

# People and Ecosystems in Mountain Landscape of Northwest Yunnan, Southwest China:

## Causes of Biodiversity Loss and Ecosystem Degradation

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## Abstract

The problems in NW Yunnan are complex and characterised by a combination of endemic poverty, environmental degradation and food insecurity. The communities are remote from services and major markets. The environmental degradation after logging and low food production in the highlands along with extreme climatic conditions has caused local livelihoods and the capacity for biodiversity conservation to deteriorate. During field assessment, three basic driving forces were found to cause environmental degradation and loss of biodiversity including; human population growth and increasing consumption (food, fuelwood, timber and NTFPs); market forces; and failure of governmental policies to address the diversity and complexity of mountain environments and indigenous people. The proximate threats include the commercial logging, land conversion, over-collection of fuelwood and NTFPs and massive tourism development.

The integrated conservation and development project (ICDP) is essential to incorporating the views and values of a wide range of stakeholders including governmental officials, resource managers, and indigenous people, to exposing them to new concepts and methodologies, and to putting them together in the process of dialogue, mutual learning and agreement in the early stages. The main challenge for ICDP is to institutionalize the participatory process and increase support for capacity building both for indigenous communities and governmental agencies in a much broader sense.

**Key words:** Ecosystem, Biodiversity loss, Driving forces, Proximate threats, ICDP

## 1. Introduction

Northwest Yunnan covers 15 counties of Diqing, Lijiang, Nujiang and Dali Prefectures, between 25°30'-29°15'N, and 98°05'-101°15'E. Its total area is 68,908 km<sup>2</sup> (17.5% of Yunnan Province). The region has the upper stream stretches four major rivers in China and SE Asia, including the Yangtze (Jinsha River), the Mekong (Lancang River), the Salween (Nujiang River), and the Irrawaddy River (Dulong River), which run in parallel courses within the narrow mountain ranges.

NW Yunnan, covering 6 million hectares, is quite well known in China and even in the world for its great biological and cultural diversity, and is one of just a few places on Earth recognized as a Global Biodiversity Hotspot and Global 200 List Priority Eco-region. The ethnic groups in NW Yunnan represent unique cultural systems with a great wealth of languages, knowledge, beliefs, technologies, art, and music. Each indigenous culture developed balance in its interactions with the natural environment. These groups have established complex livelihoods demonstrating an extraordinary innovative variety of knowledge, beliefs and institutions for maintaining, nurturing and sustaining the diverse landscapes in the region. Their livelihood strategies vary from hunting and gathering, fishing, nomadic grazing and shifting cultivation to intensive permaculture. However these indigenous people face fast change and influence from of livelihoods, knowledge and economy. Among the most powerful contemporary forces that influence both local cultures and biodiversity are various government polices, migration, development and expansion toward a market economy. These forces produce both negative and positive impacts on local biological and socio-economic systems. Deforestation and extinction of biological species are often the consequences of those impacts.

## 2. Biological significance

NW Yunnan comprises the transitional region between the Qinghai-Tibet Plateau and the Yunnan-Guizhou Plateau. It is located in the southern mountain region (Hengduan Mountains) of the Eastern Himalayas. The terrain is extremely rugged with snowy mountains and deep gorges. Thus, it has unique ecological functions. From the summit of Kawagebo (6,740 m) to the lowest place in Nujiang valley (500 m), the elevation range is over 6,000 m. Therefore, it is one of the regions where elevation differences are the most extreme in the world. It is the richest in terms of landscape, biodiversity, and bio-resources. It is also one of the three endemic species centers in China. Most of the southward sloping mountain region belongs to one of the 40 key regions with biodiversity significance (Mackinnon, *et al*, 1996). It is internationally identified as one of the regions with the richest biodiversity exceeded only by tropical regions. It is also a place with relatively intact ecosystems in Yunnan and China.

### 1. Rare vegetation types

A total of 10 vegetation types and 98 formations can be found in the region, which includes tropical, sub-tropical, temperate, cold temperate, and frigid zones as well as dry savannah, wetlands and aquatic vegetation. This has fully reflected the species diversity in the region. The most valuable types of vegetation with conservation significance are as follows:

- **Alpine mosaic** (including alpine, sub-alpine scrubs/meadow, scree)

This is one of the most unique vegetation types with vulnerability in the region distributed at elevations above 3,600 m. There are many endangered and endemic species within this vegetation type so it is of high value in terms of conservation.

- **Highland lakes and wetlands**

This is very important habitat for many endemic plant and wildlife species particularly for migratory birds such as Black-necked crane. There are thousands of different scales of lakes and wetlands in NW Yunnan, mostly located at higher elevations.

- **Evergreen broadleaf forest**

This includes monsoon evergreen broadleaf forest, semi-moist evergreen broadleaf forest and mid-montane moist broadleaf forest. Such vegetation has the second highest number of rare and endangered plant species in the region only after the alpine mosaic. Its distribution area is very small. At the moment, vegetation type has received little protection even within existing nature reserves. Therefore, it should be included within the future nature reserve system.

- **Mixed forest**

This is of conservation significance for both species diversity and environmental conservation.

### 2. Endangered and endemic species

Classified endangered plants species were jointly reviewed along with plant species endemic to NW Yunnan. NW Yunnan is rich in plant diversity with 7,000 species of vascular plants (43.8% of the total in Yunnan). Besides, the region has an obvious endemism. Among 5,079 species endemic to China, 2,988 species can be found in this region. The region has 910 species endemic to NW Yunnan, 72 genera endemic to China (28% of the total in the country), and 12 genera endemic to NW Yunnan (16.22% of the total in the country). This region is also the center of distribution of many worldwide known flowers. For an example, it has about 200 rhododendron species (470 species in China, 850 species worldwide), and 100 primrose species (293 species in China, 500 species worldwide). Moreover, many other alpine flower species have developed well in this area. Thus, it can be considered a well known natural garden and enjoy fame as the "Origin of Horticulture". It is rich in medicinal herb resources with about 2,000 species. Based on the analysis of its botanical diversity, NW Yunnan is certainly one of the hot spots of biodiversity significance worldwide.

Based on the existing data, the region has 84 rare/endangered plant species belonging to 49 families, 84 genera, with 10 species in *Liliaceae*, 7 species in both *Magnoliaceae* and *Ranunculaceae*, 3 species each in *Orchidaceae*, *Solanaceae*, *Theaceae* and *Pinaceae*. It has 3 species of the first class of national protected plants (*Taiwania flousiana*, *Davidia involucre*, and *Taxus yunnanensis*, 11 species of the second class of national protected plants (*Cephalotaxus lanceolata*, etc.), and 26 species of the third class of national protected plant (*Euptelea pleiospermum* etc.) as well as some locally protected plants.

Records of animals in the region account for half of the total in Hengduan Mountain System or Yunnan, and 1/4 to 1/3 of the total in China. It is a unique situation in the world for such a small area to have so many species (see table 1). The region has 49 animal genera (27 mammal, 7 avian, 3 amphibian, 12 fish), with 200 species (>25% of the total) endemic to China, 21 of which are endemic to NW Yunnan (see table 2).

The region has 139 (2/3 of the total species found in the region) rare or endangered species, including the black golden monkey, Bos gour, black-necked crane, wolf, etc. In addition, the region also has about 30 animal species of economic or academic significance. Eighty species are on China's Red List, 63 species in IUCN's Red List issued in 1996, 77 species in the list of national protected animal (16 species for the first class and 61 species for the second class). In the list issued by CITES, the region has 20 species in the first list, 45 species in the second list, and 13 species in the third list.

**Table 1. Comparison of the species in NW Yunnan, Yunnan, China and the world**

Taxonomic group	NW Yunnan	Yunnan	China	The world	Percentage of Yunnan
Mammal	173	278	581	4170	62.2
Bird	417	793	1244	9198	52.6
Reptile	59	141	376	6300	41.8
Amphibian	36	102	284	4184	35.3
Vascular plant	7000	16000	34000	275000	43.8
Vegetation type	10 vegetation types and 98 formations	12 vegetation types and 169 formations	29 vegetation types and 560 formations		

**Table 2. Endemic animal species in Northwest Yunnan**

Animal group	Species	Endemic species	Percentage
Mammal	173	81	46.82
Bird	417	22	5.27
Reptile	59	27	45.76
Amphibian	36	25	69.44
Total	788	200	25.38

### 3. Forest cover and land use

Forests cover is 52.74% in NW Yunnan, a total of 6,890,800ha, which is the highest in all of SW China. The land cover consists of designated forestland (4,277,900ha), farm-and-pasture land (2,044,500ha, 29.16%), and marginal land (382,700 ha, 5.55%). Of this a total of 2,315,700ha (34.5%) is owned by the state and 4,389,400ha (65.5%) by the local community.

In the designated forestland, a total of 2,524,100ha (37.64%) is closed canopy forest, 106,600ha sparse forest (1.59%), 1,012,600ha (15.1%) scrub forest, 19,400ha premature forest, and 645,200ha degraded land, with a total of 493 million m<sup>3</sup> standing volume of timber. Natural forest accounts for 2,451,600ha (98.3% of the forested land).

**Table 3: Land use and land cover in Northwest Yunnan, Southwest China (interpreted from Landsat images of 1998)**

Land use type	Area (ha)	%
Agricultural land	567855	8.5
Woodland	4197351	63
Grassland	1600594	24
Water bodies	78768	1.2
Urban & residential areas	20071	0.3
Others	207346	3
Total	6671985	100

### 3. Biodiversity Impact Analysis

#### 3.1 Driving forces in biodiversity loss

The major driving forces of these threats are: (i) human population growth and its increasing consumption (of food, fuel wood, timber and NTFPs); (ii) market forces; and (iii) government policies (including “Food Security and Self Sufficiency” of the 1960s and 1970s, and the “Open Door and Market Economy” in the 1980s and 1990s, as well as environmental conservation for designation of nature reserves and a logging ban in the late 1990s).

##### 3.1.1 Human population and consumption growth

In Yunnan the population has grown from approximately ten million in the early 1900s, to about twenty million in the early 1950s, and about forty million in 1996 (see table 4). It has doubled each half century. Population growth stresses ecosystems and biodiversity because it contributes to increased consumption and land conversion. In general, population growth in ethnic minority areas in the highlands is higher than in the lowlands (Yunnan Statistical Yearbook, 1998).

**Table 4: Population growth in NW Yunnan (tens of thousands)**

Prefecture	1978	1980	1985	1989	1994	1997	1998
Diqing	26.00	26.90	29.00	30.80	32.27	32.99	33.03
Nujiang	33.80	35.10	39.60	42.50	45.03	45.81	45.88
Dali	260.30	266.00	281.30	299.00	313.32	320.91	323.54
Lijiang	87.40	89.30	94.50	100.10	104.98	107.83	108.62

Another driving force is the livestock population. More and more farmers in the uplands rely on livestock for cash income and social security for house construction, marriage, and schooling. Most farmers said that livestock provides a potential for more cash income generation after the logging ban when income decreased from logging activities.

**Table 5: Livestock population in NW Yunnan (head)**

Prefecture	1989	1994	1997	1998
Diqing	237,700.00	255,500.00	277,157.00	283,308.00
Nujiang	131,800.00	148,000.00	159,155.00	164,970.00
Dali	791,400.00	858,100.00	941,288.00	955,899.00
Lijiang	374,700.00	401,000.00	430,178.00	438,699.00

Although the introduction of the “Household Responsibility System” and economic reforms has significantly increased the total food production in NW Yunnan, the food production per capita in some prefectures, for example in Deqing, remains little changed, since either the biophysical environment is too harsh for food crops or population growth has increased. Almost one third of households in the remote highlands report insufficient food available for one third of the year. Poverty still figures significantly in the socio-economic landscape of NW Yunnan.

**Table 6: Food production per capita in NW Yunnan (kg/person)**

Prefecture	1978	1980	1985	1989	1994	1997	1998
Diqing	358.35	350.28	346.31	344.54	358.15	384.76	384.46
Nujiang	263.48	253.12	242.14	263.04	286.03	324.07	337.26
Dali	304.39	275.80	254.98	240.07	332.72	377.88	400.04
Lijiang	360.79	352.91	294.12	332.66	303.28	368.86	356.48

Population growth increases overall demand of rural populations for food, energy, building materials, cash income and other necessities. Increased demand in these areas adversely impacts biodiversity, particularly forest resources. For example, increased food demand and need for income generates more widespread conversion of forest to agriculture, livestock grazing and fodder production. Clearing of secondary, sloped forest land for cash crops (such as bean) generates the cash income often used to purchase grain (e.g., rice) to meet consumption needs.

### 3.1.2 Market forces

Recent changes in China have been rapid and dramatic. These changes are best illustrated by the high economic growth rate, the lifting of millions of people out of poverty and the decentralization of decision-making processes. The rapid economic growth and dramatic social changes have also generated great impacts on the natural resources and livelihood of indigenous communities, particularly in upland watershed areas of NW Yunnan. As documented above, the tourism market is growing very rapidly in NW Yunnan. This increases the habitat loss, fragmentation and degradation from tourism-related infrastructure development. Over-collection of wild mushrooms and traditional medicinal plants is often associated with sudden rises in market or government procurement prices. These spikes trigger over-collection episodes in many locations across NW Yunnan. In 2001, a total of 1250 tons of one species, matsutake (*Tricholoma matsutake*), mainly collected from NW Yunnan, has been exported for Japan.

### 3.1.3 Governmental policies

Xu *et al* (1999) reported that a number of government policies also underlie a range of threats causing biodiversity loss and natural resource degradation. These include the Great Leap Forward in 1958 that asked farmers to cut trees for backyard steel furnaces, lack of government authority during the Cultural Revolution making it impossible to control logging, and the campaigns for local self-sufficiency in grain in the 1970s. During the collective period, state policies played a key role in the degradation of forests through poorly thought out efforts to manage local economies. These policies failed to address the complexity of the numerous ecological and cultural niches found across the landscape.

Frequent shift in tenure of forestland is another trigger for deforestation. During 1978-1983, farmland was under individual contracts according to the household responsibility system. Forest land, however, was restricted by the state. This often caused conflicts between the government and collectives or individuals. In order to stabilize forest land and swidden fields, a provincial policy called *liangshanyidi* (freehold land, contracted land and swidden land) was implemented with the recognition of zonation of state forest and collective forest by joint working team from local communities and government agencies. The goal of this reform was to shift forest management from the state to individuals in favor of forest regeneration or plantation. Under this reform, both freehold plots and collectively held forests could be leased to individual households. The contemporary forest tenure can be classified into protected areas, state,

collective and freehold. Dense forest is often held by the government as state forest or as nature reserves. Collective forest could be reallocated to individual farmers for management. Every household received a piece of forest land for firewood collection and tree plantation. The new trend in forestry policy in Yunnan is to hand over more responsibility and management to local communities through contracts and public auctions.

### **3.2 Proximate threats**

There are a wide range of proximate threats to biodiversity in NW Yunnan, caused mainly by human activities.

#### **3.2.1 Commercial logging**

NW Yunnan is an important logging area in Southwest China. Until the 1998 logging ban, commercial-scale logging represented the primary threat to the forest ecosystem in the region. Lijiang Prefecture alone contributed a total of 400,000 cubic meters of commercial logs annually.

#### **3.2.2 Conversion to agricultural land**

In the past two decades, much forestland has been converted to agricultural uses, including grazing, most directly linked to significant biodiversity loss, such as the following (i) shifting cultivation for subsistence farming; and, (ii) logging followed by livestock over-grazing (particularly by pigs, yak and cattle/yak hybrids). Commercial-scale agriculture is relatively limited in scope due to arable land constraints, and therefore represents a lesser threat than the aggregate impacts on deforestation and forest fragmentation of land clearing for subsistence farming.

#### **3.2.3 Fuel wood collection**

With growing populations dependent on fuel wood for household heating and cooking, fuel wood collection has become a major cause of biodiversity loss -- including the loss of many endemic and rare plants used in traditional Chinese medicine. Each year, about 130,000 ha. of forest in NW Yunnan disappears due to fuel wood collection. This threatens to cause deforestation, resulting in the decline of wild populations. Xu (2001) reported that fuelwood collection accounts for about 60% of wood use in Deqin County (Diqing Prefecture). In average, a family in the highlands needs 12 cubic meters of fuelwood per year, a family in the middle elevations needs 7 cubic meters, and 3 cubic meters as minimum for the lowlands.

#### **3.2.4 Timber harvesting for construction materials**

An increasing number of villages are experiencing shortages in supply of timber for housing materials due to long-term pressures on construction timber resources in forests surrounding villages and former commercial clear felling operations. Traditional housing designs -- based on timber -- are unimportant part of cultural beliefs and practices. Further, the prevailing custom in some areas is for newly married couples to build their own house, thus increasing the demand for construction timber. A traditional Tibetan house needs at least 120 cubic meters of good timber.

#### **3.2.5 Habitat loss and fragmentation due to tourism development**

Tourism (primarily driven by domestic tourists) has risen dramatically in NW Yunnan in since the 1990s. This trend is projected to continue, with an emphasis on "mass tourism" attraction by provision of good roads and cable car access. Tourism in NW Yunnan has been growing at an annual rate of about 23% (McKinsey 1999). According to official statistics, visitors to NW Yunnan totaled 6.5 million in 1998. The general threat stems from the fact that tourism development is currently poorly controlled and poorly planned. Infrastructure to support tourism -- airports, new roads and other transportation infrastructure, hotels, recreational facilities, and support services -- is not designed with the objective of reducing adverse impacts on natural and cultural resources.

### 3.2.6 Over-harvest of non-timber forest products (NTFPs)

A wide range of NTFPs is harvested by indigenous people for subsistence use and cash income generation in local, regional and international markets. In some areas, matsutake alone contributes half the cash income of a family. There is no regulatory regime in place for NTFPs, so over-collection, especially of fungi and medicinal plants, resulting in local disappearance of populations of certain species under particularly high collection pressures (e.g., matsutake mushrooms and bark of taxol trees), is commonly observed.

## 4. Impact on ecosystems

NW Yunnan is particularly famous among alpine ecosystems. The alpine and sub-alpine vegetation consists of diverse forest types distributed among several vertical montane zones at different altitudes in the mountain ranges. The distribution of vegetation in NW Yunnan from high to low altitude is as follows: glacial (>4800m a.s.l.), scree (4000-4800m), alpine meadow (3800-4800m), alpine conifer (3000-3800m), deciduous forest (2600-3900m), oak forest (3000-4000m), pine forest (2500-3500m), savannah (2000-2800m), and evergreen broadleaf forest.

Forest ecosystems provide human beings with food, fuel, medicines and building materials as well as ecological services such as the nutrient cycle, soil erosion control, and climate and water regulation. NW Yunnan has the most diversified forest ecosystems in the world, as reflected in the vertical distribution of vegetation from alpine meadow to evergreen broadleaf forest.

Forests account for about one third of the area of NW Yunnan, with zones from mountain tops to valley floor as follows: tundra - alpine meadow - conifer forest - mixed forest - temperate broadleaved forest - arid zone. The area is especially rich in conifer forests, and the most important commercial timber species in the area are various firs (*Abies delavayi*), spruces (*Picea likiangensis*, etc), and pines (*Pinus yunnanensis*, *P. desnata*, *P. aramandii*). Other species present include juniper, scrub oak, birch, maple, and poplar. The remaining forests tend to be concentrated either at high altitudes or in steeply sloped mountainous areas, which provide crucial ecological functions of climate regulation, soil erosion control, and water and nutrient cycles, as well as serving as a biodiversity refuge. NW Yunnan is referred to as the "three river" area because the Salween, Mekong, and upper reaches of the Yangtze (known as the Jingsha river) run very close together, biophysically creating vertical distribution of vegetation and ecosystems.

**Table7: Vegetation types and their conservation significance in NW Yunnan**

<b>Ecosystem (From high altitude to low)</b>	<b>Representative species</b>	<b>Conservation rank ( reasoning )</b>	<b>Critical threats (reasoning)</b>
Rock, snow, ice & glaciers >4800m		Natural with difficulty of access	Increasing number of tourists arriving by cable cars
Scree >4000-4800m	Saussurea spp. Fritillaria delavayi Meconopsis	Seldom accessed	Over-collection of medicinal plants
Alpine heath & meadows 3800-4800m	Rhododendron spp. Salix spp. Caragana spp. Arenaria polytrichoides	Many endemic/rare species, easily damaged	Over grazing during summer particularly due to increasing pig population
Alpine conifers (fir & spruce) 3000-3800m	Picea spp. Abies spp. Quercus spp.	Growth of these trees is very slow, regeneration very slow once damaged)	(1) building materials from this zone; (2) grazing pens for livestock; (3) livestock grazing in the understory, too; (4) impacts aren't as severe in this zone.
Deciduous forest 2600-3900m	Betula spp. Larix spp. Populus spp.	Little-known	(1) timber used for small utensils; (2) timber used for building temporary housing for getting cattle to alpine pasture in summer and back to villages; (3) big impact on the understory by grazing.
Oak forest (on north-facing slopes) 3000-4000m	Quercus spp.	These oaks are special due to high elevation, geological history, high economic value & habitat for matsutaki	Collecting oak for livestock bedding (20tons/year in some Tibetan villages)
Pine 2500-3500m	Pinus yunnanensis Pinus densata		(1) timber extraction
Mixed forest (pine with others)	<i>Taxus yunnanensis</i> , <i>Psuedotsuga forrestii</i> , (indicating a belt of endangered plant species)	Extractive collection of taxus bark for marketing	(1) timber & fuelwood extraction (2) fertilizer collection; (3) natural forest fires; (4) pests; (5) over collection of NTFPs
Savannah 2000-2800m	Heteropogon contortus Terminthia paniculata Bauhinia spp. Vitex spp. Sophora spp.	Once damaged, hard to regenerate, particularly given the dry conditions at these lower elevations	(1) collecting stones & sand for construction; (2) collecting fuelwood
Riparian (evergreen broad-leaf, and cedar) <2800m	Alnus neplensis	A vulnerable/fragile ecosystem, regeneration is limited once disturbed	(1) collection of building materials, fuelwood, leaves for incense.

## **5. Discussion and conclusion**

### **5.1 Diversity and complexity**

In general, this review of the main driving forces and proximate threats suggests that there are rarely unilinear links between one particular driving forces and its impacts. On the one hand this reflects the great variation in topography, climate, production patterns and technologies in NW Yunnan. On the other hand, it also reflects the essentially integrated nature of farming economies in their local ecological contexts. This has major implications for the ways in which policies and developmental interventions should be formulated to address the potential impacts of specific activities. In particular, complexity is easiest to understand and deal with at the local level. The sustainable management of biological resources calls for an integrated conservation and development project (ICDP), which is firmly based in sound understandings of local realities, the diversity of biological and cultural resources, the complexity of the biophysical and socioeconomic environments, and dynamic interaction among different ecological systems and different stakeholders in managing those resources. This involves finding common ground among scientific, local and political worldviews and careful consideration of the important linkages between culture, nature, and the external socio-political environment. It is necessary to establish integrated policy-making for integrated conservation and development.

### **5.2 The importance of regional perspectives in resource management**

Many of the factors influencing resource management decisions at the local level arise from, are determined by or involve people from a wider area than single village communities. Examples show that over-collection of NTFPs is often related to the activities of outsiders, that poor management of forests often involves the relationships between many different parties, and that policy decisions at higher levels can have adverse impacts at local levels, even though their overall economic benefit may be positive. This implies that communities are best seen as part of wider ecological communities, and that resource decisions should be taken at higher levels (such as watersheds or administrative areas) but that decision-making should involve villagers and their representatives. The need for area-based approaches to resource management involving villagers is clearest in the case of nature reserve management.

### **5.3 Reinforcement of state regulations for wildlife conservation among the public**

A variety of communications media should be mobilized for enforcing state regulations for wildlife conservation among government officials, the public, students and local communities. Public awareness building in biodiversity conservation and environmental protection is essential for effective conservation. Air and power guns for hunting should be confiscated. Some local norms and rules can be discussed among the public first and further developed into local regulations in the autonomous regions.

### **5.4 Support for local participation in resource management and conservation**

Key areas (watersheds, habitats, landscapes and ecosystems) should be defined for area management analysis, planning and monitoring to address the diversity, dynamics and complexity in the region. "Changing (administrative) villages to committees" is now being piloted and soon to be promoted across all of NW Yunnan. This is a good opportunity to develop mechanisms and the capacity for improved management of resources. The village

committee will be elected by all villagers more than 18-years old. Village representative meetings will make decisions about all village affairs, including natural resource management, and will consist of the village committee, village party groups, and villager representatives (each 10 households has one representative). This will significantly increase accountability of local governance bodies to local communities. It will increase the participation of all villagers in resource planning and management, leading to increased ownership of projects for local farmers, finally resulting in autonomy, self-reliance and self development.

#### **5.5 Develop strategies and capacity to reorient NR management towards co-management**

Capacity building for local resource management, planners, officials and indigenous people can promote understanding and learning participatory approaches, co-management and mechanism for conflict resolutions. Capacity must be built into all efforts to promote integrated conservation and development. Capacity building among community members, NGOs and government staff should ensure that adequate skills are possessed at the appropriate level. New technologies and strategies require effective training, impact assessment, and follow-up support. Government agencies may have to develop these skills first in order to provide technical support for local communities.

#### **5.6 Promote trade and markets that enhance cultural values and biodiversity conservation, and further reduce tax for forest products which are sustainably harvested by the local communities**

Market arrangements that shorten trade links, promote sustainably harvested local products and improve communication channels should be supported in order to ensure fair prices for products with an equitable stream of benefits to the relevant community members, enable local control of industries, and promote awareness of laws that affect resource use and trade. Strategies should be developed that promote diversification of resource use.

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