood options such as trade, subsidiary occupation and service sector jobs. Therefore, focus should be placed on protecting the ecological environment while ensuring sustainable development and enhancing people's livelihoods.

3) Development of External Trade in Burang County

Import commodities for Burang County include clothes, wooden bowls, saffron, brown sugar, coffee, cosmetics, table wares, decorations, saddles, rosewoods, etc. Export commodities are highland barley, ghee, salt, distilled spirit, wool, cashmere, goats, sheep, and horses. Before 2004, import value was 3 million RMB, while export value was 3.5 million RMB. Between 2004 and 2008, both import and export values grew steadily and reached nearly 5 million RMB in 2008. At present, external trade is low in Burang County. Export commodities are simple and of low value, and both export and import need further development.

2.12 Cultural and Religious Heritage Sites

1) Religions

From ancient times, Tibetan people have retained their Buddhism and Bon faith. Bon faith is the oldest spiritual religion in Tibet. Before establishment of the Tubo Dynasty, it was the source of Tibetan ethnic culture. The basic tenet of Bon faith is nature worship and harmonizing the relationship between humans and nature. Tibetan Buddhism is a very important component of traditional Tibetan culture. When Buddhism was introduced into Tibet, it had several contests with the Bon faith. But during development of Buddhism, both faiths gradually mixed together. Together, they constructed the principal components of Tibetan culture. Both Buddhism and Bon faiths worship *Manito*, but the shaman and aristocratic classes were mainly influenced by Buddhism while common people were influenced by Bon faith. In other words, Buddhism represents classical culture and Bon faith reflects folk customs and culture.

The people of Burang believe in the local *Manito* and have retained their traditional customs of nature worship. They hold religious rituals, especially offering sacrifices on Mount Kailash and Lake Manasarovar. People, both domestic and from overseas, with similar beliefs come to Kailash and join these rituals. In addition, there are five important religions from Asia – Buddhism, Hinduism, Bon faith, Jainism and Sikh – that regard Mt Kailash as a sacred mountain. Therefore, Kailash has a varied history and culture, while also reflecting political changes from ancient times.

For thousands of years, pilgrims from China, India, Nepal, Bhutan, Pakistan, and other regions of the world, have been coming to Mt. Kailash. They circumambulate the mountain either on foot, which takes three days, or by performing body-length prostrations, which takes from 15 to 20 days to complete. They believe that this pilgrimage helps them avoid disasters while accumulating merits and virtues. Pilgrims also visit Lake Manasarovar and take a ritual bath there to cleanse their sins and to acquire good fortune.

2) *Ethnic Customs*

Burang County has various festivals during the year including folk festivals and religious festivals. The most important festivals are Burang New Year, Spring Festival, Army Day, and Ongkor Festival. Traditional festivals that are based on the Tibetan Calendar mostly originate

from the Bon faith. The Burang Tibetan people have also maintained their marriage customs. Young people choose their own partners. After marriage, many young people choose 'walking marriage' in order to consolidate their family and to avoid out-flow of their property. Walking marriage is especially common in rural areas. This unique type of marriage has an important relation with the development of history.

3) Monasteries (Gomba)

There are fourteen monasteries (or gompas) in Burang County (Table 6). These include seven gompas in Burang Township, six in Baga Township, and one in Hor Township (Figure 16). There are eight monasteries around Lake Manasarovar: Seralung Gompa in the east; Yerngo Gompa in the southeast; Thrugo Gompa in the south; Gossul Gompa in the southwest; Chiu Gompa in the west; Cherkip Gompa in the northwest; Bon Ri in the northeast; and Langbona Gompa in the north. Seralung Gompa belongs to the Drikung lineage, Yerngo Gompa to the Sakya lineage, and Bon-Ri to the Bon tradition. The remaining monasteries were built by the Drukpa lineage.

Table 6. Gompas (monasteries) in Burang County.

Temple Names (Chinese	Religious	Locations
Khorzhak Gompa (科迦寺)	Sakya lineage	Kejia township, 15 kilometers to Burang Town
Tarchen (塔钦)		South of Kailash, Start point of Kailash
Chukku Gompa (曲古寺)		Southwest of Kailash
Dirapuk Gompa (止那普寺)		North of Kailash
Zutulpuk Gomba (祖楚普寺)		Southeast of Kailash
Silung Gompa (赛龙寺)		South of Kailash
Gyengtak Gompa (江扎寺)	Drukpa lineage	South of Kailash
Chiu Gompa (齐悟寺)	Drukpa lineage	Northwest of Lake Manasarovar
Cherkip Gompa (迦吉寺)	Drukpa lineage	North of Lake Manasarovar
Langbona Gompa (朗那寺)	Drukpa lineage	North of Lake Manasarovar
Bon Ri Gompa (本日寺)	Bon tradition	Northeast of Lake Manasarovar
Sera Lung Gompa (色拉龙寺)	Drikung lineage	East of Lake Manasarovar
Yerngo Gompa (聂过寺)	Sakya lineage	South of Lake Manasarovar
Thrugo Gompa (楚古寺)	Gelug lineage	South of Lake Manasarovar
Tsepgyi Gompa (蔡切寺)	Gelug lineage	North of Lake Rakshastal

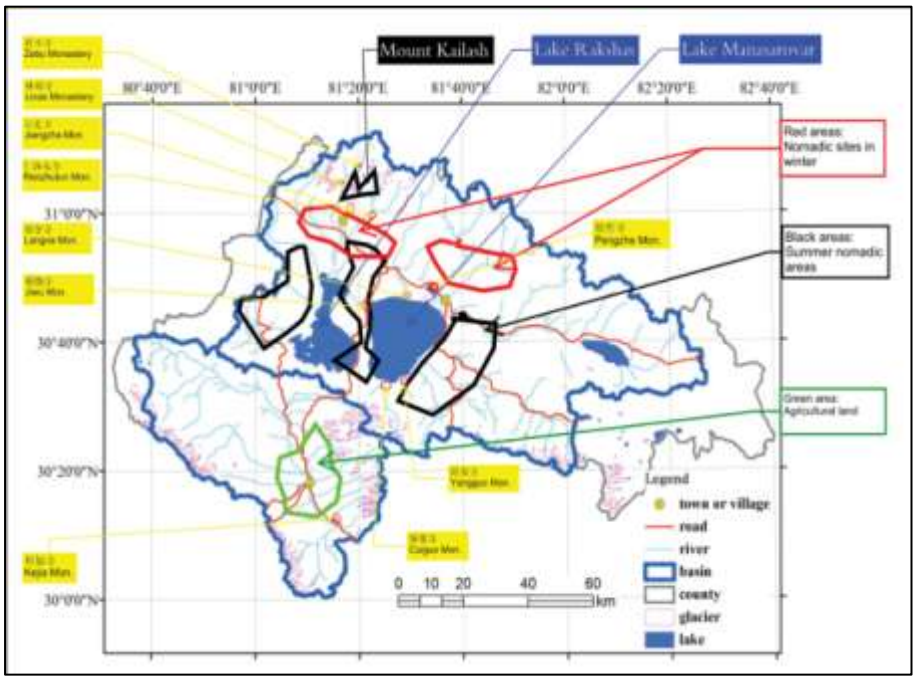

Figure 16. Distribution of monasteries in Burang County.

The schematic map of gompas in Mt Kailash and Lake Manasarovar is shown in Figures 17 and Figures 18. The famous Chiu Gompa is located in the northwest side of Manasarovar.

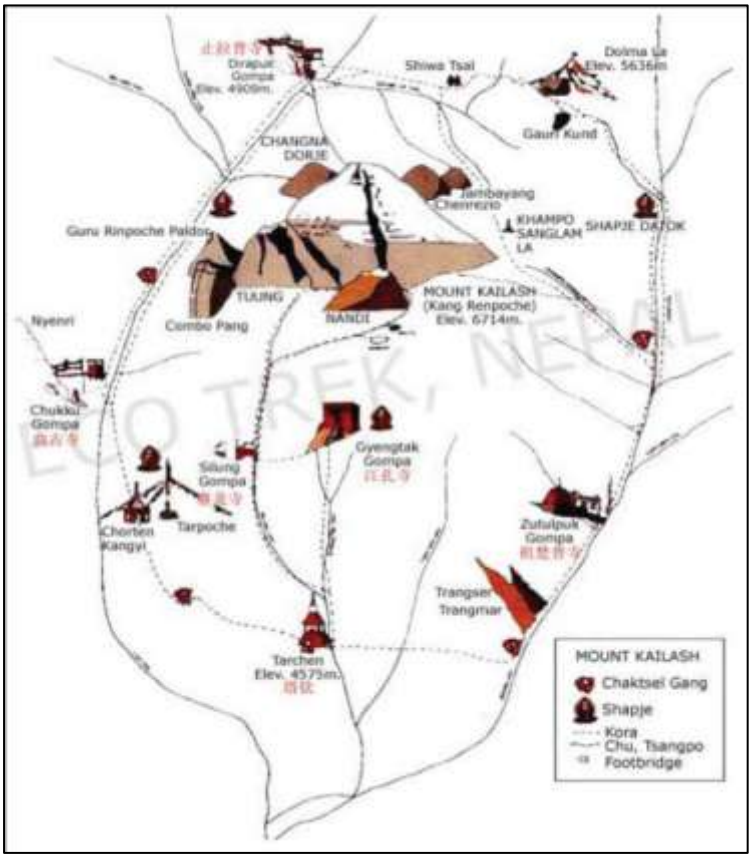

Figure 17. Five gompas in sacred Mt Kailash.

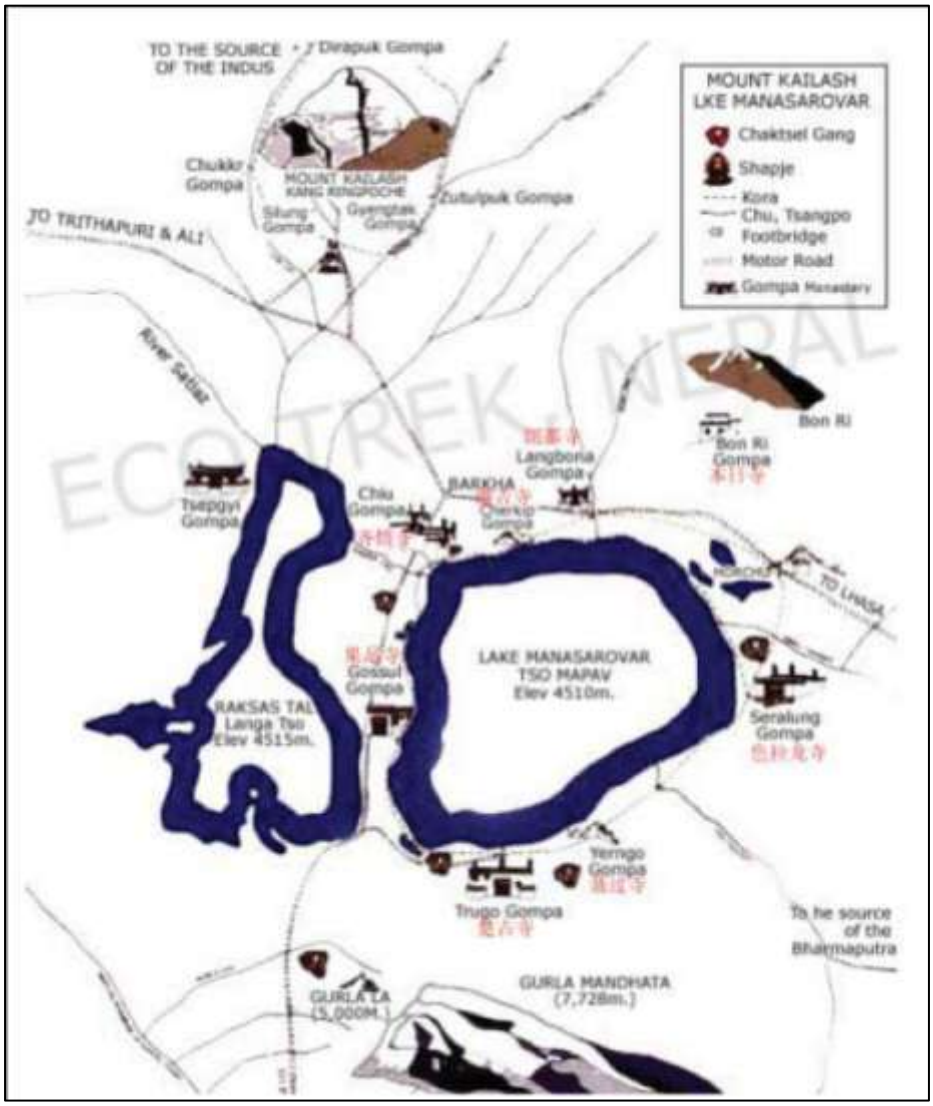

Figure 18. Distribution of gompas in Lake Manasarovar and Lake Rakshastal.

Chiu Gompa (also called Thrue-go Jiwu Gompa) is located on a heart-shaped rock. Guru Padmasambhava spent seven days at this cave on his way to subdue demons in the south-western region in 876 AD and left his footprint here. The gompa was destroyed during the Cultural Revolution and rebuilt in 1983. This monastery is managed by Dra Dingpo Che Dhondup Thongmon Gompa, a monastery of the Drukpa lineage.

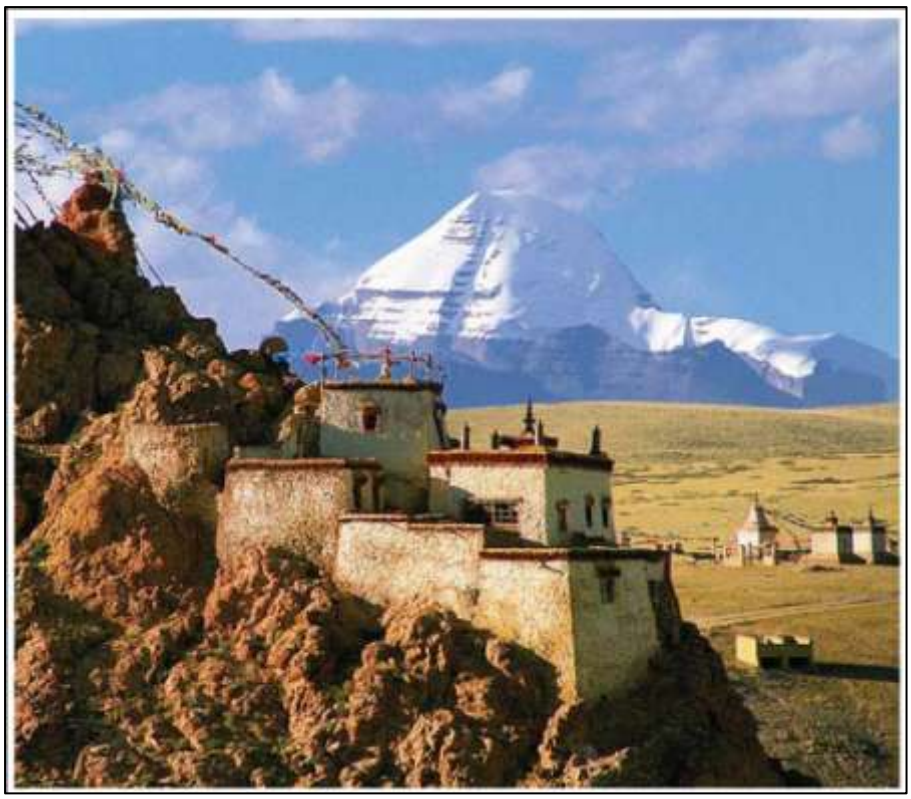

Figure 19. Chiu Gompa and the Kailash landscape.

Thrugo Gompa: A Drukpa yogi called Gyiwa built Thrugo Gompa. Initially, it was a small temple that could house only a couple of people. Later, a descendant of Ra Lotsawa built a four-pillar guesthouse with shrines around it. During the time of Kalsang Gyatso (the seventh Dalai Lama), the resident Drukpa mendicant had a dispute with a monk of Purang Shephel Ling, named Rabjam Tsulthrim, over the land of Thrue-go. Pholha Theji Sonam Tobgyal mediated and gave the ownership right of Thrue-go to Shephel Ling and the ownership of Dzu-thrul Phug to the Drukpas.

Gossul Gompa was the place where Atisha stayed for seven days when he visited the Lake. Later, when Gotsangpa came to open the route to Mount Kailash and Lake Manasarovar, he meditated for three months at the cave in the antechamber of the present monastery. Since the spread of the Drukpa lineage in the Mount Kailash and Lake Manasarovar region started from here, it acquired the name Gossul, meaning the 'Starting Point'. However, the present monastery was built by Jinpa Norbu, a monk of Purang Shephel Ling, during the time of Tsulthrim Gyatso (the eighth Dalai Lama) and turned into a monastery of the Gelugpa School.

Cherkip Gompa (also called Ja-kyib Gompa) was the cave where the five hundred Arhats who came with the Buddha stayed. Drikung Chen-nga Sherab Jungne spent a long time here with the mediators. It remained under the Drikung lineage until later. Tsang Nyon Heruka came here and set up a meditation center that flourished. It was then managed by the Drukpa lineage of Bhutan. However, most of the caves in this area submerged into the lake during the Hasak invasion in 1941 and now only about four caves remain. The monastery, built by

Drukpa followers of Bhutan, was destroyed during the Cultural Revolution and has not been rebuilt since.

Langbona Gompa is located on a hillock resembling the trunk of an elephant. Hence its name 'Langbona' meaning ‘Elephant’s trunk’. It was built by Nyemowa Samten Phuntsok, belonging to the Middle Drukpa lineage, after spending many years in retreat in Mount Kailash. Later his reincarnation Kunga Lodo Nyingpo built the monastery modeled on Drikung Yangri Gar Gompa. Langbona Gompa was partially rebuilt in 1986, following its destruction during the Cultural Revolution.

4) ***Cultural Heritage***

In Burang County, there are many historical monuments and ruins left from ancient times including the Tubo era, Yuan Dynasty, Ming Dynasty and Qing Dynasty. Burang County has special custom in response to its geographic environment and population structure. It has accumulated non-material cultural heritage, such as women’s clothing, Tibetan opera, and folk dance. In addition, Burang Tibetan people have their own distinctive artistic expressions for dancing and singing which represent religious activities.

Khorzhak Monastery (Kejia 科加寺) is a Buddhist monastery in Khorzhak (Korqag) town, 15 km south of Burang county town. The town and temple are known as Kojanath in Nepal. The village is situated on a beautiful spot at a bend of the Karnali River, from where one can see the large red wall of the temple facing the river with a huge inscription on it of the six-syllable mantra, “ཨོཾ་མ་ཎི་པ་དྨེ་ཧཱུྃ” (*Om Mani Padme Hum*).

Figure 20. Khorzhak Monastery.

The name Khorzhak is derived from the term for a 'venerable object and its surroundings' (khor) and 'is placed' (zhak). Legend has it that one of four images of standing Chenresig or Avalokiteshvara in the form of Padmapani was brought to Tibet in the 7th century from Nepal by Akarmatishila after he discovered them in a split sandalwood tree trunk. A few old photos of the image suggest it was in Pala style. Another legend says that when the temple was built, a silver image of Manjughosa spoke aloud saying it wished to be placed over a fossil: "I have wandered (khor) to this place and here I shall settle (chags)." The temple is said to have been founded in 996 CE by King Khor-re and Prince Lha-de from Purang, and its original name is said to have been 'Khvachar Lhakang'.

The largest image is a silver Jowo Shakyamuni or Maitreya (the Buddha to Come) in the form of Manjuvajra. In the 13th century, statues of Avalokiteshvara and Vajrapani were placed alongside it by King Namgonde and his consort. There used to be a smaller eight-pillared temple beside it, said to be founded by the great translator, Rinchen Zangpo.

Khorzhak Monastery was previously one of the most important Kagyu monasteries in Western Tibet. It has inner and outer gates and a large courtyard. On special days in September or early October, monks come from surrounding areas and perform day-long masked dances. Betrothed maidens also visit wearing their family's jewellery and fine outfits.

Simbiling Monastery (贤柏林寺), also known as Shambuling Gompa, Shepeling Dzong or Taklakot Gompa, is located next to the large fort of Tegla Kar (Lying Tiger Fort) on a ridge near Taklakot, 5 km northwest of Burang Township, in the Karnali River Valley. In 2003, work was begun to rebuild Shambuling Monastery by Trugo Lama, Lobsang Samten.

The temple complex and dzong (fort) are above a temple now belonging to the Gelug sect, called 'Tsegu Gompa' or the "Nine-Story Monastery" which was probably originally a Bon establishment. Tsegu covers many terraces and may be reached by ladders.

Figure 21. The rebuilt Simbiling Monastery.

5) ***Tibetan Language and Characters***

Tibetan language belongs to the Sino-Tibetan language. It is an important symbol and carrier of Tibetan culture, and it has special status in Chinese language. In Tibet, Tibetan language has three dialects depending on different regions. Burang Country keeps one of the dialects, but farming dialect and livestock dialect are also used here. After 1949, Burang assimilated and borrowed many words from Chinese and other ethnic languages for their expressions.

2.13 Tourism

1) ***Pilgrimage Routes, Associated Infrastructure, and Number of Pilgrims***

Pilgrimage routes are indicated as dash lines surrounding Mt Kailash in Figures 17 and 18. Pilgrims circumambulate the mountain on foot (3 days) or by performing body-length prostrations (15-20 days). They believe that this pilgrimage helps them avoid disasters and accumulates merits and virtues. Pilgrims also perform ritual baths in Lake Manasarovar.

2) ***Current Tourist Destinations, Attractions, and Number of Visitors***

Sacred Mt Kailash and Lake Manasarovar are the most attractive destinations for pilgrims of Tibetan Buddhism, Hinduism, Bon and Jainism. There is a legend that circumambulating Mt Kailash will relieve ones sins and purify a person. Thus, the pilgrimage around Mt Kailash is the main activity of various religions. The route around sacred Mt Kailash covers 32 km starting from Tarchen. The pilgrimage is most popular during the Tibetan Horse Year.

Mt Gurla (7,694m) is a snow-covered mountain. It is called the virgin mother of Mt Kailash, and it is also the source of water for Lake Manasarovar. The snow-caped mountain is reflected in the waters of Lake Manasarovar and forms a beautiful scenic spot in the Kailash Sacred Landscape.

Manasarovar is a holy lake in Tibetan Buddhism and Hinduism. Pilgrims think that circumambulating around the lake and bathing in its waters brings good fortune. Hot springs in Lake Manasarovar are scenic spots, and one near Chiu is utilized by tourists.

In addition, the beautiful landscape of Mt Kailash attracts thousands of travelers to the region for sightseeing. The landscape is also home to numerous birds and animals. The four washing gates and eight monasteries around the lake have become sacred religious spots.

Up to one hundred thousand pilgrims visit the Kailash region every year. In 2002, Burang Tourism Administration was established to issue tourist receipts. Since then, tourists increased rapidly. According to tourist receipt statistics, at the end of 2002, Burang County hosted 38,615 tourists including 8,025 overseas tourists. Earnings from tourism were 2.65 million RMB Yuan: 830,000 Yuan by guest houses, 150,000 Yuan from tickets, 1.17 million Yuan from hotel and catering industry, 510,000 Yuan from yak transportation. From 2002 to 2008, quantity of tourists both from China and overseas has increased steadily, except in 2003 and 2008. In 2003, this region hosted only 18,402 tourists (including 4,150 overseas tourists) and earned 800,000 RMB in total. In 2004, it hosted 21,406 tourists (6,390 overseas tourists) and earned four million RMB. In 2005, it hosted 52,646 tourists (7,531 overseas tourists) and earned five million RMB. In 2006, it hosted 62,000 tourists (9,871 overseas tourists) and earned six million RMB. In 2007, it hosted 72,645 tourists (18,012 overseas tourists) and earned eight million RMB. However, in 2008, it hosted only 2,361 tourists (1,819 overseas tourists) and earned two million RMB (Figure 22).

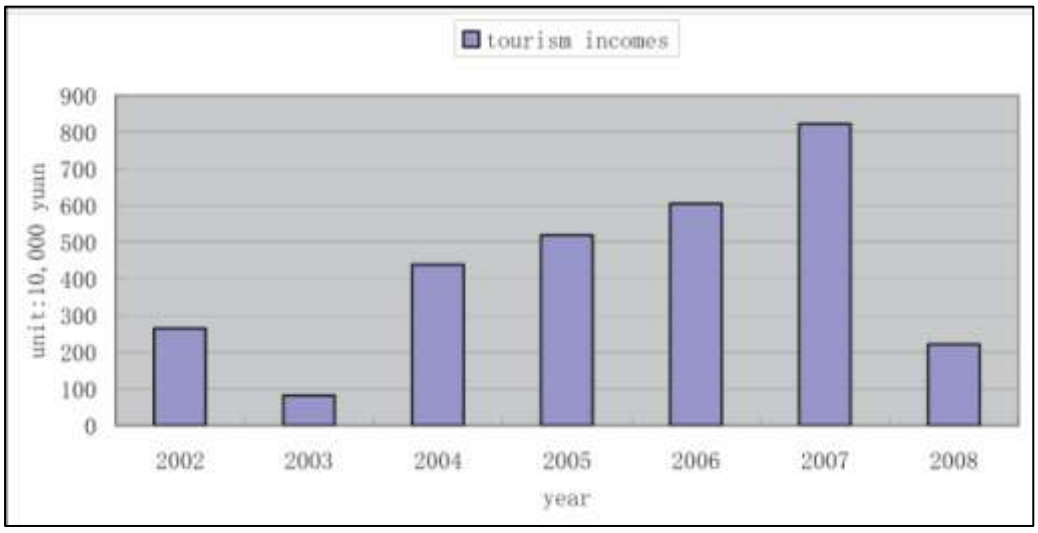

Figure 22. Tourism income from 2002 to 2008 in Burang County.

Total earnings from tourism increased annually (Figure 22) except in 2003 and 2008. In 2003, the burst of influenza (SARS), to some extent, decreased tourist earnings. In 2008, the riot in Lhasa influenced the number of tourists to Kailash for tourism and pilgrimage.

3) *Environmental Impacts of Tourism*

The distinctive position of Kailash and Manasarovar in Lamaism, Hinduism, and indigenous Bon religion, and the beautiful scenery of the sacred lake and mountain, attract pilgrims and tourists from all over the world. Number of visitors averaged at 30,000 persons annually and peaked at 100,000 persons in 2002. Thousands of tourists stay in the Kailash region and produce a large amount of waste.

Pilgrims usually generate large quantities of garbage and endanger the eco-balance in the area. Moreover, pilgrims believe that the waters of Lake Manasarovar washes away their sins and purifies their souls, so they take ritual baths and shave their hair and throw used belongings in the lake. These behaviors, together with lack of funds and insufficient infrastructure, aggravate environmental stresses in the area.

It usually takes pilgrims 3 to 5 days to circumambulate around Kailash and Manasarovar. During this time, a majority of pilgrims cut bushes to cook their food and warm themselves. Vegetation in the region grows very slowly due to the high altitude and severe climatic conditions. Cutting bushes greatly affects the fragile surrounding vegetation, and consequently affects routine migration, mating and breeding of wildlife.

4) *Potential/Need to Plan for Increased Tourism*

Strengthening Environmental Protection in Scenic Spots: Dustbins, garbage treatment stations and outdoor toilets have been built to respond to junk littering and other polluting behavior around scenic spots. Protection of bush forests has been a part of work of county and village government. Also, regulations have been stipulated to prevent wood from being cut while providing only for dung to be used as fuel by tourists and farmers. All these measures have paved the way for future environmental protection.

Protecting Environment by Promoting Tourism: Environmental pressure caused by over-grazing and tourism garbage can be lessened by adjusting industrial structures of surrounding areas. In practice, people living in this area can operate their own tourism businesses, such as operating home inns, mom-stores, and transportation business, so as to weaken their reliance on traditional ranching while providing services to tourists and pilgrims.

3. Status Report on Environmental Degradation and Cultural Integrity

3.1 Overview of general status of KSL-China in terms of environmental degradation as evidenced by land use change, forest cover, wildlife habitat, land degradation, agricultural productivity, loss of biodiversity and genetic resources

Because KSL-China is located on a plateau in an arid climate zone, the natural vegetation is sensitive to climate change, especially to change in annual precipitation. During the last 20 years, annual air temperature of Kailash region increased by 1.2°C, while annual precipitation decreased by about 50 mm (25% of total annual precipitation) (Figure 23). Decreasing precipitation and increasing evapotranspiration caused by climate warming both exacerbate drought in this region. As a result, grasslands are degrading, glaciers are retreating, lakes are shrinking and barren lands are increasing.

Besides climate warming and increased drought, pilgrims and visitors disturbing the natural environment is also a reason for degradation of grasslands and desertification. Pilgrims of several religions believe that circumambulating Mount Kailash on foot is a holy ritual that will bring good fortune. The path around Mount Kailash is 52 km long. Each year, thousands make a pilgrimage to Kailash. Some of the devout endure 3 days to four weeks of physical challenge to perform the circumambulation following a special religious regimen. In addition, with the development of tourism, visitors to Kailash region have increased reaching 70,000 in 2007. Tourists and pilgrims both impact the natural environment in Kailash region, especially around Mount Kailash and along Karnali River. In order to meet the demand of tourism, people have constructed more buildings like hotels, restaurants and living houses, on agricultural area.

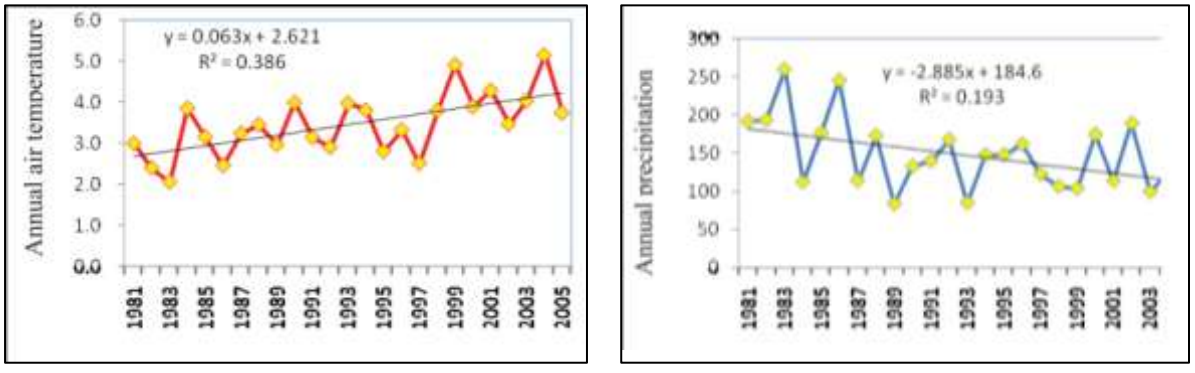

Figure 23. Climate change as indicated by air temperature and annual precipitation during the last 25 years.

3.2 Land Cover Changes and Trends

1) Land cover changes from 1999 to 2009 in KSL-China

The most important land cover change was the conversion of agricultural land into artificial surfaces. Between 1999 and 2009, total cropland area changed by 0.24 km^2 (2.24% of all cropland cover) (Table 7). Similarly, total urban and village area changed by 0.40 km^2 (18.41% of all urban and village cover), with 60% of the change occurring in urban area and 40% in rural area. The process of urbanization has been restricted mainly to croplands, and has resulted in decreased croplands and increased urban area. With the development of tourism in KSL-China, There is a large demand for housing and commercial units. The Burang County Government has tried to regulate expansion of tourism region and hotel construction. Conversion of agricultural land into artificial land is concentrated in Burang County town which is the main reasons for the large concentrated development of tourism. Transformation within cities from old to new housing is also significant.

Table 7. Land cover changes in KSL-China from 1999 to 2009.

Categories	Area in 1999 (km^2)	Area in 2009 (km^2)	Area change (km^2)	Change rate (%)
Barren lands	4,187.06	4,472.23	285.17	6.81
Sparse shrublands with sparse herbaceous	2,210.33	2,184.66	-25.66	-1.16
Open shrublands with sparse herbaceous	1,837.22	1,841.43	4.20	0.23
Sparse grasslands	1,032.57	778.87	-253.70	-24.57
Open grasslands	413.42	411.82	-1.60	-0.39
Close grasslands	44.15	44.15	0.00	0.00
Wetlands	96.14	95.14	1.00	1.05
Lakes	743.98	738.35	-5.63	-0.76
Glaciers	266.17	262.22	-3.95	-1.48
Urban and villages	2.15	2.55	0.40	18.41
Croplands	10.56	10.33	-0.24	-2.24

2) *Rangelands and High Pastures*

Conversion of rangelands and high pastures into barren lands was also very typical in the period from 1999 to 2009. Approximately 285 km^2 of rangelands (6.81% of total rangelands) was converted into barren lands (Table 7). This dramatic conversion occurred mostly in sparse grasslands (253 km^2) and sparse shrublands with sparse herbaceous (25 km^2). In

addition, Figure 24 also indicates that a large portion of grasslands around the Lake Manasarovar experienced an obvious degradation during the last 10 years, while grasslands in the Karnali River Basin remained relatively stable.

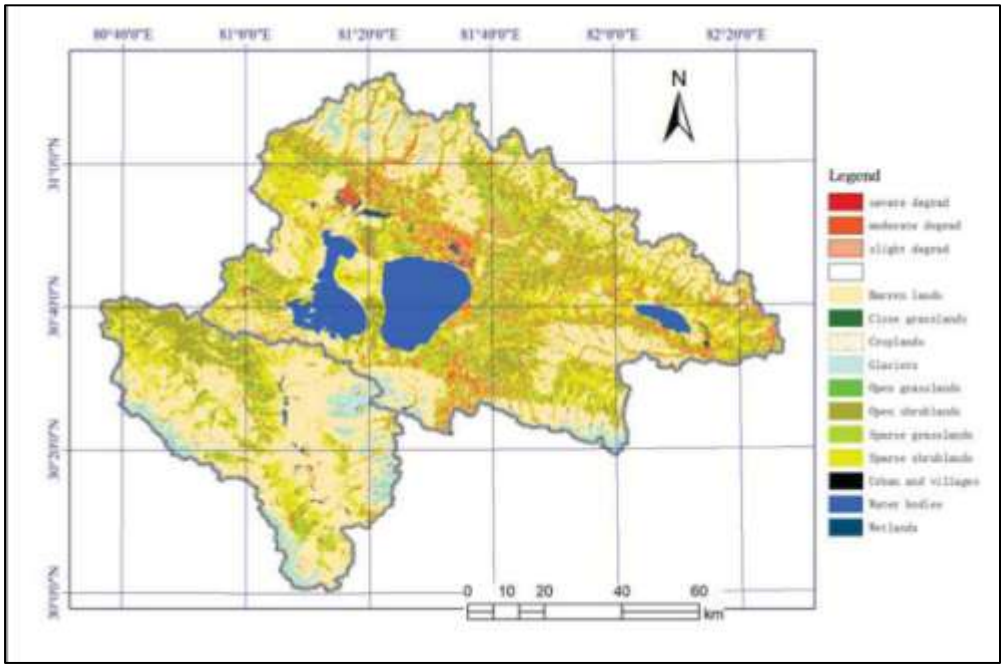

Figure 24. Rangeland degradation from 1999 to 2009 in KSL-China.

Increased drought and global warming might be the main factors contributing to rangeland degradation. This degradation occurred mostly in sparse grasslands which are very sensitive to climate change, especially to changes in precipitation. As mentioned earlier, the Kailash region experienced increasing drought during the last ten years, which in turn affected plant growth and exacerbated rangeland degradation. In addition, tourist routes and tracks to the sacred landscape are mostly concentrated around Mt Kailash and Lake Manasarovar. Disturbance to the natural environment by pilgrims and visitors may also be another reason for grassland degrading and desertification.

3) ***Glacier Changes***

Most glaciers in KSL-China have retreated during the last 10 years indicating a net negative mass balance. The total glacier area of KSL-China was 266.17 km² in 1999 and 262.22 km² in 2009; an observed decrease of 3.95 km^2 (–1.48% of total area) during the last 10 years.

Global warming and increased drought are the main reasons for glacial retreat. It is apparent that climate change, which has been experienced worldwide, is also affecting glaciers in KSL-China. While glacier melting was accelerated due to increased annual air temperature, addition of snow mass to the glacier surface was reduced due to decreased precipitation. As a result, there was a net negative mass balance in the glacier mass.

3.3 Water Resources

The total area of lakes (including glacial lakes) in KSI-China has also decreased in the period from 1999 to 2009. Total area of lakes was 743.98 km^2 in 1999 and 738.35 km^2 in 2009, an observed decrease of 5.63 km^2 (-0.76% of the total area) for 10 years. The biggest change in lake size occurred in Lakes Rakshastal and Kunggyu. The area of Lake Rakshastal was 261.86 km^2 in 1999 and 258.86 km^2 in 2009, an observed decrease of 3.0 km^2 for 10 years. The area of Lake Kunggyu was 55.95 km^2 in 1999 and 54.29 km^2 in 2009, an observed decrease of 1.66 km^2 for 10 years. There was no obvious change for the biggest lake, i.e. Lake Manasarovar. On the contrary, some small lakes (especially glacial lakes) experienced an increase in the period from 1999 to 2009.

Expansion of some small lakes (especially glacial lakes) during the last 10 years may mainly have resulted from the acceleration of glacier retreat. Increased melt water may generate new lakes and lead to expansion of existing ones. On the other hand, retreat of the big lakes may mainly be due to increased evaporation caused by climate warming, as well decreased precipitation.

3.4 Biological Diversity of Flora and Fauna

Ranching is the mainstay industry of Burang County. However, over-grazing, the rapid growth of productivity and population have caused grassland degradation and desertification, which in turn have triggered lots of environmental problems, such as soil erosion, water loss, and the lost of bio-diversity and etc. In addition, the move of soil dunk devours arable lands in the valley, thus threatens the living environment and the sustainable development of the national economy.

3.5 Wildlife and Wildlife Habitats

A great variety of wildlife inhabit Burang County, namely Tibetan wild ass, buffalo, argali, snow leopard, and golden eagle among others. The wetland of Manasarovar, the biggest freshwater lake, also provides good habitat for wildlife. Every breeding season, birds migrate here to build nests, lay eggs, hatch, and nurse their offspring. Nevertheless, wildlife hunting, stealing of bird eggs, and grassland degradation, together with the lack of protection measures, endangers biodiversity in the area.

3.6 Forests

There are no natural forests in Burang County, but individual trees or tree patches are distributed around villages or monasteries of Burang Township in the Karnali Basin. *Salix* and *Populus* are the most common genera selected by local people for afforestation in lowland Burang.

3.7 Rangelands and Rangeland Management

Ranching is the mainstay industry of Burang County. However, over-grazing and rapid growth of productivity and population have caused grassland degradation and desertification, which in turn have triggered numerous environmental problems such as soil erosion, water loss, and biodiversity loss. In addition, movement of soil devours arable lands in the valley, thus threatening the living environment and sustainable development of the national economy.

The influence of changing global environment is also manifest in KSL-China. As a result of the destruction of the food chain, numerous rodents and hares have appeared in the region and greatly endangered grasslands and exposing them to desertification.

3.8 Cultural and Religious Heritage Sites

With the large influx of tourists in KSL-China, historically significant cultural and religious heritage sites are vulnerable to vandalism and destruction. Tourists also produce a large amount of waste that threatened the environment of these heritage sites.

3.9 Tourism

Pilgrims in KSL-China usually generate large quantities of garbage that threaten the local ecosystem. Moreover, their belief that bathing in holy lake waters purifies them and removes their sins results in water pollution of the lake. These actions, coupled with lack of sufficient funds and insufficient tourism infrastructure aggravate environmental problems in this sacred landscape.

3.10 Observations, Perceptions and Projections of Climate Change, and/or Other Environmental Change Processes

1) Climatic Change from Meteorological Data in Burang

Based on data from Burang Meteorological Station (located 30°17′N, 81°15′E, 3,900m), annual air temperature is 3.5°C and annual precipitation is 153.7mm. Monthly precipitation patterns show bimodal precipitation with two peaks in March and July-August. Higher precipitation in July-August reflects a strong monsoon signal, which is a typical pattern in the southern Tibetan Plateau.

KSL-China is experiencing significant climate warming. From 1973 to 2008, annual air temperature varied from a low of 2.0°C in 1983 to a high of 4.9°C in 1999 with a 2.9°C of maximum fluctuation. Linear regression showed a warming gradient of 0.48°C per decade. The last 10 years has been the warmest of the past 36 years.

Annual precipitation shows strong fluctuations. Lowest precipitation record is only 68 mm in 1976 while highest precipitation is 265 mm in 1984. With apparent warming trends as

indicated by Burang meteorological record, annual precipitation generally shows a decreasing trend. The period from 1973 to 1988 is a relatively wet period with average annual precipitation of 177 mm. However, the climate became drier from 1999 to 2008 and annual precipitation decreased by over 40 mm to 135 mm on average.

Therefore, the climate in Burang is becoming drier and warmer in the past two decades. With higher temperature and lower precipitation, relative humidity has also decreased during this period.

Climate change in the growing season from May to October also showed an apparent warming trend with an increase of 0.28°C per decade, lower than the annual average warming trend. Precipitation trend shows a similar pattern. From 1987, precipitation decreased during the growing season, while relative humidity shows no such obvious trend. Wind speed indicates two large fluctuations in the past 36 years: i) high wind speed value in 1976 decreased until 1989, and ii) high wind speed in 1990 decreased until 2008. Total solar radiation hours increased from 1963 to 1988 and then decreased to 2008.

2) Ice Core Record of Glacier Change in Mt Gurla

A shallow ice core drilled at 6,100m from the Gurla Glacier in October 2008 was dated back to eight years based on seasonal variations of oxygen isotopes. Annual glacial accumulation is 790 mm at 6,100m of the glacier, over five times greater than at the meteorological station in Burang, confirming that the higher elevation mountain regions receive much more precipitation than valley regions. Fieldwork also found that higher elevations have more snowfall than the low attitude Karnali Basin. Thus, precipitation data from the meteorological station in the low valley region cannot represent the average condition of KSL-China. Instrumental observations of annual temperature and precipitation at different altitudes are necessary to better understand the impacts of climate change in the region.

Due to global warming, ongoing glacial retreat in Mt Gurla is significant. Based on remote sensing analysis, total glacier area decreased from 84.41 km^2 to 77.29 km^2 in the period from 1976 to 2003. This indicated an acceleration in glacial melting. Glacier areas shrank on average by 0.17, 0.19 and 0.77km^2 per year during the periods 1976–90, 1990–99 and 1999–2003, respectively.

Ice cores collected in 2006 from Gurla Glacier without radioactive horizon markers suggested no net accumulation of mass (ice) since at least 1950. Gurla is the highest glacier (6,100m) documented to be losing mass annually. This implies the possibility of similar mass loss on other high-elevation glaciers in low and mid-latitudes under a warmer Earth scenario. This ice mass loss of the Gurla Glacier is likely to result in the glacier shrinking much faster than currently predicted and having substantial consequences for approximately half a billion people downstream.

4. Identification of Priorities for KSL-China

Based on the above assessments of existing and potential threats and vulnerabilities within the various thematic areas described, major issues were identified and prioritized within KSL-China. Important criteria for prioritization included magnitude of threats to highly vulnerable species, habitats, ecosystems, cultural and religious sites, ecosystem services such as water, food security, and tourist potential.

Key issues of KSL-China are mostly manifested in biodiversity threats, grassland degradation and decline of ecosystem services, environmental pollution, inadequate tourism facilities, and degradation of cultural heritage.

4.1 Threats to Biodiversity and Biodiversity Conservation

KSL-China is a fragile area with sparse vegetation in the alpine areas. Soil depth is commonly less than 20 cm. In the high alpine area, net primary production of alpine sparse shrubs and alpine meadows is fairly low. In the past decades, major threats to biodiversity include rangeland degradation due to grazing and mouse infestation. Global warming has accelerated the trend of rangeland degradation and desertification. Goats are raised in an increasing proportion of livestock husbandry in pursuit of benefits from cashmere production. Goat-raising is a severe threat to alpine ecosystems, especially for steppe and sparse meadows.

Shrub logging for firewood consumption is also common with the pressure of increased pilgrims and travelers, and consequently it is the cause of the most direct destruction of alpine vegetation. The destroyed ecosystems are subject to wind erosion and desertification. Although the local government makes regulations to prohibit firewood logging, destruction of sparse shrublands is still increasing resulting in reduced shrubland cover.

Establishment of the Changthang National Protected Area in the north of Kailash has contributed significantly to an increase in the population of endangered wildlife. However, herders are concerned about the competition between livestock and wildlife for habitat and grasses. Solutions to this conflict are in progress. Fences for exclosure grazing are barriers to wildlife migration and affect their reproduction. Wildlife poaching, especially of Tibetan antelope for its fur, has never ceased despite it being prohibited in Tibet. Stealing of bird eggs in the wetlands of Lake Manasarovar threaten reproduction of migrant birds. All of these problems are new challenges for biodiversity conservation.

Monitoring population dynamics of flagship species and endangered wildlife and building a biodiversity database in KSL-China is crucial for ecosystem management and biodiversity conservation. In addition, it is necessary to disseminate the importance of biodiversity conservation in the context of local religious beliefs and involvement of local communities in achieving conservation and human sustainable development.

4.2 Environmental Monitoring and Degraded Ecosystem Rehabilitation

It was earlier mentioned that open grassland and sparse shrubland have decreased by 24.6% and 1.2%, respectively. Overgrazing and feulwood collection are the main causes of alpine ecosystem degradation. Global warming and reduced precipitation in the past decades have accelerated desertification in the northwest TAR, China including KSL-China. However, there are still no local and regional programs to monitor ecosystem changes except for the meteorological observation station in Burang County. A transect survey of vegetation and long-term environmental monitoring program, including establishing a monitoring station in the Manasarovar watershed, is proposed for implementation of Kailash Sacred Landscape Conservation Initiative in the next ten years.

Rehabilitation of degraded ecosystems is a long-term task of the fragile Kailash region. Although there were some actions previously taken to fence some sites and protect degraded rangelands by *Exclosure Grazing for Grass* (*Returning Degraded Rangeland for Conservation*) program and Lake Manasarovar wetland conservation planning, limited achievements have been received for degraded ecosystem rehabilitation because of relatively low input and higher pressure of overgrazing and tourism. The Manasarovar watershed was established as an international important wetland and wetland protected area of TAR, China. Exclosure grazing and rotational grazing are proposed for promotion in the Kailash region. The inner pilgrim route of Mt Kailash is also suggested for establishment as Kailash Nature Reserve by the local government to prohibit from grazing. Wetlands surrounding Lake Manasarovar have to be fenced for protection in accordance with regulations of Lake Manasarovar Wetland Protected Area. Besides, ecosystems of the upper tributaries of Manasarovar watershed also should be protected.

4.3 Kailash Landscape Protection and Pollution Controls

Kailash Sacred Landscape is a world renown sacred site. Tens of thousands of pilgrims visit Mt Kailash and Lake Mansarovar in the region every year. However, due to inadequate tourism facilities and management, wastes and rubbish are thrown both on the pilgrimage route circling Kailash, as well as in the waters of Lake Manasarovar. Furthermore, wastes from bathing in springs and other sites are also diverted into Manasarovar without any treatment. All these activities are becoming severe threats in the area.

Tourism planning has just been implemented by Burang County for the Manasarovar watershed. A philosophy of integrated landscape planning and ecosystem management is needed that includes layout of scenic spots, architecture, wildlife habitat and migration route protection, pollution and solid waste control, and involvement of local stakeholders to manage and profit from the conservation initiative.

4.4 Traditional Knowledge and Bio-Cultural Diversity Conservation

Traditional knowledge is vital for sustainability. Tibetans possess ancient religious beliefs and rich traditional knowledge. They have developed their culture, beliefs, knowledge, customs and resource use systems through living practices from thousands of years. Through their reliance on and interaction with nature and natural resources, communities have acquired an immense knowledge of their natural environment. These have played a critical role in conserving bio-cultural diversity and preserving livelihoods of local inhabitants. Yet this traditional knowledge is rapidly disappearing in the face of modern culture.

Synergy between traditional ecological knowledge and science is a key to conservation success. Traditional knowledge of livelihoods, beliefs of sacred mountains, holy lakes, sacred flora and fauna is the basis for Tibetan people in conserving biodiversity and cultural diversity. Documenting existing traditional knowledge and beliefs to meet the requirement of resource management and bio-cultural diversity conservation will be important components when developing the Regional Cooperation Framework and conservation strategies for KSL Conservation Initiative.

4.5 Alternative Livelihoods for Local Stakeholders

Farmers and herdsmen comprise 95% of the total population in Burang County. Most of them still maintain their traditional customs. Their main livelihood is from agriculture in the Karnali Basin and livestock husbandry in the Manasarovar watershed. Food production covers more than one third of Ngari District[10], although Burang County contributes only 4.12% of total land area of the District. 7.33 sq. km. of arable land produces 3,260 tons of food and edible oil with an average of 4,450 kg per hm^2 .

In the past ten years, gross earnings for farmers and herdsmen have increased steadily, but income per capita is still low. Agricultural and pastoral incomes are the main sources of income, accounting for 17.1% and 42.5% of the total gross income. With the development of tourism, transportation and subsidiary occupation have become supplemental sources of income and are steadily rising. In the future, although agro-pastoral production will still be the dominant income source, more local people are likely to convert to service occupation for sightseeing tourism and pilgrimage. Thus, service for tourism is a potential alternative livelihood option in the future. Transboundary trading has also developed rapidly between China with Nepal and India. This is expected to increase incomes of local people in Burang County and foreign traders.

4.6 Renewable Energy Demonstration and Use

Ngari District, with average altitude over 4,500m, has abundant solar radiation energy resources. Annual radiation hour is 3,700 hours and radiation is 189.3 $kcal.cm^{-2}$. Thus, there

[10] Ngari District of TAR-China includes 7 counties: Burang County, Zanda County, Gar County, Rutog County, Geji County, Gertse County, and Tsochen County. Total area of the District is 304,683 sq.km. Area of Burang County is 12,539 sq.km, accounting for 4.12% of the district.

is a high potential to develop solar energy for daily use by local people. Until recently, Tibetans, who consider themselves "sons and daughters of the sun", have relied mostly on straw, firewood, and cattle dung for fuel and shunned the use of solar energy despite its abundance. The “Sunlight Scheme” was launched in 1990s and "Electricity to Township Program" in 2002 to make efficient use of solar energy and to protect the local environment. Local Tibetans have profited from these programs and now know the advantages of solar energy over traditional firewood and dung. Solar energy is cleaner, free-of-charge, and pollution-free, and it can also be used to grow vegetables in greenhouses, as well as to cook and heat. Herdsmen in high altitudes can use solar energy to watch TV in places where electricity is not accessible.

Development and utilization of solar energy resources have not only changed ways of life and production of Tibetan farmers and herdsmen, but it has also changed their environment. Utilization of solar energy has an effective role in protecting pasture and rangeland. For these reasons, solar energy should be considered as priority energy for tourism development in KSL-China to meet the requirements of conservation.

Figure 25. A rural Tibetan from Burang County plants fruits in a solar greenhouse at 3,800m. Photo: Xinhua, 22 Sep 2007.

4.7 Capacity Building and Participatory Ecosystem Management

Ecotourism can be a promising and sustainable livelihood enterprise. But to deliver on its promises, conditions must be created for communities to control the intensity of tourism, retain autonomy, and develop tourism in accordance with conservation objectives and compatible to environment protection. For successful ecotourism in KSL-China, more attention should be paid to people and nature, to capacity building, to partnerships and then these efforts must be supported by adequate infrastructure construction, stakeholder practice and training. In order to develop community- based ecotourism, it is necessary to follow conservation principles, regulate number of visitors, and closely monitor impacts.

To ensure ecotourism, capacity building in KSL-China should focus on transportation networks construction for access to scenic spots of holy lakes and sacred mountain, logistical conditions including lodging, water, electricity and communication facilities. Sanitary facilities are especially required in the area including toilet building; water treatment; rubbish collection, transportation and treatment; and environmental beautification.

A participatory ecosystem management by stakeholders is also very important. Stakeholders strive for their livelihood improvement by participating in ecotourism, while governments seek conservation goals from socio-economic development of local people. Biodiversity and cultural heritage conservation is the basis for sustainable development, and development further enhances conservation goals.

4.8 Adaptation to Climate Change

Adaptation to global warming and climate change consists of initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects. The capacity and potential for human systems to adapt is closely linked to social and economic development. For Burang County in the arid continental climate, water saving agriculture and irrigation systems are the choices for farmers in Karnali Basin. For the higher altitude herders in Manasarovar watershed, enclosure grazing and rotation grazing to protect and rehabilitate degraded rangelands is the best option.

5. Community Perceptions

5.1 Community Perceptions on Biodiversity and Cultural Value

Tibetan Buddhists view Mount Kailash as the pagoda palace of Demchog, the One of Supreme Bliss, a tantric deity embodying the ultimate Buddhist goal of enlightenment. Shiva is said to reside in his heaven on the summit of Kailash. Numerous cultures, both traditional and modern, view mountains as gardens and paradises—heavens on earth, or center of the world and universe. Mt Kailash is the headwaters of the Ganges, Indus and Yarlung Zangbo Rivers. Kailash is a sacred place of multiple religions. Because of its sacred value, it is also one of very few mountains that have never been climbed. Together with Lake Manasarovar, they are called the sun and moon gods. The Kailash Sacred Landscape, including Mt Kailash and Lake Manasarovar, is the abode of gods, deities, and diverse cultures and religions.

Kailash Sacred Landscape has abundant natural resources and biodiversity. In Bon faith, people regard Lake Manasarovar as the dragon palace and believe its waters inhabit many dragons, as well as other types of animals. This is the origin and belief of biodiversity in Bon faith and Buddhism. Buddhists respect life in the lake. Therefore, the local government sends personnel to the bird island in Manasarovar to protect eggs from wolves and foxes in the winter. Local people also cherish Manasarovar because it provides them water for irrigation

and nurses wetlands and pastures for animal husbandry. This area is also a route for migrant animals such as Tibetan antelope and Kiang. Tibetans live in harmony with animals in Kailash and Manasarovar.

Local people generally attribute rangeland degradation to global warming and not to overgrazing. They have directly perceived the increase in temperature and decrease in precipitation, and their observations have been strengthened by media reports on climate change. They believe that rangelands can support their livestock by natural reproduction. Under pressure from overgrazing, some herdsmen near the lake also drain wetland meadows such as hydrant *Kobresia* to form pasturelands. This accelerates degradation of wetlands surrounding Lake Manasarovar.

5.2 Best-Suited Livelihood Options

Traditional livelihoods from grazing in Manasarovar watershed and cropping in Karnali Basin is enough to support local people in Burang County because of higher production to low population density ratio. Although Burang is called the 'food basket' of Ngari District of TAR-China, local people hope to increase their cash incomes with development of tourism.

From 2004, Baga Township set up a yak transportation team. The town government enacted the *Regulation of Yak Transportation for Service to Tourists and Pilgrims*. Service quality was recognized by tourists and tourism was developed rapidly in recent years. Local people earn more than 2,000 Yuan per capita from tourism service. Now, local people profit form tourism and it has become a major alternative livelihoods for herdsmen in high altitude areas.

In lowland Karnali Basin, there are less opportunities for farmers to profit from tourism. Greenhouse vegetable production is an alternative livelihood for rural farmers here. People living in Burang Town can also engage in border trading and catering service for travelers.

5.3 Perception of Environment Pollution

Local people have hope that the government will help them in improving infrastructure through tourism planning. They expect good sanitation facilities, such as garbage disposal points and public toilets in the sacred area. They know that in the sacred Kailash region and the holy lakes, people should cherish nature. They regard Kailash as a common tourism resource for the world. Therefore, all buildings should be in consent with styles of religions and natural landscape. They are not willing to let their sacred mountains and lakes be polluted by pilgrims and travelers. They suggest more people be employed in collecting rubbish and more toilets with treatment capacity be established en route Kailash and Lake Manasarovar. They also regard firewood logging as destructive and subsequently causing erosion. Thus, they hope that the government will invest enough in appropriate infrastructure. Some also suggest that simple shops and restaurants need to be established along the Kailash circuit. Polluted water from washing and bathing should also be treated in order to maintain water quality of Lake Manasarovar.

5.4 Perception of Enabling Policies and Plans

Stakeholders indicated the great efforts made by the government in recent years to enforce tourism development and environment protection in KSL-China. Monasteries and heritage sites have been rebuilt, such as Khorzhak Monastery in the Karnali Basin and gompas in the Kailash and Manasarovar circuits. The Ngari Airport, to be opened in July 2010, and the high-grade highway from Lhasa to Burang provide convenience for tourists to Mt Kailash and the holy lakes. Recently, Burang County submitted the planning of Kailash tourism development to TAR. Local people cherish this opportunity and hope to profit from socio-economic development.

Stakeholders insisted that the conservation status of Kailash be strengthened to conserve the environment and cultural diversity, which might be negatively impacted due to high pressure from increasing number of tourists. Stakeholders mentioned ecotourism under government guidance and organization as alternative livelihoods for development. Perception of local people and their aspirations and attitudes to participating in conservation and striving for development provided effective ways for inclusion of stakeholders' views and ensured initial participation in environmental planning and policy making.

6. Enabling Environment

The Chinese Government has been attaching importance to the protection and development of Tibet for four decades. During recent years, with the promotion of *Scientific Thinking on Development*, a series of policies have been made so that Kailash Sacred Landscape Conservation Initiative moves smoothly through instruction of the policies, as well as the security that these policies will provide.

In February 2009, the State Council Steering Meeting adopted "*The Eco-security Shelter Construction and Protection Planning of Tibet Autonomous Region* (2008—2030)". The CPC Tibet Autonomous Regional committee and the Autonomous Tibet Government also jointly issued "*The Implementation Proposals for the Eco-security Shelter Construction and Protection Plan of TAR*". In the eco-security construction planning document, it asserts that the most significant work is to protect ecological environment focus on four aspects including natural grassland protection, forest fire prevention, wildlife protection, and significant wetlands and biodiversity conservation. Meanwhile, it is also important to enhance the improvement of ecological environment and implement construction plan for ecological environment which includes the construction of shelterbelt system, plantation, improvement of the natural grassland, the project of combating desertification, and soil erosion control. Governments from central to local levels will plan to invest 15.5 billion RMB to the program and implement 10 items of the ecological environment conservation and construction within 25 years. The program is divided into five periods with the aim of building eco-security in Tibet. In other words, it is one of important actions for China to adopt in order to adapt to

global warming which can promote ecosystem recovery and ensure security for ecosystem goods and services.

In order to protect the extremely fragile alpine environment in Tibet, the People's Congress and Tibetan Autonomous Region government promulgated a series of regulations including "*Environment Protection Ordinance of Tibetan Autonomous Region*", "*Forest Protection Regulations of Tibetan Autonomous Region*", "*Regulations on Grassland Administration in Tibetan Autonomous Region*", "*People's Government Announcement on the Protection of the Water Resources in Tibetan Autonomous Region*" and "*The Environmental Protection Regulation of Construction Projects in Tibetan Autonomous Region*". There are a number of local regulations and administrative rules, including more than 20 documents on wildlife protection, which underpin the legal basis to help strengthen environmental protection.

As for planning, central and local governments have formulated "*The Tibetan Autonomous Region's Tourism Development Planning*", "*The Tibetan Autonomous Region's Tourism Management Regulations*", "*Ngari District's Tourism Development Planning of Mt. Kailash and Lake Manasarovar (2008—2020)*", "*The Feasibility Report of Greening and Beautifying around the Holy Lake Manasarovar in Burang County*" and "*Detailed Planning of Mt. Kailash and Lake Manasarovar International Tourism Area Construction in Ngari District*". These documents provide important references and guidelines to initiate Kailash Sacred Landscape Conservation Initiative.

The aforementioned policies, regulations, and planning are able to enhance good cooperation in KSL-China. In other words, these regulations are helpful to implement Kailash project from the point view of environmental protection.

In the detailed implementation level, central and local governments have made policies and mechanisms on ecological compensation of grasslands and forests, formulated "*Strategy of Energy Alternatives in the Tibetan Autonomous Region*", and promoted use of renewable energy such as biogas, solar energy (sun room, solar cookers), geothermal instead of traditional fuel energy, with financial subsidies provided by government to make the strategy work. The responsibility of protecting shrubs around scenic spots has been shouldered by the local township administration which has formulated rules to prohibit deforestation by local people. Meanwhile, regulations were also made to enhance rangeland management, change traditional mode of grazing by exclosure grazing, rotating grazing and fencing for longer time. In order to protect grasslands well, the exploitation of alluvial gold must be forbidden because such activities could cause severe destruction of grassland vegetation. These policies and implementation plans have created a favorable condition for further cooperation of KSLCI project and provided the basis for implementation of alternative livelihood strategies.

As a member of the UNEP standing council, China has deliberated on "*Technical Support and Capacity-building of the Bali Strategic Plan*" which can provide a good international environment for implementing KSL Conservation Initiative. Furthermore, many elements,

such as being located in the border area with India and Nepal, possessing both headwaters of rivers and internationally significant places as one of South Asia's holy land, influence of the international environment and vulnerability and sensitivity of its fragile ecological system, help set up multilateral cooperation relationships with bordering countries and assure possibility of international cooperation in the transboundary landscape.

International cooperation in environmental protection is considered to be part of China's diplomatic work. International cooperation for environmental protection is conducive not only to bringing in foreign capital, technology and management experience, but also to accelerate development of environmental protection for China, and to safeguard China's legitimate rights and interests, enhance China's international status and economic development, as well as to create a relaxing external environment. In other words, as for international cooperation on environmental protection, the Chinese government's ideology is conductive to help develop and implement the project.

China is entering a strategic transition period oriented towards environment and development. Fundamentally, the strategy will affect government management, the company's operation in both domestic and international environments, decisions for China's enrollment in environmental protection, and China's cooperation relationships in the international and regional environment for sustainable development. As a result, it requires alteration of the system, improvement of plans and management, and quest for new ways to converse with technology. China also intends to enhance its capacity to fulfill international conventions which are beneficial for the launching the project.

In short, laws, regulations, systems and policies, regardless of central or local ones, are beneficial to environmental protection in Tibet. At the same time, they also conform to the purpose of cooperation which refers to the protection and sustainable development of the Kailash region. It is convinced that China has already stipulated to protect the environment and provide a strong support to launch the KSL Conservation Initiative.

7. Gap Assessment

7.1 Biodiversity and Cultural Diversity Status and Conservation

Although biodiversity and cultural diversity are fairly abundant, there is little documentation on the diversity in KSL-China. Current conditions of biodiversity are from flora and fauna records. Their population, habitats, migrant routes, and protected status are unknown. For cultural heritage and diversity, it is almost the same. Although Central and Tibetan Autonomous Region government invest a lot to rebuild monasteries and Buddha statues, records of cultural heritage are still few, and traditional knowledge of resource utilization is scarce. This current condition is not beneficial to conservation of biodiversity and cultural diversity.

Although there is a meteorological observatory and some glacier monitoring for climate change in Mt Gurla, there is no monitoring facilities and information on endangered and protected species in Ngari District, especially in KSL-China, despite its significance. In the coming decade, monitoring and survey of endangered species, flagship species, population dynamics and their habitat identification would be priority subjects for biodiversity conservation. There is a Tibetan medicine school led by a Swiss expert in Tarchen, but there is little information on how local people and different religious beliefs use plants in their daily life and for medicine.

Wildlife habitats are under great pressure from climate change and human disturbance in the scenario of tourism development in Ngari District. The climate in western Tibet is becoming drier and warmer, and this is likely to accelerate ecosystem degradation. However, there is no assessment on threats to wildlife species and their vulnerability and adaptation to climate change. Land cover changed rapidly but the conditions of wildlife habitats are not known. Improvement of highway transportation and operation of Ngari Airport will bring more tourists to Kailash area. Circumambulating activities will inevitably be the greatest threat to wildlife habitats and migration patterns. The No.209 National Highway across the corridor of Kailash and Lake Manasarovar affects animal migration from north to south. Effects of human activities, especially tourism, await assessment.

Increasing goat numbers in livestock structure and harvesting of shrubs by pilgrims have raised the issue of vegetation degradation. Bird egg stealing is also a threat to breeding birds. Also not known are issues of commercial wildlife trade, illegal trade of CITES species, and human-wildlife conflicts.

The Manasarovar Wetland Protected Area has no corridor linking it with the Changthang National Protected Area in northern Kailash region. The ongoing fence for exclosure grazing program is a barrier to wildlife migration and its reproduction. Endangered species and wildlife face great challenges in the future.

7.2 Kailash Landscape Protection

The ongoing Mt Kailash and Lake Manasarovar planning aims to protect the landscape and environment in the target area. How are the ideas of the planners compatible with religious belief and Tibetan style of architecture and life? This should be considered and suggestions of local stakeholders solicited in this aspect. Conflict between the two may become a concern for environmental protection.

7.3 Traditional Knowledge of Diversity Conservation

In KSL-China, traditional knowledge plays a vital role in local resource management. As such, traditional knowledge can be important for maintaining and enhancing biological diversity and other essential ecosystem goods and services. Thus, identification and understanding of existing or traditional knowledge is beneficial to conservation of biodiversity and cultural

diversity. Globalization and modern lifestyles pose threats to traditional knowledge of indigenous peoples. Developing a plan for KSL without involving indigenous peoples is also a threat. Loss or disappearance of traditional knowledge, particularly from indigenous peoples, is rapidly occurring due to encroachment of market forces and loss of elders holding such knowledge. Once lost, it is not easy to retrieve. Traditional knowledge is not known by modern people today, especially local resource managers.

7.4 Alternative Livelihoods

Promising livelihood options are tourism and transboundary trade with India and Nepal. However, the latter option is still slowly developing. This will cause imbalance of development among Manasarovar watershed (Baga and Hor Townships) and Karnali Basin (Burang Township) because more activities of tourism and pilgrimage are concentrated in Mt Kailash and Lake Manasarovar. Attracting more travelers to lowland areas is one option. Another is to export lowland human resources to Kailash area. Developing arts and crafts and local specialties for tourists in Kailash area would be an alternative livelihood strategy. Equal benefits from tourism need mediation from the government through relevant regulations.

7.5 Policies and Regulations

KSL-China borders with India and Nepal. There are some restrictions for scientific survey and research. For grassland monitoring and remote sensing survey, scientific organizations or NGOs must submit an application and solicit agreement from relevant departments in order to determine the research possibility and feasibility. Cooperation between Chinese scientists and foreign organizations must first obtain approval or documents authorized by the Tibet Government or relevant departments and submit a report and register survey and mapping results when activities are completed.

To establish meteorological observation facilities, reports must be submitted to the Tibetan Autonomous Regional meteorological authorities for the record. If the period of observation is over two years, a report must be submitted to National Meteorological Administration. Due to the particular nature of meteorological data and geographical characteristics in Kailash, it will involve other laws and institutions, subject to further verification and research.

Foreign scientists and NGOs who expect to conduct scientific research and survey face restrictions from the Foreign Affair Office of TAR. They must first apply for Tibetan entry permission for scientific survey and research, and then they must apply for a boundary pass if they are to travel to boundary areas such as Kailash.

7.6 Capacity Building and Stakeholder Participation

Ecosystem degradation in KSL-China has serious consequences for plants and animals that occur in alpine ecosystems including Mt Kailash and Lake Manasarovar. Despite this, local

stakeholders are not aware of the importance of habitats for biodiversity conservation. Rangelands are overgrazed and parts of wetlands on the shores of Lake Manasarovar have been drained for grazing. It is necessary to make stakeholders aware on the value of their environment so that they can continue benefiting from wetland services and functions. This can best be achieved by incorporating a comprehensive biodiversity monitoring program into the management plan of KSL. The monitoring program could provide necessary information to local governments and stakeholders. This information would guide the process of formulating appropriate policies and aid in the design of development projects so that they are in harmony with efforts to conserve culture and biodiversity in KSL-China. Capacity must also be built to strengthen infrastructure, education and dissemination for tourism and socio-economic development.