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# **BIODIVERSITY CONSERVATION: STUDIES IN ITS ECONOMICS AND MANAGEMENT, MAINLY IN YUNNAN CHINA**

**Working Paper No. 1**

**Biodiversity Conservation: Economics, Gains  
and Costs in China**

**Illustrated by Xishuangbanna Nature Reserve,  
Yunnan**

**by  
Clem Tisdell  
and  
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**Clem Tisdell<sup>2</sup>**

**And**

**Xiang Zhu<sup>3</sup>**

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<sup>1</sup> A paper prepared for the Conference "Conservation by the Sustainable Use of Wildlife" University of Queensland, February 8-11, 1994 and delivered in the Symposium "Economics of Using Wildlife"

<sup>2</sup> School of Economics, The University of Queensland, St. Lucia Campus, Brisbane QLD 4072, Australia  
Email: [c.tisdell@economics.uq.edu.au](mailto:c.tisdell@economics.uq.edu.au)

<sup>3</sup> Southwest Forestry University, White Dragon Temple, Kunming 650224, P.R. of China – (currently on leave at World Bank Loan Project Management Centre, Ministry of Forestry, Beijing).

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Research for ACIAR project 40, *Economic impact and rural adjustments to nature conservation (biodiversity) programmes: A case study of Xishuangbanna Dai Autonomous Prefecture, Yunnan, China* is sponsored by the Australian Centre for International Agricultural Research (ACIAR), GPO Box 1571, Canberra, ACT, 2601, Australia. The following is a brief outline of the Project

Rural nature reserves can have negative as well as positive spillovers to the local region and policies need to be implemented to maximise the net economic benefits obtained locally. Thus an 'open' approach to the management and development of nature conservation (biodiversity) programmes is needed. The purpose of this study is to concentrate on these economic interconnections for Xishuangbanna National Nature Reserve and their implications for its management, and for rural economic development in the Xishuangbanna Dai Prefecture but with some comparative analysis for other parts of Yunnan

The Project will involve the following:

1. A relevant review relating to China and developing countries generally.
2. Cost-benefit evaluation of protection of the Reserve and/or assessment by other social evaluation techniques.
3. An examination of the growth and characteristics of tourism in and nearby the Reserve and economic opportunities generated by this will be examined.
4. The economics of pest control involving the Reserve will be considered. This involves the problem of pests straying from and into the Reserve, e.g., elephants.
5. The possibilities for limited commercial or subsistence use of the Reserve will be researched.
6. Financing the management of the Reserve will be examined. This will involve considering current sources of finance and patterns of outlays, by management of the Reserve, economic methods for increasing income from the Reserve and financial problems and issues such as degree of dependence on central funding.
7. Pressure to use the resources of the Reserve comes from nearby populations, and from villagers settled in the Reserve. Ways of coping with this problem will be considered.
8. The political economy of decision-making affecting the Reserve will be outlined.

**Commissioned Organization:** University of Queensland

**Collaborator:** Southwest Forestry College, Kunming, Yunnan, China

For more information write to Professor Clem Tisdell, School of Economics, University of Queensland, St. Lucia Campus, Brisbane 4072, Australia or email [c.tisdell@economics.uq.edu.au](mailto:c.tisdell@economics.uq.edu.au) or in China to Associate Professor Zhu Xiang, World Bank Loan Project Management Centre, Ministry of Forestry, Hepingli, Beijing 100714, People's Republic of China.

# **BIODIVERSITY CONSERVATION: ECONOMICS, GAINS AND COSTS IN CHINA ILLUSTRATED BY XISHUANGBANNA NATURE RESERVE, YUNNAN**

## **Abstract**

Considerable loss of biodiversity has been occurring in China as in most developing countries and threats to biodiversity are increasing because of China's rapid rate of economic growth. China is therefore developing and considering plans and policies, with assistance from international- organisations such as the World Bank, to improve its wildlife programs systematically. However, still being a low-income country, China must carefully weigh up the economic benefits and costs, of its biodiversity conservation program- and design it to generate as much economic benefit as possible without compromising its conservation objectives. Such considerations are especially important at the local level to gain local support for conservation measures and maintain or increase local standards of living. This is illustrated by Xishuangbanna Nature Reserve in southwest China. Policy-makers recognise the importance of integrating conservation within this Reserve with harmonious economic development in the prefecture in which it is located and reject the isolated 'island' concept of conservation planning. Such an approach calls for regional-integration of economic development and conservation and will make for greater sustainability of conservation programs. Prospects for sustaining biodiversity in China- will be heavily influenced by socio-political factors which in turn can be expected to reflect economic considerations.

## **1. Introduction**

Biodiversity conservation has become a major international issue. This is underlined by the establishment of the international Convention on Biological Diversity as a result of the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992. It is, however, one thing to adopt conventions and another to put them into practice.

Because the major part of the globe's remaining biodiversity exists in less developed countries, particularly in tropical and subtropical zones, success in maintaining biodiversity will depend significantly on the success of conservation programs in these countries and areas. Unfortunately, from an economic viewpoint, less developed countries are not well placed for nature conservation. Reasons include the following:

1. Because per capita incomes are low, economic growth is likely to be favoured even when it is at the expense of nature conservation. Individuals with low income usually regard conservation of nature and biodiversity as a luxury.
2. Even though practices exploiting or mining nature may be unsustainable, local people may fail to appreciate this (Cf. Tisdell, 1986). They may therefore favour such practices.
3. Even though local people may realise that their economic exploitation of nature is unsustainable, they may discount the future very heavily (Tisdell, 1991, sec. 4.7) or have no other viable economic alternatives to such exploitation.
4. Techniques for excluding poachers and trespassers from nature reserves may be costly and the socio-economic incentive of rangers to enforce the rules may be weak. Being themselves relatively poor, they may be tempted by bribes to be inclined to turn a blind eye. Furthermore, because government budgets in LDCs are small, few rangers may be assigned to protected areas and they may be ill-equipped.
5. In many cases, villagers are already resident in areas set aside for nature protection and depend on the use of these areas for their livelihood. To remove them forcibly from such areas is a difficult decision to take particularly if viable economic alternatives cannot be guaranteed elsewhere.
6. With economic growth and social change, traditional communal mechanisms for nature conservation are liable to be undermined (Tisdell, 1991, Ch. 4). Natural areas may, therefore, increasingly become open-access areas resulting in repeats of the tragedy of the commons or be put under the control of central authorities unable to exert much influence or only sporadic influence on local resource-use.
7. There may be a widespread perception that a country receives little or no material benefit from nature conservation. Therefore, nature conservation may be given a low priority by most politicians in LDCs.

The above are all significant constraints to conservation of biodiversity in less developed countries. For the most part, they are also problems facing biodiversity conservation in China.

## **2. Biodiversity Conservation in China**

Considerable loss of biodiversity has occurred in China and the number of endangered species has increased in recent years (Fan and Song, 1993, p. 24). Threats to biodiversity are increasing because of China's rapid rate of economic growth. Therefore, China is developing and considering plans and policies, with assistance from international organisations such as the World Bank, to improve systematically its programs for wildlife conservation. However, because China is still a low-income country, it must carefully weigh up the economic benefits and costs of its programs for conservation of biodiversity and design these to generate as much economic benefit as possible without compromising its conservation objectives. In particular, if its conservation programs are to obtain local support, they must deliver economic benefits at the local level.

The World Bank (1992) indicates that in 1990 3% of the land area of China was afforded official national nature protection. This compares with 3.8% on average for low income countries, 4.6% for middle income countries and 10.2% for high income countries. By comparison, the percentage for India is 4.3%. Thus on the basis of these figures, the proportionate area afforded nature protection in China is low by international comparisons. The reasons for this is not entirely clear because it is not solely explained by low incomes and high population densities as is clear from the comparison with India. Fan and Song (1993, pp. 24, 25) suggest that a weak economic base and backward science and technology cannot satisfy the needs of social development. As China is a developing country with a large population, it cannot put enough money into nature conservation. This problem will remain for a long time. Incidentally, they estimate a slightly higher proportion of China's territory to be in nature reserves than does the World Bank, namely 4%. This is not surprising because the World Bank statistics only refers to nationally protected areas. However, this does not change the broad picture - by international comparisons (particularly in comparison with high income countries) only a relatively small proportion of China has official nature protection. Nevertheless, the area protected has increased considerably since 1979 and at the end of 1991 was estimated to have reached 4.5% of its land area (Zhu, 1993).

The largest proportion of nature reserves and their area is under the control of the Ministry of Forestry. Their management is made difficult by several factors most of which have an economic basis. These include (see Yan Xun, 1993):

1. Shortage of funds for capital works and management within the reserves.
2. Lack of well trained personnel for nature management and for more general management tasks in reserves.
3. Use and pressure to use (exploit) nature reserves for subsistence and commercial purposes by human populations neighbouring them or resident within them. In some areas, population increases are intensifying these pressures.
4. Lack of interest of local people in some regions in nature conservation, which may sometimes arise from inadequate education about its value.
5. In some cases, also increased tourism is considered to be a threat to nature conservation (Yan Xun, 1993, sec. 3.6).
6. Absence of national scientific research which would be useful for nature management.

The management of protected areas in most countries suffers as a rule from shortages of funds. This is because protected areas normally can earn little income and so rely for their finance primarily on government handouts. However, there are exceptions - national parks for example, in South Africa are largely self-financing. In the Chinese context, particularly in the past, economic self-reliance has been stressed as desirable (even; at the local level) (Jia, 1993) but the scope for nature reserves to be self-reliant financially is 'likely to be limited particularly when conservation goals are given a high priority. Lack of economic self-reliance has weakened the ability of managers of protected areas to obtain resources.

Lack of well-trained managers and rangers for protected areas is a problem in many countries. In the case of China, many of its nature reserves occur in remote areas and it is difficult to recruit and retain suitable personnel in such areas. This also seems to be the case in Australia.

In many less developed countries, local populations threaten nature protection in reserves because the people concerned are usually poor and have few viable economic alternatives to exploiting the resources within the protected reserve. One way to meet this problem is to develop alternative economic possibilities for local people but unfortunately this is often

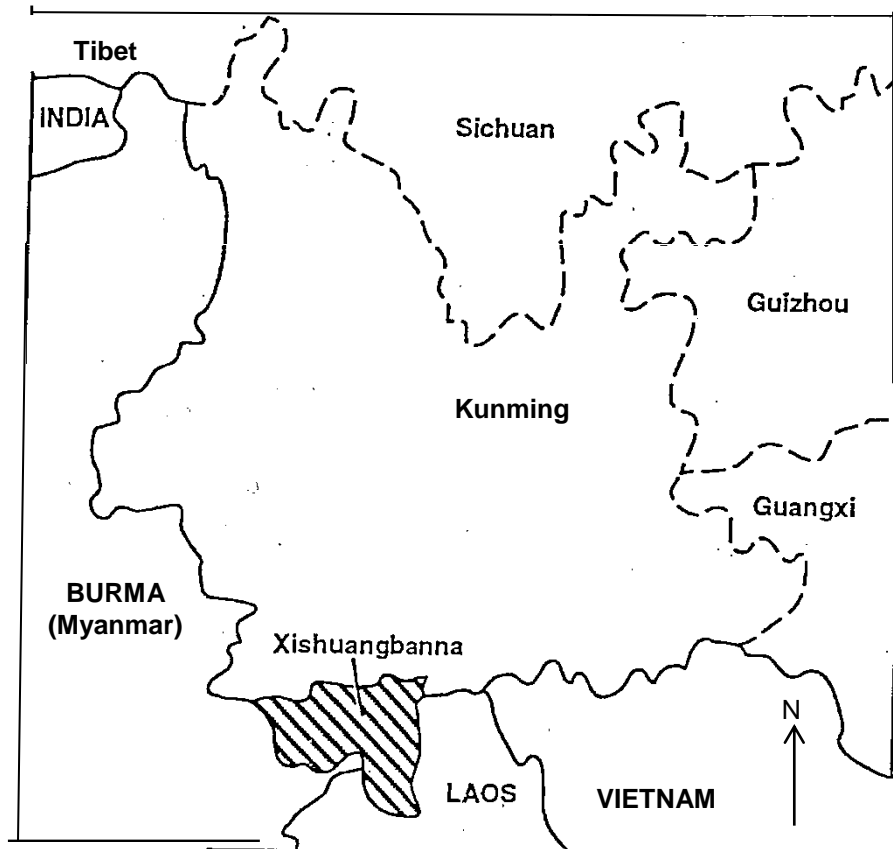


easier said than done, especially in remote regions. However, it is a strategy being explored in China. Lack of interest of local people in nature conservation, while it may sometimes arise from lack of education, may more often be traced to the possibility that nature protection can threaten their livelihood or provides them with little or no economic benefit.

Tourism, particularly ecotourism, may provide a means to give economic benefits to local people from nature protection. However, the benefits may vary considerably from case to case and often only a small share of these benefits trickle through to locals. Locals will be especially interested in whether their economic gains from this source exceed the other economic opportunities forgone by them as a result- of nature protection. Clearly the matter is complex. Some managers of nature conservation believe that tourism and nature conservation should not be mixed or that the former should be kept at arm's length from the latter (Yan Xun, 1993, see 3.6) whereas others see it as a means to improve economic self-reliance and a force which will favour nature conservation in the long term.

### **3. Xishuangbanna Nature Reserve - Its Nature Management and Economic Issues**

Xishuangbanna National Nature Reserve is located in Xishuangbanna Prefecture in the southwest of Yunnan (see Fig. 1) in the tropical zone of China and is considered internationally to be rich in biodiversity (Myers, 1988, 1990; Mittermaier and Werner, 1990). Although the whole National Nature Reserve consists of 241 800 hectares, it is divided into five sub-reserves. This fragmentation may reduce its conservation value to some extent-Its core area is 132 500 hectares.



**Figure 1: The location of Xishuangbanna Dai Autonomous Prefecture, Yunnan Province, Southwest China.**

Unlike nature reserves in Australia and the United States, a sizeable local population is resident in Xishuangbanna Nature Reserve and dependent on it for their livelihood. They engage in agriculture, forestry, animal production, fisheries, and small scale retailing and commercial activities. Approximately 15 400 persons reside in the reserve in 90 villages. About half of their gross economic production is obtained from livestock production - mainly pigs and cattle. Crops account for about 44% of the value of gross output of the population resident in the Reserve and in declining economic importance, consist of rice and vegetables, sugar cane, cinnamon, tea, fruit and rubber. A small amount of gross output is derived from forestry in the Reserve, rice-processing, brick-making and bamboo processing. Slash and burn agriculture is the norm. While hunting and other activities detrimental to conservation in the Reserve are prohibited, these laws are difficult to police in practice.

There are pressures on the Reserve from the population within it as well as from those contiguous to it. , In 1990, 354 000 people lived in the area contiguous to the Reserve which has been classified as \_a buffer zone.

It is claimed that: “Principle threats to the biodiversity riches of Xishuangbanna are continued shifting cultivation, the collection of firewood and construction timber, and hunting. All these factors are increased by the relentless build-up of human density which still increases by 3% per year. The situation is complicated as a result of the diverse ethnic make-up of the population and the different ethnic rights and traditions that depend on forest utilisation” (Ministry of Forestry, 1993, p. 44).

Dai, Hani, Bulang, Lahu, Yao, Zhuang and Jinuo minorities are resident in the Reserve. This adds sociological complications to its management and can give rise to sensitive issues.

The Ministry of Forestry is concerned that more effort must be made to protect the Reserve. It is believed that areas which remain in good condition are not so much due to good protection or stewardship but to the fact that population pressure has not yet reached them. It is, however, predicted that within the next few years, human population pressure will impinge on all areas of the Reserve.

There is also a remote threat to nature in the Reserve from “climate change due to global influences as well as local deforestation and acid rain from increasing numbers of industrial pollution sites in Yunnan”. Tourism also, if it is not well managed, can be damaging to the natural environment in the Reserve.

Each of the sub-reserves has its own management division and all except Shenyong have a management station.

A number of benefits have been identified for conservation of the Reserve but these have not been quantified or estimated in economic terms. They include:

1. Biodiversity conservation.

2. Favourable regulation of water flows throughout the year, maintenance of water quality and reduction of siltation. Some of these benefits are obtained in Cambodia and Vietnam because this area is part of the catchment area for the Mekong.
3. The forests of Xishuangbanna are believed to be important for regulating local climate. Change of climate as a result of forest loss would adversely affect tropical moist crops such as rubber and tea which are important in the region.
4. An attraction for tourists. The forests of the region are already a significant attraction and could become even more important.
5. The Reserve provides a useful resource for scientific research.
6. An educational resource for training and formal education in tropical biology, environmental management, conservation and wildlife management as well as for general education of the public.

The following economic costs have to be offset against these benefits:

1. The costs of management of the Reserve.
2. Losses in income from agriculture, forestry and so on within the Reserve due to restrictions on these activities.
3. Economic damage, e.g., to agriculture, caused by animals or other wildlife protected in the Reserve, e.g., as the result of their straying from the Reserve.

While quantification of benefits and costs for protection of the Reserve would be useful, insufficient data are available to do this accurately at present, and there will be limits (economic and otherwise) to this quantification. It may therefore be decided to adopt a standards approach in managing the Reserve and to try to adopt means to achieve "the desired standards most economically. It is also possible that multiple standards or constraints may be applied to the management of the Reserve. This means that the management goals should to be analysed in terms of decision theory for consistency and feasibility.

The Ministry of Forestry of China is proposing a project to the World Bank for funding from the Global Environmental Facility (GEF) to improve the management of conservation in Xishuangbanna. The GEF is located within the World Bank and is designed to provide financial support to less developed countries for environmental of global significance. Let us consider this project and the prospects for tourism development associated with the Reserve.

#### **4. Conservation Goals for Xishuangbanna and Tourism**

As a primary objective, the Ministry of Forestry would like to develop Xishuangbanna as a prime example of conservation in China. It would like it to act as a pilot for the integration of ethnic communities into conservation, to be a leader in the development of ecotourism and for it to develop coordinated research programs.

Specific goals mentioned in connection with the Ministry of Forestry draft request GEF funding for Xishuangbanna include:

- “strengthen the reserve management and protection to safeguard the region's unique wealth of biodiversity;
- develop ecotourism facilities so as to help pay for and justify protection of the forest area, in ways that do not threaten the biodiversity resource base;
- develop processes for assisting villages in and around the reserve to reduce their dependence on forest resources, strengthen their involvement in forest protection and protect their ethnic rights and features;
- provide a favourable environment for conducting scientific research on tropical biodiversity resources and the relationship between such resources and human utilisation; and
- forge cooperative linkages with other institutions involved in agriculture, forestry, and tourism extension and in research. (Ministry of Forestry, 1993, p. 45)

The new plan for the Reserve is expected to focus on a stronger program for the patrolling and monitoring of the Reserve, to involve a tourism development plan, a village assistance plan and a new research plan. Minority groups are expected to be more involved in the conservation program. There will be, for instance, a program of training and assistance to buffer zone villages to support conservation. This will build on the conservation of holy hills or longshans. In the past, the local Dai and other minority people have left some hills in their natural state because these have been considered to be holy. Information will be gathered about traditional knowledge in resource management and used where relevant.

Tourism is a significant factor in the conservation plan. It is planned to develop tourism (including ecotourism) further to provide an economic basis for conservation of the Reserve. It is possible that many tourists in Xishuangbanna prefecture will not make heavy use of the Reserve in the same way as many of the visitors to the Great Barrier Reef Region in Australia do not make significant use of coral reefs. There is, however, a regional 'halo-effect' from such natural attractions and secondary tourist attractions such as appropriate exhibitions and museums located in the region (but not necessarily in the primary attraction) may prosper. For example, supporting tourist attractions for the Reserve-- may be developed in Jinghong or Menglun, such as interpretative information centres about local ecology or culture.

Tourism is already a significant industry in Xishuangbanna prefecture. The prefectural capital, Jinghong, receives about 250-000 visitors a year and Menglun 100 000. Between 1986 and 1990, 23 000 international tourists visited the Prefecture.

A five year tourism development plan for the Prefecture is proposed containing the following key elements:

- "Jinghong will be developed to handle increased levels of tourists with enhanced facilities, such as new international air routes and increasing number of hotel facilities. In addition, international marketing will be improved with the opening of new offices in Bangkok and Hong Kong;
- the Mekong [Lancang Jiang] will be improved as a tourist route through the building of lodges along the river and by increasing and improving tourism boat traffic; and
- improve [access to and facilities] at 22 scenic spots within the prefecture" (Ministry of Forestry, 1993, pp. 41-42).

Many of these developments will not be in the Reserve.

In developing tourism, it will be necessary to keep an appropriate balance between the provision of private tourist facilities and supply and construction of public tourist amenities and assets. In the recent past in China, there has been a tendency to expand private tourist facilities without a concomitant increase in expenditure on public facilities such as public gardens and parks, museums, historical buildings and natural attractions, many of which cannot or do not earn revenue or sufficient funds for their upkeep (Tisdell and Wen, 1991).

Nevertheless, they can be extremely important in attracting tourists to an area and indirectly contribute to the expenditure of tourists locally on hotel accommodation, food, souvenirs and other private goods.

It is necessary to plan tourism development, including ecotourism, carefully if it is to be of greatest economic value to Xishuangbanna prefecture and to support rather than damage nature conservation in the Reserve. While the development of ecotourism is one of the interests of the Reserve Bureau (a body, located in Xishuangbanna which helps administer the Reserve), other tourism agencies may compete with it in the future. It will be necessary to exert some control over the development of tourism in the Reserve. If the Bureau has a commercial interest in a tour business, this could compromise its overall conservation management function, or it may use its power to restrict or prevent legitimate commercial competition with its tourism business. There are, therefore, some difficult to be made about the role of the Bureau in tourism development in the Prefecture.

Agroforestry has been suggested as an economic activity which could be encouraged to provide local people with an alternative to exploiting the Reserve for their livelihood. The economic prospects for this would however need to be the subject of research and analysis. One cannot prejudge the matter in advance. There is a firewood problem in this area, for example, because a considerable amount of wood is burnt in processing latex from rubber trees grown in the region (Zhu and Santiapillai, 1992). There might therefore be a market for firewood but this does not necessarily mean that will be profitable. The following has been observed:

“There is no guarantee that untested agroforestry models will meet the living requirements of local villages and no guarantee that raised living standards among the villages inside and around the reserve will in fact reduce their levels of exploitation of the forest resources. Indeed there are several reasons why such progress could increase pressure on the forest.” (Ministry of Forestry, 1993, p. 47)

The reasons for increased pressure on the Reserve are not stated in the abovementioned Forestry document but the need to improve management and protection of the Reserve is

stressed and it is recommended that any development of agroforestry be in an integrated prefectural program rather than in isolation by the Ministry.

The need to integrate the conservation of the Reserve with the harmonious development of its Prefecture is increasingly recognised by Chinese policy-makers (Cf. Zhu and Yang, 199 ). The isolated 'island' concept of conservation planning is unrealistic. integration of economic development and conservation programs is likely to for greater sustainability of both.

## **5. Concluding Comments**

China, like most developing, but less developed countries, faces serious problems in maintaining biodiversity and protecting nature because of its economic situation and its strong impulse to maintain economic growth. To these general factors are added socio-economic difficulties in protecting or managing particular nature reserves. Local people strongly desire to exploit such areas for their livelihood because of their past and continuing practice of doing so. Furthermore, rising regional populations add to pressure for increasing the exploitative use of such areas.

The problems are well illustrated by the management issues faced by Xishuangbanna Nature Reserve in Yunnan. The difficulty of conserving the rich biodiversity of the Reserve is compounded by economic pressures from villages in the buffer zone of the Reserve as well as by minorities resident in villages within the Reserve. Population levels in Xishuangbanna Prefecture are rising rapidly and economic opportunities not dependent on use of the Reserve's resources are expanding at an insufficient rate compared to the rate of population increase in the Prefecture. The prospects for conserving nature in the Reserve need to be approached in terms of the economic needs of the Prefecture and the ability of the Reserve to help satisfy these needs. Thus planning of the management of the Reserve must be done in a regional context.

There is a need to determine the costs and benefits of conserving Xishuangbanna Reserve more exactly and to consider economic mechanisms that will support nature conservation, particularly at the local level. Whether tourism will provide a valuable and useful means for such support will depend on how it is developed. Although conservation of biodiversity depends ultimately on the maintenance of appropriate ecological conditions for living things,



the likelihood of these being able to be sustained by managers of protected areas depends on socio-political support which in turn is often influenced by economic factors. Thus in pursuing the long-term goal of sustaining biodiversity consideration must be given to ecology, politics and socio-economics. This is well illustrated by the situation facing Xishuangbanna National Nature Reserve in China.

## 6. Acknowledgements

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