

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

**Working Paper No. 8**

**Conservation of Biodiversity is the Most Important  
Aspect of Ecologically Sustainable Development:  
An Economic Perspective**

by

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**April 1994**



**THE UNIVERSITY OF QUEENSLAND**

ISSN 132-6619

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<sup>1</sup> This is a slightly revised version of a contribution to a forum on 29 June, 1993 forming part of the Conference on 'Conserving Biodiversity: Threats and Solutions', held at the Sydney University. I am grateful to forum participants for their useful comments.

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WORKING PAPERS IN THE SERIES, *BIODIVERSITY CONSERVATION: STUDIES IN ECONOMICS AND MANAGEMENT, MAINLY IN YUNNAN, CHINA* are published by the Department of Economics, University of Queensland, 4072, Australia, as part of Australian Centre for International Agricultural Research Project 40 of which Professor Clem Tisdell is the Project Leader. Views expressed in these working papers are those of their authors and not necessarily of any of the organisations associated with the Project. They should not be reproduced in whole or in part without the written permission of the Project Leader. It is planned to publish contributions to this series over the next 4 years.

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

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# **Conservation of Biodiversity is the Most Important Aspect of Ecologically Sustainable Development: An Economic Perspective**

## **1. Introduction**

Several different concepts of sustainable development exist in the literature (Tisdell, 1993, Ch. 9). However, it seems that no matter which of these concepts is adopted conservation of biological diversity is necessary for its achievement, even though there is room for argument about the amount and type of biodiversity that should be preserved.

In order to decide how important biodiversity is for sustainable development, I shall consider its significance in relation to five commonly used concepts of sustainability:

1. The intergenerational equity concept – future generations as a result of economic growth or change should be left no worse off than the current generation from an economic point of view. Alternatively in a less strong and a vaguer form as expressed in the Brundtland Report (World Commission on Environment and Development, 1987) the current generation should try to ensure that the economic needs of future generations can be met with the stock of resources bequeathed to them.
2. Survival of the human species for as long as possible. This involves the avoidance of the human species being forced into premature extinction by man-induced environmental or related economic change.
3. Maintenance of the resilience (stability and robustness) of productive systems especially economic systems such as agricultural ones dependent on ecological and environmental relationships.
4. Sustainability or maintenance of community. This refers to the maintenance of satisfactory sociological interrelationships in human communities.
5. The maintenance of the 'web of life' with its variety of life forms as suggested by those favouring the 'land ethic'.

In one way or another biological diversity can be linked to all these concepts. Conservation of biological diversity may be necessary to meet the needs of future generations, to maximise the span of existence of the human species, to contribute to the stability and robustness of many economic and ecological systems. In addition, some might even argue that if individuals have more opportunities to commune with nature in varied forms that this will strengthen communal life and finally for those who subscribe to the 'land ethic', biodiversity is an integral requirement. Let us consider the relationship between the above concepts of sustainability and biodiversity in detail.

## **2. Intergenerational Equity**

Maintenance of biological diversity seems necessary for ensuring intergenerational equity from at least three points of view:

1. The maintenance of the productivity of economic activities relying primarily on living resources (such as agriculture, aquaculture and forestry) is dependent upon the preservation of adequate gene banks or reserves. Productivity based on existing genetic material which is utilized can rarely be sustained, e.g. due to the occurrence or evolution of new diseases, and much larger stock of genetic material needs to be maintained to provide flexibility.
2. Preservation of biodiversity may be necessary to keep options open for future generations, e.g. a new use may be found for an organism previously regarded as useless or a pest by mankind. Furthermore, not all organisms are yet known to mankind so maintaining biodiversity through conservation for the time being will leave open the option of discovering new organisms and learning more about their properties.
3. Individuals may obtain intangible benefits from the existence of other species via non-consumptive use e.g. curiosity value, non-destructive recreational value, existence value. Reducing biodiversity can deprive future generations of non-consumptive benefits and this may involve a considerable loss. However, the loss is hard to gauge. For example, Australians may feel deprived by the disappearance of the Tasmanian tiger but it is not apparent that they feel deprived by the disappearance

of dinosaur-like species.

Pearce *et al.* (1989) have suggested that in order to achieve sustainability in the sense of ensuring intergenerational equity, it is necessary to preserve the natural resource or environmental stock. They in fact suggest that all project appraisal should be subject to this constraint. However, Pearce *et al.* (1989) concede that in some circumstances, it may be allowable to reduce the natural resource stock for an increase in the stock of knowledge.

According to Locke's principle, each generation should leave "enough and as good for others" that follow on. Apart from the imprecision of this rule, this raises the question of whether there should be 'betterment' for future generations. If incomes are low and poor socio-economic conditions prevail, economic 'betterment' of future generations would seem appropriate. If economic growth or development did not occur in a very poor society, living in some sort of a stationary state with nature, income might be sustainable. However, the society might be vulnerable to natural disasters, to some extent at the mercy of nature and the prevailing economic conditions may be undesirable, a situation facing our ancestors in the past. What one needs to attain and sustain is a satisfactory standard of living. Once this is achieved there, is no reason why future generations should have a higher one. In order to achieve a minimum satisfactory standard of living in society, it is likely to be necessary to deplete natural resource stocks and in some cases reduce biodiversity, e.g., eliminate populations of slow growing species, in order to generate sufficient surplus income to enable additions to the stock of knowledge to be made.

However, as biodiversity declines, the marginal opportunity cost of removing more diversity is likely to increase and do so at an increasing rate. At the same time uncertainty about the impact of eliminating further species may spiral. Therefore, the importance of applying the precautionary principle and conserving biodiversity may increase because the economic value of retaining remaining options may rise. Consequently, the application of safety-oriented rules such as the safe minimum standard approach to species conservation may attain increasing support.

### **3. Survival of the Human Species for the Longest Time Possible**

Fears have been intermittently expressed that the impacts of human beings on environmental and natural resources could be such as to extinguish the human species prematurely. Pollution from economic activities and depletion of stocks of non-renewable resources have been seen as recipes for such a disaster, as for example expounded in the predictions of the Club of Rome (Meadows *et al.*, 1972). Basically this approach sees the demise of humanity as coming from depletion of non-living resources such as non-renewable energy resources. Georgescu-Roegen (1971) has provided a sophisticated exposition of this problem using the Law of Entropy. Whereas the Club of Rome predicted the possibility of a cataclysmic global collapse," Georgescu-Roegen sees a slower irreversible run-down of non-renewable resource stocks which nevertheless could result in the premature end of the human species.

His suggestion is to adjust human population levels and economic activity to levels which can be supported by reliance solely on the sustainable use of renewable resources.

One may debate whether such a restriction is really necessary to ensure the survival of the human species for as long as possible. Nevertheless, Georgescu-Roegen's theory does highlight the possible long-term significance of biodiversity for human survival and welfare. As non-renewable resources become increasingly depleted mankind is likely to become increasingly dependent on living resources as substitutes for non-renewable resources. Therefore, biodiversity becomes of increasing economic importance and essential for the long term survival of the human species.

The above theories basically see the premature end of the human species coming about as a result of non-renewable resource depletion. However, there have also been warnings that loss of living resources could result in this fate. A view has been expressed that the existence of species is interdependent. The loss, therefore, of some could lead to the loss of many more. In the extreme case, the loss of some species, especially keystone species, is believed to threaten the survival of all through a chain of extinctions. As Randall (1986) points out if one believes in the extreme version of this theory the only policy choice regarding human-induced extinctions would be about the speed with which the process to ultimate extinction of all species takes place, since some species have already been extinguished.

However, there seems to be little evidence that all species are so closely interdependent that the extinction of one (or even a sizeable set) will result in the eventual extinction of all. Nevertheless, important interdependence between sets of species often exist and it is true that the removal of one species can set in train a chain-reaction leading to the extinction of others. One of the difficulties is that the interdependencies between species are not always fully understood and keystone species are not always obvious. Therefore, the impact of extinction of a single species can be very uncertain.

According to Young (1992, p. 38), "A related proposition of interest to a significant number of ecologists is the GAIA hypothesis. The idea behind the GAIA is the proposition that -the world is one single complex living entity, arranged in a hierarchy of mutually interdependent components which, through collective interaction, maintain a stable self-organising and self-regulating system". Furthermore, it is believed that as a result of economic growth mankind is destroying components of this system including biological diversity and consequently threatening the survival of all life.

#### **4. Resilience – Ecological Sustainability and Stability**

To some extent we have already touched on the resilience of systems or lack of it, particularly their propensity for irreversible collapse. However, let us consider the matter at a more micro-level. There is a general view that ecological systems are more resilient and sustainable if they possess greater genetic diversity. In reality, however, the most sustainable ecological systems could be those which contain few species whereas the least sustainable may be those that contain many species.

In the temperate zone, there are few species but they are very adaptable to changing environmental conditions. In the tropics there are many species but they are not very adaptable or tolerant - each tends to make use of a narrow niche and each has a narrow range of tolerance to a change in environmental conditions. Under these conditions, it can be argued that greater sustainability is associated with the less diverse and specialised ecological system.

Despite the above, it is of course necessary to recognise that the loss of species from a particular ecosystem may threaten the functioning of the system as whole depending upon the



paths of interdependence between species. However, whether this loss is likely to create greater impairment to the functioning of ecosystems with less diversity rather than with more is unclear. For example, is the loss of species in a temperate zone more likely to impair the operation of an ecosystem than a similar loss in a tropical zone? Nevertheless, it is still possible that as the diversity of species in a region is decreased that the sustainability of ecosystems in the region is likely to be increasingly impaired.

## **5. Sustainability of Community**

The ideal of sustaining human community, a satisfactory set of sociological relationships, has been stressed by a number of writers even though views often differ about what is a satisfactory community. One view is that small democratic communities in which all individuals have a chance to interact in social decision-making are ideal. Such communities are considered to be cohesive and that they are likely to be fostered by appropriate technologies involving small scale operation, particularly in a rural context (Schumacher, 1973). The idea is to overcome the alienation of individuals from nature and from one another largely brought about by the advent of impersonal competitive market economies, involving extreme specialisation of labour and very often large scale economic operations. The need for mankind to preserve the natural environment and nature are stressed in a number of expositions of this approach (Schumacher, 1973). It is believed when mankind has opportunity to commune with nature and have a harmonious relationship with it that this will also lead to more harmonious and stable communal relationships. Thus followers of the concept of sustainability are often supportive of the preservation of biodiversity.

There is also another sense in which sustainability of community and biodiversity can be interrelated. Norgaard (1992) and others believe that human societies and their technologies and cultures evolve along with nature. There is co-evolution. Significant disruption to the natural world which has evolved can threaten the societies that have evolved in parallel with them. These societies could be rendered unsustainable by a rapid loss of species.

## **6. Maintenance of the 'Web of Life' – The Land Ethic**

Aldo Leopold (1966) in particular has stressed non-anthropocentric reasons for conserving species. His view is that mankind has a moral obligation not to destroy the web of life; life in all of its diversity involving myriad interconnections should be preserved. Thus this is a moral imperative for conserving biodiversity which contrasts with those arguments in favour of biodiversity which mainly stress human benefits as the rationale. Leopold's emphasis is on the desirability of conserving the whole system, including species considered by many to be pests to man as well as those that are not.

## **7. Concluding Comments**

If one believes in the 'land ethic' then conservation of biodiversity is the most important aspect of ecologically sustainable development. The land ethic requires that economic development be consistent with preserving the diversity and integrity of nature. Given the land ethic, ecological values constrain man-centred ones. Furthermore, it seems that if one believes in maximising the possible span of human existence, maintenance of biodiversity is one of the most important requirements. If economic development is to be consistent with intergenerational equity, in the senses previously defined, conservation of biodiversity is an important prerequisite. Furthermore, conservation of biodiversity is important to maintain the resilience of particular ecosystems. Without such resilience they may, for example, fail to perform economic functions adequately. Even in relation to the maintenance of human community (closely knit harmonious communities) conservation of nature can play an important role.

The bottom line as far as sustainability is concerned is that *homo sapiens* is a higher order animal - the survival of the human species depends upon other species and ultimately on the conservation of ecological systems of value to mankind (Tisdell, 1991, Ch. 1). To the extent that loss of biodiversity threatens the continued existence of such systems or their productivity, it must remain an important social concern in relation to sustainable development. It seems at this stage of economic development that it is appropriate to regard conservation of biodiversity as the most important aspect of sustainable development.

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