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**Transformation of land-use institutions and its implication for biodiversity and sustainable resource use in Naban National Nature Reserve, Xishuangbanna, South-West China**

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**Abstract**

The focus of research is Naban National Nature Reserve (NNNR) in Xishuangbanna Dai Autonomous Prefecture in the Southern part of Yunnan province. Xishuangbanna, bordering Laos and Burma is part of the Indoburman Biodiversity Hotspot and, despite covering only 0,2% of China's land area, it is home to 16 % of higher plant species found in China (ADB 2005).

Over the last decades, political, social and economic transformations had a huge impact on land-use and ecosystems. The most drastic result might be the loss of forest cover: the share of native forests has been reduced from 70% in the 1940ies to 26% in the 1990ies. At the same time, the population density rose from 10 to 50 persons/km<sup>2</sup> (Shapiro 2001).

In this paper, the institutions which govern land use and their transformation will be described, focussing on the question to which extent modern institutions are capable of ensuring sustainable land-use, especially the protection of biodiversity. Intensive field-research has been conducted in NNNR since 2007 by an interdisciplinary team of researchers funded by the German Federal Ministry of Science and Education (BMBF) and the Chinese Ministry of Science and Technology (MOST).

**Traditional land-use institutions**

Being a buddhist Dai kingdom for several centuries, basically all land belonged to the king of Sipsong Panna, which was organized under a feudal system. The majority of the population belonged to the ethnic group of the Dai Lue, who were- dwelling in the fertile valleys mainly engaged in paddy rice cultivation. The more remote and mountainous areas of the kingdom were inhabited by different ethnic groups, which were engaged in shifting cultivation and hunting and gathering. These upland groups were endowed with a large degree of independence- thus they could develop or maintain their own social structure, culture and land-use systems.

Abundance of forests and land, a low density of population and strict institutions governing land use allowed for a rather sustainable use of natural resources. For example, long fallow periods (10-20 years) within shifting cultivation regimes, which enabled a regrowth of natural vegetation helped to maintain biodiversity. Certain forest areas, among the Dai ethnic group for example the so called "holy hills" were completely exempted from access and use, similar institution could be found amongst other groups. The natural environment was not only base of peoples' livelihoods, but also home to the pantheons of innumerable spirits and gods of the different ethnic groups (Yin, 2001, Xu et al., 2005). The legitimacy and justification of the land-use institution was based on spiritual believes and their implementation monitored, i.e. enforced by strict social control within the village community and by traditional village elites.

### **Changing land-use institutions under the Communist period**

These systems abruptly changed with the advent of the communists in Xishuangbanna in early 1950ies. The traditional, customary institutions which facilitated maintenance of ecosystem functionality and a balanced relationship between humans and the natural environment were abolished and partly replaced by regulations which were based on Maoist ideologies and modern technologies. These ideologies left no space for environmental concerns- nature and environment was to be conquered and subdued by technical means. Land was collectivized and especially during the cultural revolution, forests were logged to be replaced either by rubber plantation or, in less favourable environmental conditions by fields used for shifting cultivation (Shapiro, 2001).

The new institutions failed to maintain the balance between environmental and economic interests, leading to a decline in forest cover, (agro-) biodiversity and degradation of arable land.

After Mao Zedong's death, a shift in thought and accordingly policies brought the country upon a path of liberalization. Crucial for land-use was the land-tenure reform, which replaced the collective with the household responsibility system, putting the individual household back to being an autonomous economic unit which is endowed with decision making powers concerning land use. Elements of a market economy were introduced, leading to a larger demand in natural resources and stronger incentives for the individual producers. Also, environmental concerns came slowly back on the agenda for example by increasing, at least nominally- Nature Reserve areas, which make now up almost 13% of Xishuangbanna's total area (ADB, 2005).

### **Land-use institutions in Naban National Nature Reserve**

One of those reserve areas is the Naban National Nature Reserve, which was established in 1991. It encloses an area of 260 km<sup>2</sup>, of which 2/3 are state forests and the remaining land belongs to the 32 villages which are located in the Reserve. At present, the NNNR is home to about 5500 people from 6 different ethnic groups.

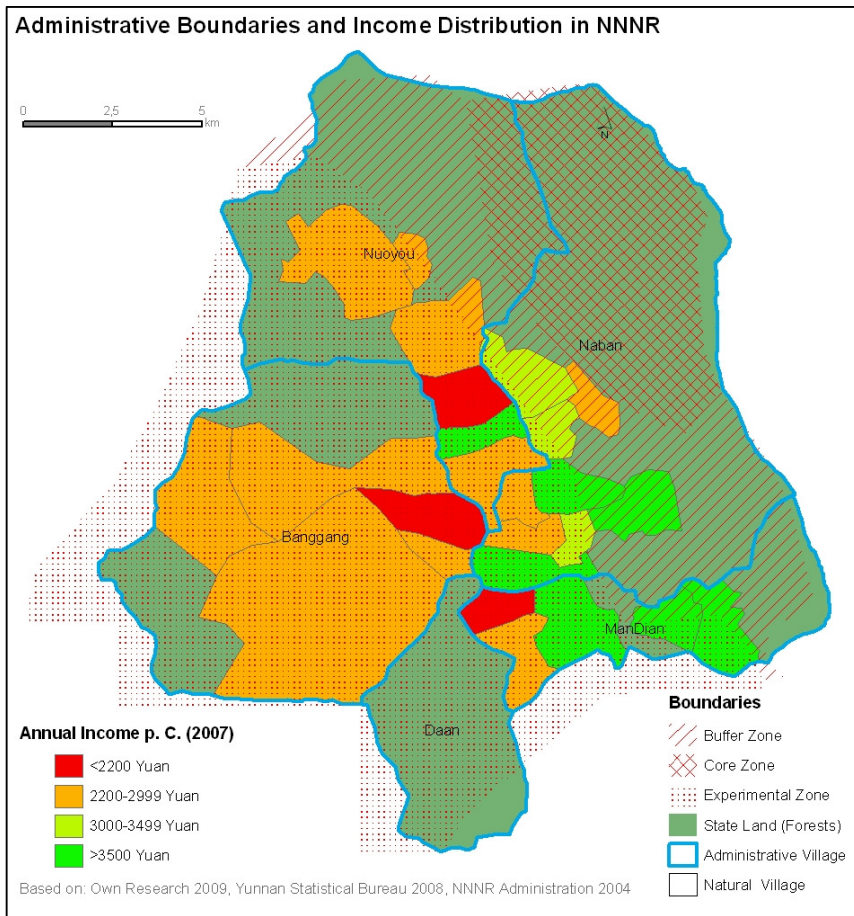
Under the land tenure reform, land was also classified according to usage. Collective land was roughly classified as collective forest, irrigated land, arable dryland and wasteland (shifting land). The agricultural land was distributed in equal shares to each household and is rented for a period of 30 years, the last extension of those contracts was undertaken only recently in 2008. Farmers were strongly encouraged to put "wasteland" under production, land which was either a secondary forest or in certain stages of natural succession. Agricultural land was expanded at the expenses of natural vegetation. Also collective forests, which were the remaining source for firewood, construction timber, food and medicine were increasingly logged or degraded in favour of agricultural production. Especially when rubber cultivation spilled over from state farms to small scale farmers, those collective forests below an altitude of 1000m, were widely replaced with rubber plantations. Also, agricultural biodiversity declined since farmers were encouraged to replace the local varieties of paddy and upland rice by high yielding hybrid rice varieties.

In 1991, a new institution was introduced based on the UNESCO's Man and Biosphere concept with the objective to combine the protection of biodiversity and natural resources and sustainable social and economic development.

The area was divided into three different zones, the core, the buffer and the experimental zone, of which each has its own rules and regulation. Monitoring and enforcement of those rules is task of the NNNR administration, itself a body of the Yunnan Environmental Protection Agency.

The core zone, which encloses some of the best maintained primary forest in XSBN, is excluded from any extractive activities. It is only accessible for staff from NNNR administration and selected scientists for monitoring and scientific purposes. However, my research indicated frequent infringements through villagers through hunting and collecting in the core zone.

The buffer and experimental zones are mainly used for agricultural activities, depending on the elevation for rubber, tea or subsistence farming. State forests in the experimental zone are open to the adjacent villages for a certain extractive activities.



The compliance with regulations on the ground is monitored by forest guards from local villages. These forest guards receive a regular salary by the NNNR administration and also training. They also act as buffer-persons between the government in form of NNNR administration and the local villagers, which puts often puts them under pressure when they have to deal with different interests from the groups they are both part of. In case of severe transgressions against Reserve Rules, the forest police as an executive organ of the State Forestry Administration becomes involved.

### Case studies: Pabin and Xiao Nuo You Shan Zhai

Based on two sample villages, 2 different typical land-use types which have emerged will be described and it will be shown to what extent regulations of the NNNR can support sustainable land-use and protection of biodiversity.

The first case study is the village of Pabin, which consists of 38 households and about 149 people from the Akha/Hani ethnic group. It is located in the buffer zone at an elevation of 770 meters. Agricultural activity are focussed on rice and rubber cultivation, hence the village economy is mono-structured, depending on rubber as their only cash crop. Only part of the rice for subsistence is produced by the villagers themselves. Since they receive high income from rubber, villagers prefer to avoid strenuous labour and to buy rice instead, leaving the paddy fields to lie fallow for one season, despite the potential of a second harvest. Mapping of land-use history in a participatory mapping session with the villagers (carried out in January 2008) showed that only two decades ago, native forests and wildlife were abundant in the village area. Today, very little of this collective forest remains-most of it has been turned into rubber plantations. Part of the logging has occurred before the logging ban introduced in 2000, however, some of the collective forests were afterwards turned into rubber illegally. Only in recent years, these illegal logging activities have led to legal consequences. The remaining collective forests of Pabin are overused and degraded. The Akha have traditionally strong linkages with the forest, especially in providing food and medicine. Even though Pabin is now one of the richest villages in the area (average cash income per person in 2007: 5500 Yuan), people still collect and sell NTFPs to complement their daily diet and also for sale. Since the forest resources of Pabin are very limited, they use the nearby state forest, which is officially not allowed. This also has historical reasons: before the introduction of the Nature Reserve, people used this forest. Even after more than a decade, people still consider it is their forest which they are entitled to use. The new regulations have so far not

been widely accepted.

Xiao Nuo You Shan Zhai with a mixed population of Lahu and Mountain-Han at an altitude of 1550 meters offers a different picture. Till last year, all 33 households depended on tea and some surplus corn as cash crops, with an average income of 2640 Yuan per person in 2007. Only since 2009, farmers are strongly encouraged to plant hemp to supply a fibre-production plant which was recently established in Menghai, the county capital. Villagers have developed or maybe maintained a stewardship relation to their collective forests and manage them, in cooperation with the Reserve Administration- very well. Areas around the village have been reforested by the villagers themselves over the last 20 years, due to esthetical and practical reasons. Products from the forest, edible as well as medicinal plants are still a very important part of their livelihood, with the next Village Clinic a one-hour walk and the next hospital a 3 hour bus ride away. Moreover, villagers partly participated in the national "Slope Land Conversion Programme" and turned part of their rotational cropland into economic forests, especially tea plantation interspersed with walnut or native tree species. To diversify their income basis, each household planted bamboo in order to sell the poles. The introduction of hemp also diversified and increased their cash- income. However, with the new cash-crop, they will- as research results from neighbouring villages suggest- shorten the fallow periods of the rotational land, possibly leading to a decline in soil quality and a shorter period for the succession of natural vegetation.

The cooperation between the NNNR administration and the village community works rather well, with a high acceptance of the NNNR staff and the regulations. This cooperation is based on good personal relations between villagers/elites and staff and also on financial support, for example in village infrastructure projects (biogas, road improvement) by the NNNR administration.

#### **First Conclusions**

The compliance with the new regulations especially vary widely throughout the reserve. My findings suggest that there is a trend towards increasing acceptance, due to 3 reasons:

- A slowly growing environmental awareness of farmers in response to NNNR activities,
- Stronger presence of Nature Reserve staff and increasing enforcement of regulations, also through implementation of fines
- Villagers can feel negative consequences of environmental degradation, for example negatively perceived change in micro-climate and decline in water quality and quantity.

In the areas which are suitable for rubber cultivation however, the implementation and the stronger enforcement of those regulations have come too late to effectively protect especially the collective forests. Most forests have already been cleared and those remaining are under strong pressure, particularly those forests in the lower altitudes, where economic forests (rubber) have driven out native forests. The situation is slightly, but not uniformly better in the higher altitudes, where generally more collective forests remain. My results indicate that good or bad management or protection of the forest resources heavily depend on the attitude of the villagers, mainly on the attitude of the village head, who himself has a very strong position and influence within the village community. Despite much progress in the area, the new institutions – namely the NNNR administration are still too weak to completely fulfil their given task- to ensure sustainable land use, community development and the conservation of biodiversity.

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