

# **Sustainable Livelihoods and Biodiversity in the Uplands of Southeast Asia: a multi- cultural assessment of resilience, risks and opportunities**

## **APN 2002-18 Final Activity Report**



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Front Figure: A Karen man in Om Koi District, Thailand, filtering resin collected from a forest tree that will be used as adhesive and sealant, for example, to repair the roof (Based on Photo: L. Lebel).

# Main Report

## ABSTRACT

The mountain areas of South and Southeast Asia are very important for conservation of biodiversity as they are often the only places with significant areas of remaining forest vegetation. At the same time these upland areas are typically home diverse, poor, and politically marginalized communities. They are potentially among the most vulnerable to changes in biodiversity, ecosystem functions, and climate.

Through a set of case studies supported by APN in Thailand, Philippines, India, China, Vietnam, and two later additional cases from Lao PDR and Indonesia, we examined the causes and consequences of changing linkages between biodiversity and livelihoods. We draw two initial conclusions.

Firstly, the consequences of degradation in, or new restrictions in access to, biodiversity for sustainable livelihoods, can be serious for those household unable to take advantage of the often simultaneous opportunities created by market access. The replacement of local resources by more distant ones, however, may in the long term reduce incentives for local management and stewardship, which if not replaced by an effective external agent, or some other mechanism, lead to further degradation and conversion to other uses.

Secondly, uniform national policies on the conservation of biodiversity, many which have adopted a strict no-use no-people attitude to protected areas are clearly infeasible and likely to counter-productive in many locations. Allowing flexible institutional arrangements at the local level which are nevertheless accountable to a wide group of users of ecosystem goods and services seems to be the key.

## PROJECT INFORMATION

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### APN Funding

US\$ 59,000

### Duration

One Year (June 2002 – February 2003)

### Participating countries

Indonesia, Thailand, Vietnam, Philippines, India, China and Lao PDR.

Participants from the following countries were directly funded to prepare the case studies for the synthesis workshop and book: Indonesia<sup>1</sup>, Thailand, Vietnam, Philippines, India and China (Yunnan). The additional grant for the North Indian case study was made possible the agreement of Chiang Mai University to forego the administration fee. The overall scope of the project has thus become South and Southeast Asia. Apart from these country teams other participants from Lao PDR and Indonesia attended the synthesis workshop.

## INTRODUCTION

The purpose of this report is to document the research findings and main activities of the one year collaborative project “*Sustainable Livelihoods and Biodiversity in the Uplands of Southeast Asia: a multi-cultural assessment of resilience, risks and opportunities*” funded by the Asia Pacific Network for Global Change Research in 2002. The project is a contribution to the IHDP research programmes on Global Environmental Change and Human Security (GECHS) and the Institutional Dimensions of Global Environmental Change (IDGEC), and START activities in Asia.

The first part of the report explains the rationale, objectives and design of the project. This is followed by a concise overview of the key activities completed during the project. The main body of the report is a summary of the main research findings with selected highlights from each chapter of the edited book being prepared from the results of this project. The report ends with a critical reflection on the projects achievements and limitations, drawing conclusions that suggest opportunities for future APN and START activities.

### ***Background and rationale***

The mountain areas of South and Southeast Asia are very important for conservation of biodiversity as they are often the only places with significant areas of forest remnants, as most lowland plains and larger inter-montane valleys have been completely cleared of native vegetation for agriculture and cities. Expansion of lowland commercial agriculture, plantations, logging activities and immigration into forest margin areas, remains a threat to the remaining forest in the uplands. Public concern over forest loss and its potential consequences for watersheds, however, has resulted in increased political pressures to maintain high forest cover in upland areas, often with a very restricted view on how this should be achieved.

The people living in the uplands are culturally diverse and often from different ethnic groups than those that dominate the rural lowland landscapes and political structures in the cities. By conventional indicators many groups rank among the poorest in each country.<sup>2</sup> For most of the past century the indigenous and ethnic minorities have been outside the mainstream development concerns of government, but have nevertheless shown a remarkable capacity to adapt their land-use systems and culture to a wide variety of challenges and opportunities.<sup>3,4,5</sup> Wars, harassment, population growth and the promise of more secure livelihoods elsewhere, also led to significant movement and resettlement of villages.

As a consequence of the growing interest in conservation and control of forest lands the activities of upland people have come under much closer scrutiny. The critical policy dilemma can be stated as: how best to combine conservation and development or production goals in upland landscapes? The initial reaction from most governments has been to consider ways of limiting access to land, timber, and other forest products. What impact does this have on livelihoods?

### **Sustainable Livelihoods Framework**

A conceptual framework based on sustainable livelihoods appeared particularly appropriate for addressing these issues in the uplands, because it starts with assets and strategies of the poor, looks at ways of supporting their knowledge, skills and expertise, and acknowledge that vulnerability to disturbances are caused by various social structures and processes.<sup>6,7</sup> A livelihood can be defined as the capabilities, assets or resources, entitlements and activities required for living. A livelihood is sustainable when it can cope with and recover from stresses and shocks (i.e. is resilient)<sup>8,9</sup>, maintain or enhance its capabilities, assets and entitlements, while not undermining the natural resource base.<sup>10,11</sup>

Among the various adaptation strategies of upland people and communities, forest resources often have an important role. Access is often crucial to securing livelihoods. Apart from direct harvesting of timber for construction materials and cash, non-timber products are often very important components sources of cash or exchange income for upland societies.<sup>12</sup>

A significant part of forest products are used within households and thus are easily underestimated by market-related surveys.<sup>13</sup> Finally, not only goods, but services, such as the watershed forests of the Karen, may be actively managed by villagers.<sup>14</sup>

A few studies suggest that forests and biodiversity promote resilience of livelihoods, but one that is changing with globalization and land-use practices.<sup>13</sup> For example, Sunderlin *et al* study of smallholders in forest villages in outer island provinces in Indonesia found that dependence on forest resources increased during the 1997-99 economic-political crisis.<sup>15</sup> In addition, they observed increases in clearing of forest land for both sedentary and swidden land-use systems, with the largest increases being for expansion of rubber tree crops in West Kalimantan and Jambi-Riau provinces. On the other hand, access, use and dependence on forest products and services is often changing rapidly with market integration, off-farm employment opportunities, new land-use practices and watershed and forest policies that restrict access.

Biodiversity within other land-use systems is also significant and in any case distinguishing “forest” from “non-forest” in many of these settings is problematic. Various multiple-cropping systems including trees, or planting of shrubs within naturally regenerating forests is common. A large diversity of aquatic plants and animals are also found in aquatic systems, including rice paddies, and stream margins.

### Hypothesis

This study proposed to make a systematic investigation and synthesis of the role of biodiversity in sustaining the livelihoods of upland people. The main working hypothesis for this study is:

*Biodiversity (in surrounding managed forests and within more intensively cultivated aquaculture, agricultural and agro-forestry land-use systems) increases resilience of livelihoods, for two main reasons: (1) because it provides alternative sources of food and other products which help people cope with and recover from biophysical disturbances (like droughts and floods) and social disturbances (like commodity price drops, over-harvesting or political interference) and (2) high levels of biodiversity imply functional redundancy which increases the capacity of ecosystem to continue to yield key goods and services even when specific components (species, size-classes) of the community are lost or greatly reduced in abundance.*

We recognize, however, that the impacts of changes in biodiversity will interact with other key economic and socio-political transformations to affect the resilience of livelihoods<sup>16</sup>. Globalization processes, for example, could provide access to new markets for non-timber products that would enhance incentives for sustainable local management. On the other hand, by providing diverse opportunities for off-farm activities it could also result in a lower dependence on biodiversity during times of crisis, and over time, an erosion of knowledge about uses of biodiversity. Decentralization, that facilitated greater involvement of local communities in decision-making about natural resources, and provided security of tenure and access to forest and land resources, could also lead to processes of enhancement of biodiversity.

### Origins

The origins of the project lay in a previous APN project in which some of the collaborators had been involved on institutional interplay<sup>17</sup>, but this time focussing just on the upland sites and in the end adding new case studies from China and India. One of our key findings was that level and nature of dependency of communities on local resources from forests, and their ability to control and access those resources, was one of the key influences on whether interactions with rules from higher levels would be effective or not. As Geist & Lambin<sup>18</sup> have documented in their analysis of studies of land-use and –cover change in the tropics, many of the assumed simplistic relations with deforestation, for example poverty, population growth, and so on, are not well supported by the evidence, but have more the status of myths. Deliberate policy changes and market factors often direct with other institutional and ecological conditions to produce observed patterns of change.

In our analyses we also recognized the large importance of market access for people’s livelihoods and institutional arrangements at the local level. At the same time we observed examples of where forest management was appearing to be reasonably successful and other situations where it was failing, and that this conditions were not necessarily associated with improvements (or

deterioration) in local livelihoods. As many of the people living in upland areas remain among the poorest and most marginalized politically we also recognized their potential vulnerability to regional and global environmental changes.

These experience suggested the need for a project addressing the issue of how livelihoods and biodiversity were related, and that such an effort could lead to improved conceptualization of issues like vulnerability, security, resilience and adaptation.<sup>19</sup> For that reason we engaged closely with IHDP project on Global Environmental Change and Human Security (GECHS)<sup>20</sup> during its early stages. At the same time we were convinced of policy relevance of such research within our case study countries and the potential value of a more neutral regional platform from which to draw lessons and take back to decision-makers at various scales.

### ***Research Objectives***

The primary research objectives were:

- To assess the consequences of changes in biodiversity for sustainable livelihoods, with emphasis on coping with and recovering from biophysical disturbances and socio-economic crises.
- To assess how changes in biodiversity may interact with economic globalization, especially integration into agricultural markets and changed opportunities for off-farm incomes.
- To improve understanding of how local capacities to adapt to disturbances can be enhanced and eroded by national and regional development policies on biodiversity.

### ***Study Design***

The research objectives were addressed through a comparative analysis of a series of local upland case studies (Figure 1) which the research teams already had some experience in gathering ecological, ethno-botanical data, or were involved in development oriented work. This made it feasible to pursue a rich research agenda with very modest funding.

In addition to the case studies, we reviewed recent research on biodiversity and ecosystem functions in upland land-use systems, and the mechanisms for how biodiversity contributes to resilience of livelihoods in the region. For the purposes of this analysis part of North and Northeast India, and Southwest China were considered culturally and ecologically similar enough to be considered parts of “southeast Asia”.

**Figure 1.** A map of South and Southeast Asia showing the sub-national regions in which the case studies analyses were carried out.



Although when we initially wrote the proposal we had envisaged a very tight design with each case following a strict protocol in the end we had to abandon this approach for two reasons. Firstly the funds were inadequate. All projects had to depend on other work already underway or completed as a basis and this differed substantially among cases. Second, there appeared to be enough differences in the crucial intervening variables (or social and ecological contexts) among sites that over-standardization would lead us to erroneous or irrelevant conclusions. In the end we were able to compromise by agreeing to share a common set of guiding questions, observation checklists and so on, but that other details had to be left flexible.

The questionnaires and observations collected data to : (1) describe current and recent changes in livelihoods including assets, capabilities, entitlements, and major activities, with special emphasis on natural products from forests, fields and ponds; (2) probe in more detail adaptive strategies used to cope and recover from past major climatic and socio-political disturbances and events, what role biodiversity has had in this, and the characteristics of the disturbance of itself; (3) preliminary assessment of impacts of livelihood activities on local (and external) natural resources.

Some research teams concentrated on a small region or village whereas others took a comparative approach within the country, collecting more generic data, but from multiple sites (see Outcomes section for details).

### ACTIVITIES CONDUCTED

The main activity carried out under this project was a set of case studies conducted by teams of researchers in each of the contributing countries (Table 2). At the start of the project the team leaders from each of the groups met in Chiang Mai (Appendix 1) to agree on a research protocol producing a “Case Study Guide”, summarized in the form of a working paper (Appendix 2). This formed the basis of the individual work between June 2002 and January 2003.

In February 2003, the teams and a few invited external reviewers and other research groups, met again in Chiang Mai (Appendix 3) to critically review and synthesise the findings of the case studies.

**Table 2.** Summary of the main activities completed under the APN grant. A few more details about participants, agendas and outcomes for each of the meetings are given in the appendices.

<b>Activity</b>	<b>Venue, Dates, Participants</b>	<b>Inputs</b>	<b>Objectives Achieved - Main Outcomes</b>
Initial Planning Meeting	14-15 June 2002, Chiang Mai <i>All team leaders</i>	Case Study proposals and draft comparative framework	Agreement on case study framework and process of collaboration, including timetables, budgets and rough chapter outlines.
Work on Individual Case Studies	Various locations in case study countries <i>July 2002 – January 2003</i>	Various combinations of primary field work, expert meetings, and small groups writing and synthesis tasks.	Draft papers for presentation and distribution at synthesis meeting
Synthesis Meeting	11-15 February 2003, Chiang Mai <i>All team leaders + invited experts and researchers</i>	Draft Chapters and initial synthesis presentation Presentations by other groups working on related research projects in Southeast Asia	Recommendations for revision and completion of chapters Ideas for synthesis and conceptual papers Agreement to continue regional international collaboration through network-based projects

## OUTCOMES AND PRODUCTS

### *Summary of Findings*

A full synthesis of the findings from the set of case studies has begun but is not yet complete. The efforts by the 8 working group sessions at final synthesis workshop in mid-February, however provided a number of pointers to guide the final steps of analysis.

1. Changes in access to markets is clearly one of the most critical force affecting the linkage between livelihoods and local biodiversity. Dependencies for the most part are falling but remain important at critical times or for some parts of each community. The historical and future outcomes for conservation and sustainable use vary widely depending on things like, the relationship between local communities and protected area staff, the strength of community-level institutions for cooperation and conflict resolution, whether the legal framework allows commercialization of non-timber-forest products, and ecological conditions.
2. Changes in access to the political system is also hugely important, and again varied greatly among cases, and sometimes within cases. The way decentralization unfolds in practice as opposed to on paper or in state rhetoric is key. Thus, there is no guarantee, given other forces at play, that local control of biodiversity, will lead to better conservation or more secure livelihoods for all, but the potential is huge for greater participation in decision-making to improve the effectiveness and relevance of development interventions in the uplands.
3. Upland livelihoods today are often very different from what they were just a decade ago. Contrary to popular images of ethnic minorities as lost in a time warp, or policies trying to maintain such myths, we found major changes in livelihood strategies even in fairly remote villages, as well as the desire for further changes. Upland livelihoods and the landscapes in which they are situated are undergoing rapid transitions. In this context maintaining sources of innovation (e.g. genetic resources) and adaptive capacity (knowledge of traditional uses) could easily be lost, to the detriment of future sustainability of these livelihoods. At the same time it is clear that a narrow-minded adherence to past forms of technological and institutional solutions will probably not be able to cope with new combinations of environmental and social challenges. Managing risk isn't what it used to be.

Thus one of the outcomes of our work is the revision and elaboration of the initial conceptual framework (Appendix 2) into a more comprehensive understanding of how assets, entitlements and strategies interact with biodiversity in changing way (Figure 2).

Thus, when we return to the three initial goals of the project we can now tentatively conclude that:

1. The consequences of degradation in, or new restrictions in access to, biodiversity for sustainable livelihoods, can be serious for those household unable to take advantage of the often simultaneous opportunities created by market access. The replacement of local resources by more distant ones, however, may in the long term reduce incentives for local management and stewardship, which if not replaced by an effective external agent, or some other mechanism, lead to further degradation and conversion to other uses. Biodiversity remains important for some households in coping with disturbances and socio-economic crises, that is, has a safety-net effect, but where wage-labour is now available this often has become the dominant solution to immediate crises.
2. Thus, increased opportunities for off-farm incomes, have, overall, reduced dependence on biodiversity for both daily subsistence needs as well as in times of crises. Against this average picture, however, it should be noted that for some households, especially in the remoter villages, access remains critical to survival and livelihood security. This is especially true where agricultural yields are declining as a result of shortening of swidden cycles and the inability to purchase input or knowledge of other practices that could help maintain fertility. Changing level and patterns of access to markets, as noted above, has



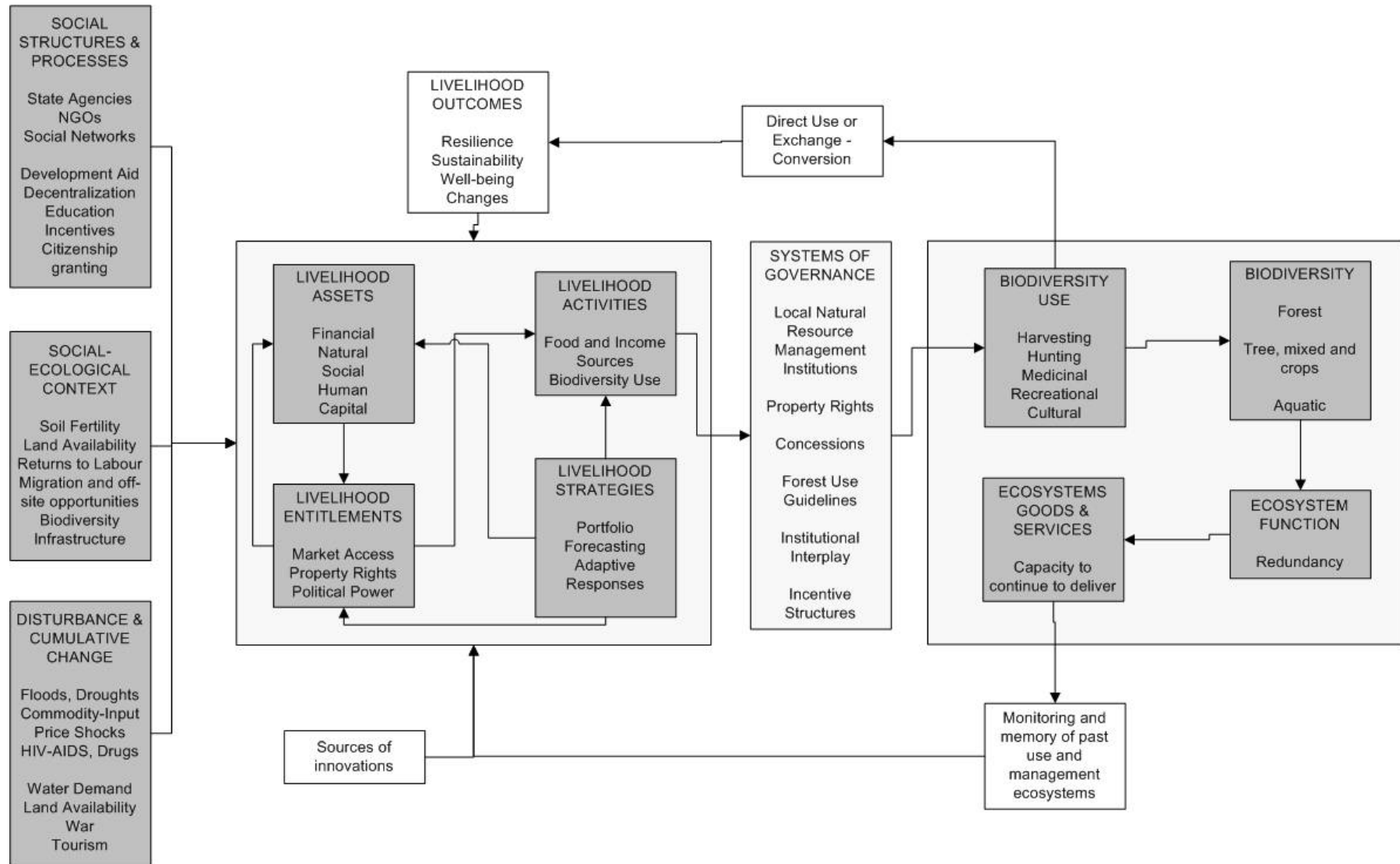
had a tremendous impact on the land-use systems and livelihood strategies of upland farmers.

3. Uniform national policies on the conservation of biodiversity, many which have adopted a strict no-use no-people attitude to protected areas are clearly infeasible and likely to counter-productive in many locations. The fact that these rules on paper in places like Thailand are not always enforced to the letter, has been important as it has allowed local agencies and communities to come to their own, one might argue, “ more sensible “ institutional arrangements. Indeed if one conclusion about institutional arrangements stands out above all others from this work it is the need to facilitate flexible arrangements at the local level. Blanket legislation in the context of the uplands hasn't and won't work to conserve biodiversity or sustain livelihoods. At the same time flexible arrangements, and project interventions, need to be closely monitored and evaluated.

Although these conclusions are still very preliminary they do point out the importance of considering global environmental change in local places.<sup>21</sup> The policy landscape is littered with myths about the “causes” and consequences of land-use and –cover changes which have little basis in systematic evidence.<sup>22</sup> They also argue for the critical importance of more research on biodiversity and ecosystem functions, as well as the social and political incentives for conservation in what must be productive landscapes. An obvious starting point for these researchers is the livelihood activities of local resource users and their traditional ecological knowledge.

The comparative case study design in this project has allowed us to explore the importance of differences in context, and where multiple sites within a country were investigated, even finer scale differences that exist within nations. These show again and again the importance of social and political factors for vulnerability. Livelihood insecurity is not just a product of crop failures caused by climate variability, or ecological mismanagement of forest lands, or lack of modern agricultural technologies, or the failure to use science. As often as not it is a result of inequitable distribution of rights which prevent even the possibility of scaling the asset ladder. Many of the households in the communities we studied were near the bottom tier in the nation when it comes to their levels of “consumption” and income. If they also had few and were losing more rights their situation could become desperate. On the other hand, with a few critical entitlements, especially tenure security, political representation in local government, and improving access to markets, the outlook for many is upwards and outwards. And biodiversity could be conserved and protected along the way.

Figure 2. A revised conceptual framework for how sustainable livelihoods and biodiversity are linked placing emphasis on institutions, exchange values and learning or sources of innovations.



### ***Livelihoods and Biodiversity Book***

One of the main products from this project will be a book (Table 3). As of the end of the synthesis meeting we have full drafts of all the main chapters. The introduction and synthesis are still only in outline form. In addition to the initial set of case studies funded by APN we intend to include chapters by two of the invite speakers (Lao PDR, Indonesia) in the final publication as their results are complimentary to the overall aims of the project. The final meeting provided useful material for a synthesis chapter, but this still needs to be written. After additional reviewing and editing and electronic exchanges to finish the final chapter we expect the book to be ready to go to publishers in second half of 2003.

**Table 3.** Planned Organization of the Final Publication

<b>Likely Chapter Titles</b>	<b>Authors</b>
Introduction – Biodiversity and Sustainable Livelihoods	Louis Lebel, Carol Stock, Po Garden, Supaporn Khрутmuang
Biodiversity and livelihood uncertainty in swidden agroecosystems: a case study of the Mengsong Hani community, Southwest China	Xu Jianchu, Zeng Yiqun, Lu Bin
Biodiversity and sustainable livelihoods in the uplands of Northern Thailand: consequences of changing access and dependencies on local natural resources	Louis Lebel, Po Garden, Supaporn Khрутmuang, Carol Stock
Biodiversity and Sustainable Livelihoods in the Uplands of Vietnam : Tat Hamlet Case Study	Le Trong Cuc, Tran Chi Trung, Le Trong Hai
Sustainable Livelihoods and Biodiversity in Selected Upland Communities in Luzon, the Philippines	Antonio P. Contreras and Ma. Larissa Lelu P. Gata
Biodiversity and sustainable development in the Central Himalaya, India	Maikhuri RK, Rao KS, Saxena KKG, Ramakrishnan PS
Local natural environment, livelihoods and rural development projects in Namon Neua, Lao PDR	Lilao Bouapao
Biodiversity conservation as an entry point to achieve sustainable livelihood of the Dayak peoples in West Kalimantan: an integrative approach	John Bamba
Synthesis – Reducing risks, building livelihood resilience and making the most of opportunities	Louis Lebel, Antonio Contreras, Xu Jianchu, PS Ramakrishnan, Le Truong Cuc

Apart from the book a modest web-site with private (ie. For project members only) and public areas was developed (see [www.sea-user.org](http://www.sea-user.org)). The private area although not used early in the project will become more important in the follow-up for the exchange of draft text and completion of the book.

In the following sections of the report we provide a selection of highlights from each of the individual case studies. This is necessarily very sporadic treatment of the work, but should give some idea of the scope of the overall book. Please also note the some of the text in the summaries has been extracted verbatim from the original text of the authors (see Table 3) but other parts have been edited for language, flow and to make more concise.

### ***Sustainable Livelihoods and Biodiversity in Selected Upland Communities in Luzon, the Philippines***

This case study focused on five sites in the main island the Luzon, the Philippines (Table 4) . Two sites were classified as having sustainable livelihoods (Mt. Makiling, Imugan) and three sites were classified as having relatively marginal or vulnerable livelihoods (Pagkalinawan, Sta. Catalina, Bicol National Park). The study relied upon secondary sources, key informant interviews, group interviews, and field observations.

When analyzing the data in conjunction with the hypotheses set forth in the original proposal, we must make the distinction between natural biodiversity residing in forest ecosystems and biodiversity in cultivated lands. Natural biodiversity in the forests are strictly controlled by government policies and are for the most part inaccessible to the villagers. Only the indigenous community of Imugan was given limited harvesting rights by the States. The other four communities have very restricted access to the forests. Therefore, the natural biodiversity in the forest has little impact on their livelihoods.

For the two sites that we classified as having sustainable livelihoods, these sites also have relatively high levels of biodiversity. However, the livelihood systems are not solely dependent on the natural biodiversity of the forest, but instead rest on agricultural systems that mimic the natural diversity of their surrounding forest ecosystems.

It is interesting that the three sites with relatively marginal livelihoods also have a higher prevalence of off-farm employment, with two of the sites located along major highways. These three sites demonstrate a situation wherein biodiversity and resource quality are evidently declining, even as forest dependence has fallen and livelihood options have switched to a mixed system of agriculture, off-farm, and off-site income sources. The decline in forest dependence was not brought about by the communities themselves but by state policies forced upon them.

The community of Pagkalinawan has given up some of its land to outside forces (limestone mining) due to the declining resource base of the land. This possibility was put forth in hypothesis #2, where as dependence on forests falls, resources will easily be given up to external forces.

The communities of Sta. Catalina and Bicol National Park (relatively marginal livelihoods) do have community-based forest management, but these organizations were formed as a matter of state policy, not because of movement from within the communities. In fact, at Bicol National Park, despite the fact that there are many people's organizations, it is still doubtful whether the community, without external support, could manage their forest resources.

What distinguish the Makiling and Imugan sites from the three sites with marginal livelihoods are social capital, market access and wealth. Market access was important, but above and beyond this was the capacity to control the price, the ability to rely on market institutions, and the ability to take advantage of market information to gain some leverage in the selling of products.

**Table 4.** Examples of a selection of livelihood and biodiversity variables assessed at the 5 sites comprising the Philippines case studies. These are for illustration only as full table is 9 pages.

SITE CHARACTERISTICS	WITH RELATIVELY SUSTAINABLE LIVELIHOODS		WITH RELATIVELY MARGINAL OR VULNERABLE LIVELIHOODS		
	MT. MAKILING	IMUGAN	PAGKALINAWAN	STA. CATALINA	BICOL NATIONAL PARK
General Site Features	Migrant community within a forest reserve under the jurisdiction of the University of the Philippines; problematic tenurial rights	Indigenous cultural community with self-organized livelihood activities; marginal to degraded forest lands; ancestral rights recognized	Pilot area for Social Forestry; strong presence of urbanization and globalization forces; marginal to degraded lands; with tenurial rights	Community-based forest management site, Model site by DENR; with tenurial rights	Community living in the buffer zones of a protected area
Market Access	Distance to market is about 2 kilometers; market days average from 2-3 days a week; High bargaining power; they can dictate the price and bargain their products especially in cases of direct selling; No contract growing present, only contract buying.	Raw farm products are processed and sold through a middleperson, although the community established their own local store to serve as outlet for their products; A separate foundation was established to facilitate the marketing of their products in Metro-Manila	Access to markets is mainly through individual selling, as there is no mechanism by which products are pooled	Distance to markets is about 12 kilometers; Farmers could not dictate the price of their produce, as their products are highly perishable	Direct selling of farm products in markets that are accessible but whose prices they could not control
Forest Access	No legal rights over land-holdings; they have secured rights over the products of their farms; The nature of the land as a forest reserve bring land insecurity	Rights legally recognized by the State; including harvesting rights	The 25-year lease over their forest farms are set to expire by 2005-2009; and there are doubts if they will be renewed	Through both individual usufruct rights (CSC) and through community-based forest management agreements (CBFMA)	The Park is declared as a protected area; Under the NIPAS law, it is currently governed by a Protected Area Management Board (PAMB), of which one seat is reserved for the President of the Federation of all POs operating within the Park; community live in buffer zones; they do not have harvesting rights
Sustainability of stocks and flows	Environment has improved; more productivity	The forest cover is vast; no significant soil erosion can be seen; farming methods are compatible with the bio-physical characteristics; “outside” cultural influences are being screened	Degrading due to land conversion; their agroforestry farms have been abandoned and the mountains are being mined for limestone	Resource is relatively more degraded now compared with before, as evidenced by fewer trees and declining farm productivity	No more wildlife seen in the area; large patches of open degraded lands; signs of soil erosion; however reports of some animals returning to the area are made as outcome of protection and reforestation activities

## ***Biodiversity and Sustainable Livelihoods in the Uplands of Vietnam : Tat Hamlet Case Study***

This case study focused on a single Tay ethnic minority community in the northern mountain region of Vietnam that now practice a composite swidden farming system. Tat hamlet, a part of Tan Minh village in Da Bac District of Hoa Binh Province, had been the focus of a series of studies over the past decade documenting land-use management practices and household economic that has given a detailed understanding of livelihoods. The current project supplemented the past work with detailed biodiversity surveys and then synthesized these findings with previous work on livelihoods.

### Village population and market access

The population of 480 persons of 110 households is from the last survey in 2001 by CRES. The Tay ethnic minority is dominants of Ban Tat with a few number of Kinh (lowland Vietnamese) who are temporary principally school teachers. People in Ban Tat have unusually good access to public services and there are numerous government's People's Committee offices situated in the area which are tax office, health station, family planning clinic and retail store including pharmacy, post office and primary school.

There is no market in Ban Tat or in Tan Minh Village. The nearest market is at Cao Son, 12 kms distance of good asphalt road. The closest daily market is in the district capital at Tu Ly. Some products as bamboo shoots and other forest products are collected by shopkeepers and transported to market on buses or logging trucks. Traders from China occasionally came to buy a variety of wild medicinal plants. Maize, cassava roots and canna are sole in bulk to local middlemen or outside village middleman. Cattle and buffalo are sold to Kinh traders to use in delta areas. Modes of production are almost entirely organized on a household basis. Although most household production is for subsistence purposes, the trade in commodities very limited. Farmers report a pressing need to obtain cash, particularly in recent years since the local government began to collect taxes in cash rather than paddy. Informants readily cite prices for different locally produced commodities including livestock, paddy, and fruit. It is lack of physical access to markets, and the scarcity of marketable commodities.

### Land-use practices and landscape changes

The covering with the primary forest territory of Ban Tat has changed to the swidden or fallow plots since 1960s, only tiny remnant patches survive on extremely steep and inaccessible peaks (Table 5). Wild animal has decreased in numbers because of extravagant hunting and habitat loss that influence of the loss of the forest cover areas. It was reported that last few years wild mammals were quite abundant in the forest; wild pig, several species of deer, pig, tusks and night flying bat were hunted and hung from the house posts.

A subsistence-oriented livelihoods activity is based upon the composite swiddening agroecosystem which is a simultaneously management system of both permanent wet rice fields in the valley bottoms, shifting swidden fields on the hillslopes, and exploit wild resources of the forest. The similar composite systems are found among the Muong of northern Vietnam, the Shan of Myanmar and Northern Thailand, the Hani of Xishuangbanna Prefecture in Southwestern china, and the Ifugao of the Cordiller in the Philippines.<sup>23</sup>

However, the fallow period has been declining rapidly in recent years, reflecting the scarcity of land available for swiddening caused by increased population density and by government intervention to protect the forests<sup>24</sup> besides facing a strong impact of the allocation of hill lands nad prohibition of logging.<sup>25</sup> The key subsystems include wet rice fields, home garden, fish pond, livestock, tree gardens, rice swiddens, and cassava, corn, and canna swiddens. Fallow swiddens and secondary forest are exploited to a limited extent. Land ownership is no long-term or use rights over that field and after one cycle of cultivation it is not necessary to return to the same field. At the clearing time everyone in the hamlet travels together to the designated forests to mark their fields under the observation of the village people 's committee staff.<sup>26</sup>

The Tat community has a strong ethos of sharing. For example, the hunted wild animals will be shared to neighbors, young farmers who have hot sufficient capital to purchase their own buffalo are able to borrow animals from relatives or neighbors, farmers who do not have sufficient swidden

land are able to use some of the larger plots of its owner. Much of work in the village including in the paddy field is done with exchange labor such as plowing and transplanting even installing a house's new roof. Regarding to the gender relation, it found that women are in a subordinate position to males but carry on greater responsibility for both in the fields and nurturing their families.<sup>27</sup>

**Table 5.** Land cover and fragmentation in Ban Tat in 1952 and 1995. <sup>28</sup>

Land Cover	Total Area				Fragmentation			
	1952		1995		1952		1995	
	Ha	%	Ha	%	Number of fragments	Mean size (ha)	Number of fragments	Mean size (ha)
Secondary regeneration	681	92	616	84	18	37	292	2
Close canopy	81	11	19	3	4	20	19	1
Open canopy	400	54	110	15	5	78	40	3
Grass, bamboo, scrub	200	27	487	66	9	22	233	2
Swidden	52	7	73	10	35	1	75	1
Paddy	7	1	43	6	1	8	45	1
<b>Total</b>	<b>740</b>	<b>100</b>	<b>732</b>	<b>100</b>	<b>54</b>	<b>13</b>	<b>412</b>	<b>2</b>

The results of the land-cover field surveys, interviews with local informants, and the creation of the land-cover map suggest three important things about the landscape in Tat Hamlet. First, the local population actively manages the landscape, and they make use of and take advantage of the different land-cover types in their composite swidden system. Second the land-cover in Tat Hamlet is fragmented and reflects the influence of the human population. Third, the largest areas of the healthiest forest type (secondary evergreen broadleaf forest) are found in the hamlet where farmers have most recently immigrated to, and also in areas that are dominated by steeply sloped limestone karst mountains and unsuitable for swidden. These three findings will need to be taken into account when a monitoring system for the impacts of development projects on land-cover is considered.

This indicator also shows at least two things. First, it can indicate how intensively land is used within the commune. Second, the patch size of different types of vegetation can also indicate the relative length of time that people have been using the land in an area.

#### Use of biodiversity

The livelihood of Tat Hamlet is primarily based on using biodiversity of farming, animal husbandry and collection of forest products for the subsistence basis. Some households supplement income from these primary sources by working as government cadre, occasional employment as wage laborers, shopkeeping and production of handicrafts (Table 6). Households are largely self-sufficient although in recent years have become increasingly dependent on the market for the supply of many material needs, including even rice.

**Table 6.** Source of income in Tat hamlet

Sources	Total cash income for 42 household (VND '000)	Percentage of total income	Average income per household (VND '000)
- Agriculture crops	31,000	22.1	738
- Livestock	29,000	20.7	690
- Timber from tree garden	1,600	1.1	38
- Timber from forest	5,600	4.0	133
- Non timber forest products			
	33,000	23.6	786
<b>Sub-total</b>	<b>102,200</b>	<b>71.5</b>	<b>2,385</b>
- Wage labor	2,360	1.7	56
- Handicraft	1,330	0.1	32
- Shop and service	13,000	9.3	310
- Government salary	14,000	10.0	333
- Government pension	3,130	2.2	74
- Government assistance	5,821	4.2	138
<b>Sub-total</b>	<b>39,641</b>	<b>28</b>	<b>943</b>
<b>TOTAL</b>	<b>139,841</b>	<b>100.0</b>	<b>3,329.5</b>

### Timber

Since 1996 timber exploitation in Tat hamlet was prohibited but a weak enforce by the authority allowed a logging industry and young men in the village operated the timber clearance. Logging in Tat reduces a high-quality timber and men who used to make a living cutting timber, and who have little land for cultivation are facing economic difficulties and turned to seek a jobs such as motorbike driving, rice milling, collecting non-timber forest products for sale and working as hired laborers. However, an illegal logging in the forest has been still operated skeptically among the young men villagers and logging company. Money is spent for purchasing motorbike, TV, and other manufactured goods. Timber for housing and repairing houses is allowed but they have to apply to the village People's Committee and must pay tax. VND 100,000 to 120,000 is paid for four to five cubic meters of wood.

Forestry department is officially the forest management. Under a national program, the government pays households to protect regenerating secondary forest plots assigned to their care. The fine for cutting protected forest is VND 800 per square meter. The chances of being caught are relatively low and the potential gains high, so the fine system is not an effective deterrent. Protected forests found in gullies are under control of the hamlet cooperative and swidden is not allowed. In some areas, particularly on slopes above their houses, farmers preserve the forest to maintain water supply for home consumption.<sup>29</sup>

### Non-Timber forest products

Firewood, bamboo, bamboo shoot, mushroom, wild vegetables, medicinal plants, broom grass and other forest products are collected for basically household consumption. Among those bamboo is the most promising cash income for the Tat people (Table 7). Almost half of the households in Tat Hamlet collect bamboo according to demand from lowland markets make and sale it to buy rice to



eat between the crop harvests. The collection period of shoots is between May to June. It happens that the excessive collection reduces the area and quality of bamboo forest. The medicinal plants are widely used particular women and almost all of them know which plants to use and how to process them. The Chinese traders occasionally came to the village to buy many wild medicinal plants.

**Table 7.** Timber and non-timber forest products use.

Product	Percentage of household utilizing forest products for different purposes (%)		
	For sale	For home use	Both
Wood	30	40	30
Fuel wood	0	100	0
Bamboo	47	18	35
Bamboo shoot	16	32	51
Mushroom	7	46	47
Medicinal plants	5	95	0
Wild animals	0	57	43
Broom grass	66	17	17
Other (culy)	80	0	20

### Wet rice

Wet rice is an important source of food for the local people. The terraced rice field is practiced for years by the Tat people. Two crops per year is allowed in lower fields which covers 6 ha (78.9 percent of the total paddy area), while only one crop is grown in the higher fields covering 1.6 ha (21.1 percent). The slightly increasing paddy land along the foothills and stream has been explored to response to the population growth. The people innovate to use chemical fertilizers recently instead of the manure from cattle, buffalo and pig. The pesticide use for the wet rice is uncommon use in Tat. People plant sweet potatoes or beans for rice substitute when the rice crop fails.

### Swidden fields

Sixty percent of the households in Tat use swidden fields where they plant rice, corn, cassava, canna and ginger.

Cassava is a solid product for household consumption, making wine, pig fodder, and sale for cash income to the government and used to use as tax, and villagers have cassava as rice substitute when rice shortage.

Ginger had been a massive income source when the Japanese market operated in 1995. They earned VND 2000/kg and high up to 7000 and then dropped to 700/kg. The variety of the vegetables from the swidden crops is served for the household food basket, together with the home garden which they identify more than 89 various species.

### Conclusion and Recommendation

Tat Hamlet is classified as a moderate high level of diversity. The changing in livelihoods of the Tat Hamlet may a cause of the increasing number of population growth that impacts to the condensed forest use. Approximately 50 people (7 households) lived in the village in 1954. In 1993 the total population were 389 (69 households), and slightly increases to 480 (110 households) in 2001.

The increasing need of Tat Hamlet for cash is probably a key change the character of the collection of forest products in recent years. For example, bamboo, mushrooms, medicinal plants were formerly collected mostly for home consumption, but now are mainly sold to traders. Timber in forest is illegally cut to exchange for a cash to buy rice and young men want to purchase motorbike, TV, and other manufactured goods.

The chemical fertilizer and pesticide is likely to be ruthless use in the future to optimize the farm products while the over-exploited environment and biodiversity and growing population are greater pressures.

The key problem facing is food security while the given limited paddy land is not sufficient to produce rice which the yield is low. The yield development of rice variety and exploring the additional source of income as well as raising of livestock and fish and cultivating of high value forest plants as rattan are possible alternatives.

The improved management of fallow swiddening system and rice yields is the cause to response to the shortened fallow and lengthened cultivation periods. Fast growing nitrogen-fixing trees and shrubs planting is recommended to restore soil fertility.

### ***Biodiversity and sustainable livelihoods in the uplands of Northern Thailand: consequences of changing access and dependencies on local natural resources***

This case study comprised a set of seven villages, four Akha villages in Chiang Rai province, and three Karen villages in Om Koi District of Chiang Mai province in the uplands of Northern Thailand. The set provided a range of market accessibility contexts as well as major differences in histories of settlement and traditional culture. The study focused on livelihood transitions, in particular, how households were coping with and adapting to changes in the conditions and rights of access to forest biodiversity, as well as the new opportunities for diversification of income sources that arose from improvements in infrastructure and access to markets.

Livelihood activities in the Karen and Akha villages we studied had undergone substantial changes over the past few decades. Diversification of activities and income sources has become a key strategy in coping with, and adapting, to changes in socio-economic and political conditions and risks.

Some of the arising combinations of challenges are best characterized as crises (*sensu* Gunderson) *where management and policy are widely seen to be failing or have failed*. The most serious crises arose out of combinations of slow and fast changes in the social and ecological systems.

In general, longer-term, decadal-scale changes in ecosystems and socio-economic systems were less well articulated by individual villagers than more discrete events, but we nevertheless suggest in combination with shorter term fluctuations in things like commodity prices, crop failures and political conflicts, have probably been the most important crises for upland livelihoods and natural resource management systems (slow and fast variable interactions, Table 8).

For each of the major crises we found at least a few ways in which households and villages were able to adaptively responded (last column, Table 8). In some cases a successful response required a major re-organization of livelihoods activities. At the same time it was clear that for the poorest households in all our study sites, as well as a substantial fraction of all households in the more remote villages like Bai Na, Mae Rameat and Abawdo, that effective responses were not always possible, and people ended up much worse off than they were before.

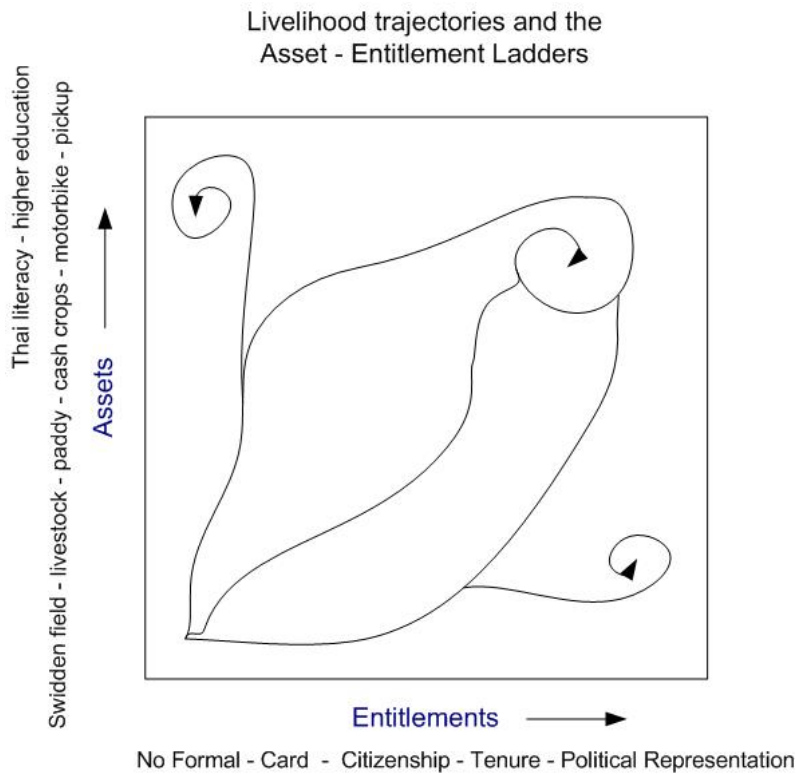
**Table 8.** Summary of some of more important crises, their causes and responses in upland livelihood and natural resource management systems over the past several decades in Northern Thailand.

<b>Major Crises</b>	<b>Slow Variables Contributing to Underlying conditions</b>	<b>Fast Variables</b>	<b>Examples of adaptive responses and the re-organization of livelihoods</b>
Land shortage- fallow shortening and problems with soil fertility and pest/weed outbreaks	Population growth Forest closure preventing village fission and re-settlement as well as opening up of new land for fallows; Reforestation projects Opium substitution and sedentarization policies of state and various external agencies;	Pest and weed outbreaks	Intensification – greater fertilizer and pesticide inputs Urbanization, non-local wage labour
Boom-bust cycles of profitability (and profit squeeze) in simple cash-crop intensified systems	Input price rises	Market demand and fluctuating commodity prices  Crop failures due to pests, weeds, disease or unsuitable rainfall pattern	Diversification Demand for higher education for children
Wildlife over-harvest /Protein Sources	Progressive decline in wildlife population from over-hunting, and habitat degradation Overharvesting, inappropriate technologies for fishing		Rising cash assets and better infrastructure allowing option of purchasing food inputs
Water-resource conflicts	Steady increases in demand for water, especially in dry-season, to irrigate fruit trees; Reforestation projects especially with water demanding pine.	For uplands inter-annual variation in previous wet season rainfall and dry season falls;	Formation of watershed networks Intervention of state agencies with forced re-location or strict controls on expansion of upland agricultural lands
Forced re-settlement of villages	Long-term conflicts and ideological changes within Thailand and “neighbouring” countries (Burma, Lao PDR, China) Forest enclosure and “border national security” policies	Armed conflicts  Village-wide fires and infectious disease outbreaks – cultural view of “bad spirits” that must be left	After relocation - development of new rice terraces Purchase or take-over of existing fallows Re-establishment of social networks, for example linkages with other villages with relatives thru marriages and re-linking with old trading partners
Extended droughts or widespread crop failures			In events more than 2 decades ago were almost entirely dependent on wild foods to survive, now seeking temporary wage labour is much more important strategy.

A principle feature of the adaptive responses to livelihood crises and new opportunities created by improved market access has been the adoption of diversification as a key livelihood strategy. Although activities in upland livelihoods have always been in some senses diverse, today, diversification is aimed at achieving income and food security rather than maintaining a particular set of activities or land-uses.

The level of assets is perhaps the best single indicator of the livelihood activities available to a household (Figure 3), and this in turn, depends strongly on market access which is mostly a function of location.

**Figure 3.** Assets and Entitlement Ladders. Critical changes to assets and entitlements influence the livelihood options available. Livelihood strategies such as diversification of income sources are seen as one way to cope with the constraints on forest access on the one hand, and the new opportunities created by market access on the other.



Livelihoods in the uplands are dependent on a variable mixture of goods and services obtained from specific ecosystems, as well as the larger landscape mosaic (Table 9).

**Table 9.** Examples of some of the more important ecosystem goods and services supporting upland livelihoods and the types of institutional arrangements governing their use. Additional details discussed in text.

Ecosystem Good and Service Bundle	Examples of property right arrangements	Livelihood Activities supported
Food from fields and orchards	Locally recognized rights to land under cultivation Sophisticated irrigation institutions with wet rice paddies	Paddy and upland rice staple Cash crops Orchards Home gardens
Goods from fallows and forest	Diverse institutional arrangements ranging from non-existent to private ownership of particular trees	.... Subsistence food Supplementary income from sale of NTFPs Construction of housing Fuelwood for cooking
Services from the landscape	Locally recognized areas for maintenance of key watershed functions	Agricultural Aesthetic-recreational uses for villagers including hunting

The likely consequences of an overall decline in direct dependence on uncultivated biodiversity (and some ecosystem services), both for day-to-day food provision from collecting-hunting, as well as in the maintenance of agricultural systems, for future conservation of biodiversity in these landscapes are complex, but very important for future policy.

On the one hand, the direct incentives for local management of many natural resources, especially general ecosystem services beyond the farm plot boundary, has declined as key ecological functions have been substituted with purchased inputs from other sources, and the state has created many dis-incentives to community management. With little incentive to manage secondary forest areas in the landscape there is a likelihood that locally recognized common property rights systems will break down, creating the opportunity for short-term exploitative extraction by outsiders (ie. Conditions of open access).

On the other hand, the reduced pressures on harvesting forest products and the areas of land needed for production, could allow more areas of secondary forest in the landscape to mature, which in turn, would increase interests in their exploitation for timber. This would create more habitat for plant and wildlife conservation (and use). The history of pressure from the state on conservation has also led communities to strategically promote conservation practices around their villages as way, it is hoped, of securing land tenure and other basic rights. The alignment of interests remains tense, and in the longer-term such an outcome can only be sustainable if the institutional arrangements are, and are seen to be, legitimate, credible and feasible to implement.

***Biodiversity and livelihood uncertainty in swidden agroecosystems: a case study of the Mengsong Hani community, Southwest China***

This study takes regional approach covering 11 hamlets over about 100km<sup>2</sup> area. The focus is on the Hani people their changing uses of biodiversity as a result of policy changes affecting systems of property rights and access to forests. The importance of changes in the structure and level of access to markets is also investigated. Finally, the case draws on earlier research in these areas examining swidden practices and local knowledge systems about the use of biodiversity in fields and forest.

The Hani people (and the Akha in Thailand who were originally members of the same group) originated from Hong He, the Red River region of central Yunnan, where they are believed to have

practiced irrigated agriculture more than a thousand years ago. Following wars, earthquakes and landslides, some Hani split off from the Akha and migrated toward what is now Xishaungbanna. Other members of the same group migrated south reaching northern Thailand and Myanmar early in the eighteenth century. Finding the river valleys of the warm, humid, sub-tropical regions already occupied by other groups, the Hani learned to practice shifting cultivation in the still vacant uplands. Today there are approximately 1.2 million people of Hani ethnicity living in the uplands of Yunnan (1990 census). The Hani practice a composite swiddening system that includes traditional tea gardens (in the forest), intensively terraced rice paddies in the river bottoms, homegardens, livestock, and shifting cultivation on the hillslopes.

Customary institutions play important roles in regulating land and natural resources. For example, detailed regulations have been developed to manage forestlands, and a complex system of sanctions exists for fining infractions. A man collecting one rattan cane from a community-protected rattan forest (*sangpabawa*) would be fined 50 Chinese yuan (equivalent to 8 USD). Individuals are only allowed to harvest mature rattan seeds, medicinal plants and timber for making coffins. Indigenous arrangements for managing forestlands are function-oriented, such as protecting forests for rattan (*sangpabawa*) or protecting fire-resistant broad-leaf trees (*Schima wallichii*) around their villages in order to provide protection from fires that escape when the swidden fields are burned.

The Hani are basically animistic in their beliefs and place a strong emphasis on worshiping their ancestors as evidenced in their strictly protected cemetery forests. Familiar objects such as trees and animals are often invested with supernatural powers.

This case study argues the importance of treating biodiversity as a natural assets and provides assessments of its “value” in different land-use systems, from mature forest through to 6-year fallow.

It also recognizes that while livelihood transitions are inevitable and even desirable, that whether these will lead to sustainable outcomes, socially and ecologically, depends greatly on the maintenance and building of social capital. Traditional institutions and knowledge form part of this foundation, but in addition, old and newer links from upland-lowland interaction are also important in creating social networks that can facilitate adaptive change.

Finally, the impact of external policies regarding land-use, allocation and rights to forests have presented multiple and huge challenges to livelihoods. Often various policies contradicted each other making strategic decisions harder and the operation of institutions far from clear on the ground. As elsewhere diversification of land-use has been a key response.

### ***Biodiversity and sustainable development in the Central Himalaya, India***

This case study starts with a general review of the role of natural and agro-system biodiversity in securing livelihoods in the Central Himalaya region of India, and how interventions have often disrupted traditional practices. It then proceeds to a more in-depth review of research in two villages where modern science was used to enhance traditional ecological knowledge and practices to help restore and improve degraded ecosystems. The emphasis is on the role of traditional ecological knowledge and the importance of meeting the needs of local resource users in conservation. Rural development and conservation are seen as tightly intertwined activities.

Depletion of biodiversity, forest cover and terrestrial carbon stock, declining farm productivity, shortage of water, and soil erosion are the root-causes of poor economy of the central Himalaya. Further exacerbating the problem, the government environmental conservation and rural development efforts were treated independently and conventional/ indigenous knowledge gaps contributed to obstacles of putting ecological and developmental theories into practice. The outcomes of the policy interventions hence were unsatisfactory in achieving both the development and conservation goals.

Impact of government intervention on local livelihoods were assessed on topics pertaining to local animal husbandry and grazing practices, usage of medicinal plant and wood resources, rural development as component of protected area management, as well as problems arising from people and wildlife conflicts arising from implementing government conservation programs.

Under the traditional biodiversity management system, timber trade was never practice because local communities value services from trees over the timber. However, government policy let government agencies to commercialize 'dead and diseased trees' has become problematic. Although benefits from the trade are shared with the village concerned, conflicts arise as the government does not allow autonomy to manage how the fund is going to be used.

Government wildlife conservation is also problematic. Snow leopards and wolfs, are the main predators of villagers livestock, however protected areas managers imposed penalties for killing the wildlife. Local people dislike the policy as it treats outsiders hunting wildlife for game and economic gains at par with local people who resort to killing only when the wild animal turn hostile to their livestock. Such policy is looked by local people as way of promoting conservation at the cost of their livelihoods.

This article also discuss some aspects of indigenous knowledge based resource uses, management, and changes as well as scope of integrating indigenous knowledge with conventional ecological sciences for resolving development conflicts in Himalayan mountain context. Successes in rehabilitating land, improving soil fertility, and indigenous agro-forestry practices were evaluated.

In the recent past, traditional agricultural practices have undergone prominent changes. Although there is no perceptible change in cropping intensity, crop diversity has declined due to biodiversity services degradation, off-farm migration, and changes within farming techniques resulting from integration into market system.

About 1/3 of 59 million ha of Indian Himalaya is degraded land- 7.3 million of which are belong to the community and the rest 13.5 is considered degraded forest. Although a rehabilitation model was proposed, local people on both research sites were unwilling to invest their labor and other resources to rehabilitate the land because they are not skeptical about the immediate return. Indirect and intangible benefits such as soil conservation and hydrological balance, as well biodiversity conservation were not taken into consideration. However, after seven years soil rehabilitation program was initiated, soil fertility and water holding capacity showed significant improvement.

Ecological science research methodology were also used to determine optimal lopping practices in traditional agro-forestry systems as well as techniques to improve soil fertility through use of cattle excreta mixture with leave litter. Results showed that oak/ manure treatment under poor soil condition contributed to 15 percent higher yields in traditional agriculture system than using pine litter.

Conservation and socio-economic development of local communities are complementary and are equally important in achieving sustainability goals. In practice, it is essential to capitalize on the positive dimensions of traditional knowledge and overcome its negative dimensions through conventional science. Furthermore, perceptivity and respect of indigenous knowledge is the key element engaging people in environmental conservation and development processes.

### ***Local natural environment, livelihoods and rural development projects in Namon Neua, Lao PDR***

This case study was added to the initial set at the final synthesis meeting. It is analysis of the livelihood and biodiversity consequences of a series of rural development projects in a Hmong ethnic minority village, approximately 140km north of Vietiane, the capital of Lao PDR. The author grew up in the village and then returned to study it as part of an MSc at the University of Sydney, Australia. The case study begins, however, with an overview of the history and form rural development interventions in Lao PDR drawing attention to the neglect of environmental and social impact assessment for the very large number of smaller projects being carried out.

In the past few years, with the aim of poverty alleviation and food-security increase, a lot of rural development projects have been put in place with various degrees of international assistance in the forms of loan and grant. The number of the development projects will likely to continue to increase in the years to come. So far, development has paid much attention to technical and financial aspects. Considerations for social and environmental outcomes, however, have been neglected and the role of local knowledge has often been little recognized especially in small rural development

projects, leading to some significant socio-economic and environmental concerns. In contrast to large projects, small projects require less human, financial, and natural resources and they may create less impact. Consequently small projects may receive less social and environmental attention and priorities. Small projects often fall outside the scope of formal environmental impact assessment (EIA) as well as research.

However, the case study in Namon Neua shows that small projects can also create impacts on the community and the environment. All projects, no matter how small, distribute negative and positive effects unequally<sup>30</sup>. More importantly, impacts of small projects can be cumulative and significant. According to Court et al., “many development activities are individually minor, but collectively they may pose a significant impact on the environment”.<sup>31</sup> Furthermore, it is underlined that “in the context of resource-based projects, social, ecological, economic, and cultural changes experienced at the local level may involve impacts on regional and local development”<sup>32</sup>. For these reasons, I argue that there is a need to provide an approach for project management to ensure that social and environmental issues occurring with small rural development projects or the EIA exempted projects are taken into account as a priority.

Much of the impact has been on the natural resources (forest, rivers, and biodiversity) that local livelihood depend on. Forests in Laos are considered to support high biodiversity. The issues of forest degradation and poor water quantity and quality may pose significant impact on habitat crucial to supporting high biodiversity. Thus, a part from direct impacts on the local communities, development activities have also indirect impact on the local livelihood through the decrease in the local natural resources.

In sum, a part from the pressure of the population growth whose livelihoods depend heavily on the forest and biodiversity, expansion and intensification of agricultural practices, development activities contributed significant input to the changes in the local natural resources and livelihoods, not all of which are positive. The good intention of the developers were not fully realized. In some cases, the project activities added further pressure to the natural environment and the local livelihoods.

Causes of the impacts rooted not only inside the projects, but also beyond. Both internal and external factors influenced the extent of creating impacts on the local livelihoods. The causes found indicate the ways to fix them. The need for the establishment of a supporting legislation framework has long been recognized and this has been developed by the government. To some extent this should be able to solve the problem of the lack of political support in environmental considerations of development projects and will have effect on many significant projects. However, analysis on the newly established development and environmental legislation indicates that it contains an insufficiency, which is the screening processes that might miss some projects that can cause social and environmental impacts especially the small ones. From this point of view I argue that there is the need to employ an informal EIA system approach to project management that can ensure that the exempted projects not only are socially and environmentally sound, but also would be able to help with the project success in their immediate goals.

### ***Biodiversity conservation as an entry point to achieve sustainable livelihood of the Dayak peoples in West Kalimantan: an integrative approach***

Like the previous case study, this contribution was added to the initial set only in the final synthesis meeting. The case provides first an overview of the cultural and biological diversity of Kalimantan and a series of argument about their futures are intertwined through the way development impacts on livelihoods. The paper then illustrates the application of scientific research and traditional ecological knowledge to a series of projects (briefly summarized below) carried out by a local people's organization, the Institut Dayakologi, in the Jalai and Kanayatn communities.

Kalimantan's diversity, both ecologically as well as culturally, has been known to the world. It has 11,000 species of flowering plant, 10 genera and 270 species of dipterocarps, 221 species of wild land animal, including 92 species of bat, and 15 species of sea mammal, 14 different types of primates and 549 bird species (Muller, 1990:23; Cleary & Eaton, 1992:18,192). The Dayaks--as the



indigenous peoples of this island are being called--consists of more than 400 different sub-ethnic groups, speaking different languages and practicing diversified traditions and lifestyles.

In the case study a number of community-based projects are described and evaluated. Briefly these were:

1. The plant Genetic Resources Research Project which was completed within 5 years has taught Institut Dayakologi that local people's full participation is the key to the success of any initiatives in biodiversity conservation. At the same time, it determines the sustainability of the initiatives which could further encourage the local communities' actions and commitment to empower themselves in various sectors.
2. The establishment of a Credit Union (CU) after a series of workshops facilitated by a Pontianak-based NGO that specializes in Micro Credit Management has rapidly grown and the model has being copied widely in the region.
3. Efforts at cultural revitalization including make use of Indonesian law which allows inclusion of a certain percentage of "local content" to improve local curricula with traditional ecological and cultural knowledge. The community know holds regular *Adat* Assembly and Cultural Festival, and assigns some of their oral tradition experts to provide tutorial on culture and knowledge to the elementary school children in their villages.
4. Use of participatory mapping activities to identify opportunities and threats to biodiversity in the areas, started in 2000 and as of December 2002, covered territories of 31 villages and approximately 106,000 mapped.
5. The facilitation of a locally developed integrated pest management system to combat locust plagues which had become very serious after the 1997 forest fires and land clearing for oil palm in the area. The combined shock of the economic crisis created a major challenge to livelihoods in the Jalai Dayak community, and a number of other activities have been undertaken to help recovery.

## CONCLUSIONS

The main findings of the research were summarized in the previous section on outcomes and products. In this part of the report we focus on the relevance of this study, and others similar to it, for the research and policy activities coordinated by the International Global Environmental Change Programmes, and donor coordinating agencies like APN. We offer six suggestions:

First, we would argue that the results of this project, and an earlier one also sponsored by APN on forest governance and institutional interplay (APN 2001-14) underline the importance of studying institutional arrangements at local as well as national and international levels. A too narrow focus on just international agreements will fail to provide the understanding required to direct policy changes in ways that will actually matter and at the same time don't produce undesirable side-effects.

Second, putting these two projects (APN 2001-14 and APN 2002-18) together suggests the value of pursuing the "vulnerability, resilience, security" type themes within IHDP as a cross-cutting activity, because many of the more important interactions in the systems we study involved both institutional issues and livelihood security. We would also argue the importance of more theoretical and conceptual development of how these various aspects of risk are related to each other at different scales, for example, when applied to a nation as an economic unit, as opposed to an aggregation of livelihoods.

Third, an emerging theme that has arisen in both these past projects as well as others sponsored by APN and START, for example, in relation to ENSO forecasting, is the way scientific and local, or experiential, knowledge can be better combined to pursue goals of sustainability. Although this would lie a little beyond the traditions of APN funding in the past we suggest that putting a new focus on how knowledge is produced and used could help improve efforts to bridge the science – policy and science – practitioner or action gaps. One way could be to stimulate a cross-project synthesis of lessons learnt about successful and unsuccessful use of knowledge.

Fourth, the work started in this network could develop into a more comprehensive contribution to the new DIVERSITAS programme. We believe that timing for this programme is excellent in that there is a wonderful opportunity to build on the outcomes and publicity surrounding the Millennium Ecosystem Assessment activities to help stimulate and meet the many research gaps in understanding the linkages between biodiversity conservation and use. This would take much of the current analysis which focus either on land-use and –cover changes, or on ecosystem functions in a particular patch, to considering in a much more integrated way the function of biodiversity in the maintenance of ecosystem goods and services over time and disturbance cycles.

As research on diversity has been relatively under-emphasized by both START and APN in the best we recommend that consideration be given to perhaps a special programme to develop and incorporate parts of this "parallel universe" into the framework of the international global environmental change programmes.

Fifth, as the management and governance of forests, especially where timber harvesting or the rights of indigenous people is concerned, are often very politically sensitive issues for Asian governments, regional activities, in South and Southeast Asia (including Southwest China) we believe there are some excellent opportunities for APN or START to play a facilitation role in stimulation regional science-policy dialogues that would be way too "hot" for single countries to handle. Partnership with other civil society organizations or "think tank" groups in the region may also be considered, as well as possibly agencies like UNEP.

Sixth and last we would like to conclude, that we found, again, that collaborative research and synthesis through networks of small projects is an excellent way to mutually develop scientific capacity. We found the sharing and exchange of technical and analytical skills between groups in different countries one of the highlights of this project mode. As people come into these collaboration with complimentary skills, each of us was able to learn something important from our own from others, whether it be on the measurement of social capital, the validation of traditional ecological knowledge, the functioning of markets, or practical measurements for biodiversity.

## **FUTURE DIRECTIONS**

Although each of the groups participating in this collaborative study had experience working on livelihood and biodiversity issues prior to the APN project, we were surprised by the strong similarities in issues across cases, but still strong differences in opinion about solutions and the role of things like markets, common property systems and traditional ecological knowledge for livelihood sustainability. We therefore expect our synthesis attempts to lead to new insights and provoke additional arguments and research activities, for example, in elaborating the concept of “resilient livelihoods” as a way to span the gap between development, and environmental change literature.

As a group we also feel there is important follow-up work required on taking our combined findings into public policy arenas within each of the case studies. Our preparatory discussions to the synthesis meeting suggest our findings will challenge several widely held assumptions about how best to manage biodiversity in areas being rapidly transformed by socio-economic development.

Finally, three of the team leaders have agreed to continue direct collaboration and will develop a follow-up proposal for a 2-3 year project focussing on the consequences of changing market access for livelihood sustainability in these upland communities. Others from the network for this project, and outside, will be invited to join in once an initial plan has been worked out. We remain convinced that a better understanding of how people cope and adapt to environmental and socio-economic changes now is crucial for considering the potential consequences of global environmental change.

# Appendices

## APPENDIX 1. FIRST PLANNING MEETING

### Meeting Agenda

APN Project – Sustainable Livelihoods & Biodiversity

### 1st Working Group Meeting

Siam Commercial Bank Training Centre, Hang Dong, Chiang Mai, Thailand,

14-15 June 2002

### Draft Program and Logistical Information

#### *PURPOSE OF MEETING*

The main objectives of the meeting are (1) to fine-tune the design of the study and (2) reach agreement on the process for collaboration, and the dates for future meetings and deadlines for drafts. In short, this will be a crucial planning meeting to launch our collaborative project. The draft agenda for the meeting appears on the next page.

#### *SUGGESTED PREPARATIONS FOR WORKSHOP*

1. Prepare a short presentation (10min) about your proposed case study areas. Include in this an overview of already published work, and any other important background information, for example on socio-economic conditions and biodiversity which you think will help others understand the context for the study.
2. Give some careful thought to the design of the study. For example, how many villages do you expect to include. How will they be selected? How much variation in social and ecological settings should be captured in the study? How will informants be selected?
3. Please also make at least an outline of what you think the questionnaire or in-depth interview guideline and any other data gathering tools should include using the proposal as a starting point, but reflecting on issues of importance in your own case study areas.
4. Give some idea on how expect to analyse data from own site as well as how it might be compared and synthesized with results from case studies in other countries.
5. Please also bring laptop computers and one copy (which we can reproduce) of any highly relevant empirical or conceptual papers or books which you want to share with others or which may help us refine the design of the study.
6. Please go over the agenda on the next page.

#### *MEETING VENUE AND ACCOMMODATION*

The meeting will be held at the Siam Commercial Bank Training Centre, a hillside resort about 25km outside of Chiang Mai town. Accommodation will be within the same set of buildings as the meeting. The meeting rooms are on the same floor as the main lobby and entrance, but on the opposite wing from the accommodation.

The organizers have already booked accommodation for all participants. In case you need to contact the Centre directly the address and contact details of the venue are:

Siam Commercial Bank Training Centre  
 198 Moo 4 Hang Dong – Samoeng Road  
 Hang Dong District  
 Chiang Mai 50230  
 THAILAND

**Tel:** 66-53-365-256, 365-257

**Fax:** 66-53-365-256

***SUGGESTED AGENDA***

<b>14 June</b>	<b>Theme and Purpose</b>	<b>Format</b>
0900-1030	<b>Overall Objectives and research questions</b>  Review initial proposal and reach agreement on the meaning of the objectives and the overall research questions.	Group Discussion
1030-1100	Break	
1100-1230	<b>Proposed case studies</b>  To help team leaders understand the main livelihood and biodiversity issues in each of the other case study areas and some of the options for designs.	Short presentations on each case study (max. 10-15 minutes)
1230-1330	Lunch	
1330-1500	<b>Sustainable Livelihoods &amp; Biodiversity</b>  To reach a common understanding about key concepts and terms and to highlight alternative theories which the project should address.	Group Discussion
1500-1530	Break	
1530-1700	<b>Study Design</b>  To exchange ideas on suitable data gathering methods and get agreement on procedures for selection of villages and informants. Begin outlining structure of questionnaire/interview guidelines with smaller writing tasks for evening as required.	Group Discussion  Individual work on drafting parts of questionnaire
	Group Dinner	
<b>15 June</b>		
0900-1030	<b>Questionnaire / Interview Guidelines</b>	Group Discussion

	Discuss drafts of sections of interview guide and reach agreement on detailed content of common survey instrument and design.	
1030-1100	Break	
1100-1230	<b>Comparative analysis</b>  To critically review design and survey instruments in terms of how they will contribute to comparative analysis and synthesis across case studies. Revise depending on results of discussion.	Group Discussion
1230-1330	Lunch	
1330-1500	<b>Work plans</b>  Review overall project timetable.  To prepare draft work plans and budget checks for the individual case study reflecting on design discussions and overall project schedule.	Short group discussion then  Individual work
1500-1530	Break	
1530-1700	<b>Follow-up</b>  Final agreement on timetable for project and process for follow-up. Discuss further any outstanding conceptual or design issues which have not been satisfactorily resolved.	Flexible.

### ***Airport transfers***

For those arriving at Chiang Mai airport we have arranged transfers from the airport to the meeting venue. The journey takes 25-30 minutes. There will be students waiting to meet you at the arrival exits. They will be holding signs “APN Sustainable Livelihoods & Biodiversity Meeting”. Please keep a look out for them. They will help you get into the right vehicle.

Please make sure you inform us about your arrival information beforehand if there are any changes from the tickets we bought for you. If for some reason you don't meet anybody at the airport, a reliable taxi service is also available, directly near the domestic arrivals gate.

If we are supporting your travel to the meeting and you have purchased your own tickets then please bring receipts and bank account details.

### ***Meeting Facilities***

In the main meeting room there will be a high quality LCD projection unit available to hook up to laptops. The SONY unit I have usually doesn't require re-booting between switches of computers, so it is a convenient way to update and present material. An overhead projector, flip-charts and a slide projector will also be available. If you need anything else please let us know beforehand.

We will set up all small computer room with desktop computers, printers and internet connection for use by participants. A small secretariat team will be on hand to help with ticketing.

A small allowance in Thai baht to cover taxis, departure taxes, and meals while travelling will be given to each participant on the first morning. If you have to pay unusually high departure tax etc. then please keep receipts. We will pay for your accommodation and meals during the meeting. Have a safe trip and look forward to seeing you in Chiang Mai.

My contact details are:

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URL: <http://www.cbik.org> or  
<http://cbik.ac.cn>

## **APPENDIX 2. CASE STUDY GUIDE**

### **Unit for Social and Environmental Research**

#### **Working Paper No. 2002-1**

**Version 1, July 2002**

The Asia-Pacific Network for Global Environmental Change Research Project  
on:

Sustainable Livelihoods & Biodiversity in the Uplands: a multi-cultural  
assessment of resilience, risks and opportunities

**APN 2002-18**



Prepared by

Louis Lebel,

With

Antonio Contreras, Xu Jianchu, Mochamad Ali, Le Trong Cuc, PS Ramakrishnan



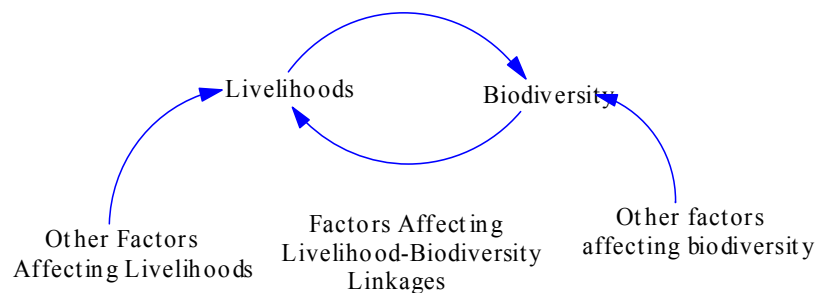
## ***Introduction***

The purpose of this working paper is to outline a set of guidelines for the development of contributing case studies to the APN-funded project on Biodiversity and Sustainable Livelihoods (APN 2001-44). These guidelines arose from discussion among case study leaders at the Initial Planning Meeting of the Project held on the 14-15 June 2002, in Chiang Mai, Thailand. As such this working paper also is a synthesis report of that meeting. The agenda through which this guidelines were arrived at is given in appendix 1.

## ***Study Design***

### Research Themes and Questions

The overall goal of the project is to explore the roles of biodiversity in sustaining the livelihoods of upland people. We recognize that questions about the relationship between livelihoods and biodiversity are confounded or mediated by other important variables (figure 1). Understanding which variables are important and how is a key aim of this research. The simple figure provides a possible structure for grouping sets of related analytical questions that can help guide the research. Although our main focus on the linkages it is important to understand other major processes altering livelihoods or biodiversity (e.g. driving land-use changes) because they will in turn feedback onto the linkages.



**Figure 1.** *Very simple conceptual framework used to group research questions.*

### **Theme 1: Biodiversity – Livelihoods Linkages**

- ❖ What impacts have livelihood activities and changes in livelihood strategies had on biodiversity? And, conversely, how have changes in biodiversity affected livelihoods? In what ways does access to higher levels of natural, agricultural or landscape biodiversity effect the resilience of livelihoods?
- ❖ How important is access to biodiversity during periods of crisis, and periods of re-organization following crisis, compared with “normal” periods? For whom is access most important?
  - What are the most important crises affecting livelihoods in the past years and decades? How do individuals, households and communities respond to crises?

Whom did crises affect the most?

- Was the response to biophysical crises, such as droughts or floods or pest/weed outbreaks fundamentally different from those resulting from socio-economic changes such as commodity price crashes?
- ❖ Has the relationship between sustainability of livelihoods and biodiversity changed over time (past several decades)? How have dependencies changed? What has been the role of external interventions?
- ❖ What are the most critical intervening variables influencing relationships between biodiversity and livelihood sustainability? How do these help explain variation among individuals, households sexes, communities, ethnic groups or regions? Or patterns over time? Specifically, what is the influence of:
  - **social capital** – both internal and external to the village or community;
  - the level of **assets** (economic, physical and human);
  - set of **entitlements**;
  - the **political position** or *niche occupied*;
  - **ethnicity** and **culture**;
  - way traditional **knowledge** is stored, shared and hybridised;
  - differences in **openness** of communities to innovation and predictions of future change;
  - extent and form of integration of livelihoods into **markets** - for both forest-derived and non-forest products.
- ❖ What are the main natural products and critical ecosystem services derived from forests, fields and ponds? How are they used? How are they governed? Is the flow of these likely to be maintained under current management and harvest practices? That is, is utilization and production sustainable? Does sustainability of livelihoods vary with consistently with ecological properties of biodiversity goods or services that are used?

## **Theme 2: Changes in Biodiversity**

- ❖ Have levels of biodiversity or access to biodiversity changed greatly over time? What have been the proximate and underlying causes of changes in biodiversity? What is the role of external factors in driving changes in biodiversity?

## **Theme 3: Changes in Livelihoods**

- ❖ What are the major factors, apart from biodiversity, driving changes in livelihoods? Are these making livelihoods more or less sustainable?
- ❖ For upland communities, are there systematic relationships between wealth, sustainability, resilience and well-being?

### Hypotheses

These research questions came out of reflections and discussion in the workshop about what the important issues are in the case study areas. The research questions can be combined into more comprehensive hypotheses about the relationships between biodiversity and livelihoods. The project proposal states an over-arching working hypothesis for how biodiversity increases resilience of livelihoods as follows:

*H1: Biodiversity (in surrounding managed forests and within more intensively cultivated aquaculture, agricultural and agro-forestry land-use systems) increases resilience of*

*livelihoods, for two main reasons: (1) because it provides alternative sources of food and other products which help people cope with and recover from biophysical disturbances (like droughts and floods) and social disturbances (like commodity price drops, over-harvesting or political interference) and (2) high levels of biodiversity imply functional redundancy which increases the capacity of ecosystem to continue to yield key goods and services even when specific components (species, size-classes) of the community are lost or greatly reduced in abundance.*

During the meeting an alternative hypothesis was formulated which placed more emphasis on the coevolution of institutions, biodiversity and livelihoods over time.

*H2: If there is high dependence of natural biodiversity, but overall pressure/levels of exploitation are low then institutions for management of forests resources are few. As pressures on resources increase then institutions multiple and become stronger. As biodiversity falls and some resources are degraded levels either*

*(1) dependence on forests falls as livelihood strategies switch to permanent agricultural systems and off-farm income sources. Under these conditions incentives for local management of forests decline and degradation by others or those with fewer alternatives continues OR resources are given up easily to outside forces for conservation or exploitation/settlement/conversion;*

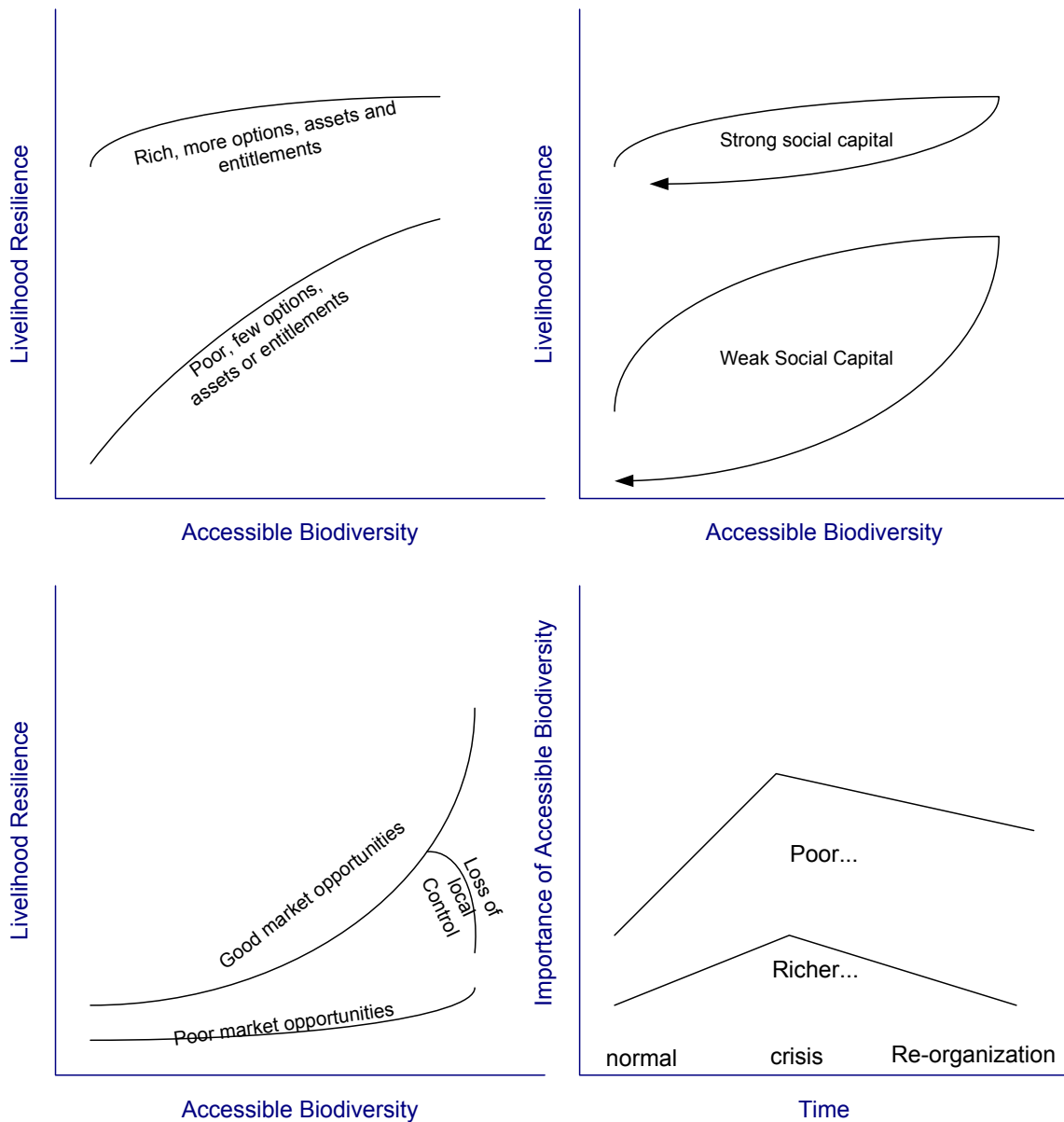
*(2) dependence on forests may remain high for a while, with livelihoods becoming less and less secure as the natural resource base weakens, and eventually become unlivable – to be followed by famine, migration, or aid intervention.*

A third hypothesis argues that social capital, market access and wealth are key intervening variables. This set of “draft” hypotheses is illustrated graphically in Figure 2. In the upper left figure, for example, the assumption is that those who are better off in terms of assets and entitlements generally have livelihoods with a higher resilience at all levels of accessible biodiversity. Changing the level of accessible biodiversity has the greatest impact on the poor (either positive or negative). The upper right figure suggests the impacts of a variable, like social capital, may vary depending on whether biodiversity or resilience is increasing or decreasing. That is, directions of change themselves may matter of how the overall system changes.

The split in the graph of the lower left figure is meant to capture the idea, that while market opportunities generally improve livelihood resilience, much depends on whether control of benefits and management is local or siphoned away by outsiders with little long-term interest in the system.

In all these figures there is no intention to imply that cause-and-effect are only in one direction. In some cases may be important to think about how changes in livelihood resilience will effect biodiversity. The system should be understood as one of joint interaction and evolution, perhaps even driven by other shared factors.

Finally the aim of this initial set of figures is primarily to encourage thinking more closely about expected relationships. Much more work is need to explore potential mechanisms and whether these are really sensible sequences and relationships given current understanding of markets, politics, poverty and social capital.



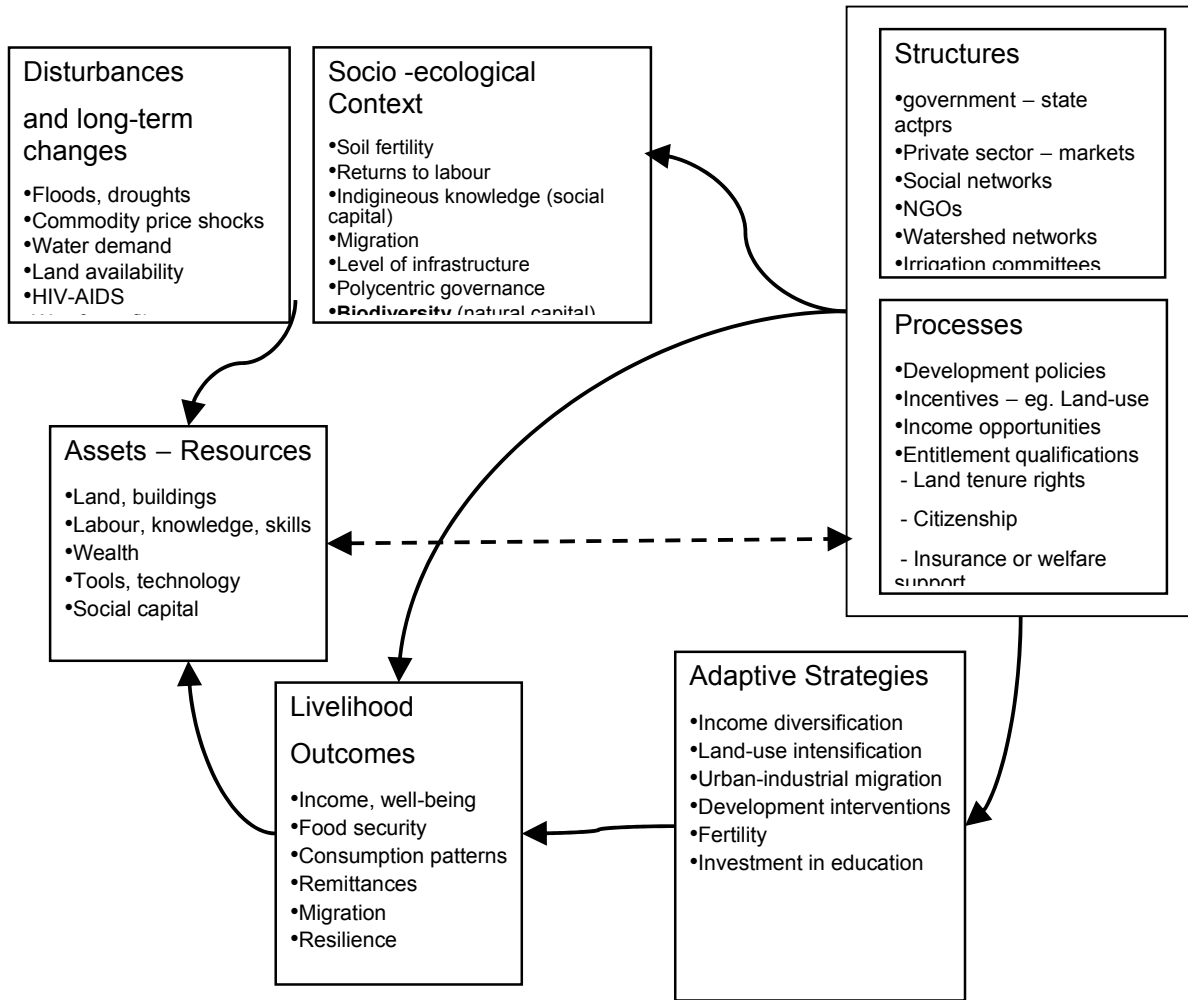
**Figure 2.** Some hypothesized relationships between livelihoods and biodiversity for various key intervening variables. See additional explanations in the text.

In practice the group felt that various other alternative hypothesis could be constructed and tested by the project, but that it was important not to pre-constrain our ideas too much about key intervening variables, structures and processes. The hypotheses should be seen as helping to frame the issues of concern rather than being the sole focus of the research.

Conceptual Framework

The list of research questions and hypotheses above and a more mechanistic graphical model of livelihoods (Figure 3) help outline the emerging conceptual framework for the study. We expect that this framework will evolve and improve as a result of the cross-cultural research.

**Figure 3.** *Conceptual Framework for Sustainable Livelihoods*<sup>33</sup>



Approach

The overall approach of the study was to pragmatic and not overly prescriptive to the exact designs opted for by the different cases. We agreed to share research questions and to adopt a broad strategy of obtaining data from a set of village (or hamlets etc.) for which livelihood, biodiversity and intervening factor variables would be assessed.

During the meeting we moved away from the idea of a fixed common questionnaire to be shared across all country case studies. This was felt to be too inefficient and difficult to construct in a meaningful way given the huge variation in cultural and development contexts we were study. WE also were concerned that pre-judged to many important parts of the questions we went to address and our ultimate goal of helping the people in the places we study. Instead we agreed to concentrate on sharing frameworks, about problems, key research questions, measurements, and

analytical methods, and to create opportunities for local communities where we work to contribute to the way we framed the research.

Selection of Sites and Scope

Each team is free to select the sites and overall scope of variation they want to tackle, but were encouraged to capture at least some variation in biodiversity, livelihood, and the key link variables. Within this general framework we noted that it is possible to select sites based on current conditions (eg proximity to quality forest areas), as well as historical trajectories of change. Much will depend on data availability and previous experience with sites.

It was recognized that it may become necessary to additional sites within case studies as findings and understanding point to gaps in combinations of important variables. That is “*snow-ball sampling*” may be a useful strategy.

The initial set of case studies outlined in the proposal, namely, in Vietnam, Thailand, Indonesia, Philippines and Yunnan, China was expanded at the first meeting to include Northeast India. The budget for this additional case study will come from the administration fee, which Chiang Mai University kindly agreed to forego so that the important case can be included, and small cut-backs in funding for coordination and meetings.

**Measurement**

It was recognized at the outset that one of the most difficult aspects of this project was finding ways to meaningfully measure livelihoods and biodiversity in case studies with only limited resources. We therefore spent some time in the workshop thinking about practical proxies, indicators and measurements that could be made in the case studies.

Sustainable Livelihoods

In this project, a **livelihood** is defined as the capabilities, assets or resources, entitlements and activities required for living. A **livelihood is sustainable** when it can cope with and recover from stresses and shocks (i.e. is resilient)<sup>34,35</sup>, maintain or enhance its capabilities, assets and entitlements, while not undermining the natural resource base.<sup>36,37</sup>

Measuring livelihoods is a non-trivial task, especially, given our project emphasis on linkages to biodiversity. Our group is therefore developing its own framework (Table 1), but to do this by building on the experiences of others.<sup>38</sup>

**Table 1.** Composite classification of livelihood components with preliminary ideas on how they might be measured.

Livelihood Components	Measurable variables – direct, proxy, indicators
<b>Assets or Resources</b>	
Physical Capital	Ownership of agricultural, harvesting and construction machines/tools
	Ownership of motorcycles, carts, pick-ups
	Means of transportation
	Infrastructure - presence of public meeting areas, schools, health

	centres, drinking water, shops, electricity
Economic-Financial Capital	Remittances
	Off-farm work effort: working Days
	Savings – accounts or gold jewellery
	Credit – formal and informal systems
	Income – overall and seasonal patterns
Human Capital	Health - days work lost due to illness
	Presence of serious morbidities
	Food insecure weeks/year
	Infant mortality rates
	Prevalence of preventable diseases
	Well-being – self-assessed
Natural Capital	Physical Accessibility - distance of forest and other natural resources from community
	Physical quality or condition – forest cover, variation
Social Capital	Nos of indigineous knowledge experts in the community
	Nos and forms of organizations and social groups
	Use of welfare network – eg for weddings and death ceremonies
	Presence and form of natural resource management institutions
Social Capital (continued)	Presence and form of other customary institutions – number of meetings, conflict resolution systems, election/leadership selection systems; regulations, penalties and levels of compliance
	Frquency of sharing/exchange of labour, tools and products – work days received or given;
<b>Entitlements</b>	
Market access	Frequency to markets
	Time-distance to markets
	Bargaining power/discrimination
	Product distribution and marketing
Forest access	Rights under local institutions
	State agency imposed constraints
Identity	Possession of id and other state-issued cards/certificates
	Self-assessed identity and changes in this over time
Land tenure	Land tenure documents for settlements and other areas used (forest and agricultural)
	Ownership of land
Politics and policy process	Involvement and choice – elections, access to local government for grievances
	Responsiveness of local government
	Quality of relations and interaction with military, police and forest department officials

<b>Activities</b>	
Modes of production	Means of acquiring food, income – eg. Agriculture, harvesting, or employment
	Division of labor (include gender)
Biodiversity & Resource Utilization	Frequency, regularity and amounts of harvest/hunting/gathering Productivity – average, variability, storage capacity
<b>Strategies</b>	
Intensification	Changes in use of inputs – chemicals, fertilizers, terracing, irrigation, labour for weeding etc.
Diversification	Number of crops/land-use systems Number of sources of off-farm income Investments in education and off-site activities
Expansion or Contraction	Changes in areas under cultivation
Abandoning forest-related systems	Changes in harvesting intensity
Migration	Residency – time spent in village per year
<b>Sustainability</b>	
Resilience and risk or crisis management for critical periods	Actor-defined critical periods / events Food insecure months Livelihood turning points – labour allocation differences between generations, gender or over-time Coping mechanisms – avoidance, resistance, tolerance, switching
Sustainability of stocks and flows	Evidence of improving, degrading or maintained natural resource base or the flows of goods and services (with understanding of internal vs external causes/drivers); Observation, experiences or reports on good and bad practices;
Economic	Longer-term trends in income, savings, assets, and returns-to-labour
Socio-Political	Longer-term trends in entitlements

### Resilience

We follow Holling's (1973) original meaning of **resilience** as the potential of a particular configuration of a system to maintain its structure/function in the face of disturbance and the ability of the system to re-organize following disturbance-driven change.<sup>39</sup> Resilience has three defining characteristics:

- The amount of change a system can undergo (and therefore the amount of stress it can sustain) and still retain the same controls on function and structure (still be in the same configuration, or state - within the same domain of attraction)
- The degree to which the system is capable of self-organization



- The degree to which the system expresses capacity for learning and adaptation

Adaptive capacity is a component of this resilience that reflects a learning aspect of system behaviour in response to disturbance. Methods for assessing resilience of regional socio-economic systems should help in the analysis of livelihood sustainability, especially understanding of role of crises, surprises and re-organization.<sup>40</sup>

## Biodiversity

### ***Natural Ecosystem Biodiversity***

- Broad classification of forest vegetation types indicative of key species, successional status, perturbation regimes [local and external to the socio-ecological system(s)] under consideration from the region.
- Use of remote-sensing information-spatial/ temporal – to the extent feasible, indicative of land use/ cover changes.
- Considering forest types as a component of an integrated socio-ecological system, evaluating NTFP-yielding biodiversity as an accessible biodiversity component & local communities.
- Evaluation of the socio-cultural perceptions & key tree species, (culturally/spiritually selected species) based on the assumption that socially valued species often tend to be ecologically significant key stone species supporting a wide variety of associated biodiversity, and performing key ecological functions of the given forest ecosystem
- Socio-cultural perceptions & local communities with respect to sacred groves and sacred landscapes and a socio-ecological evaluation in the same, in space & time.

### ***Human managed biodiversity***

- Broad typologies & agroecosystems operational in space (with in the landscape) and in time (rotational) with a consideration of crop and associated biodiversity.
- Evaluation of agro-ecosystem adaptations by human societies – the typologies- that are a consequence of biodiversity depletion/land degradation and/or market forces operating in the area.
- (Evaluation & crop cultures (varieties) if possible for the above two.)

### ***Landscape level biodiversity***

- Diversity of ecosystem types in a given unit space
- Extent of monoculture in both agriculture and forestry sectors.
- Societal perceptions of the landscape as a unit in terms & availability/ accessibility to fodder and fuelwood, and on sustainable soil fertility issues based on resource recycling between forest and traditional agricultural practices.
- Analysis of proximal/ external drivers of land use changes determining landscape level, ecosystem diversity.

## Intervening Variables

Many of the critical intervening variables have already been dealt with in part, in consideration of livelihoods (Table 1). Indeed it is often difficult to separate out livelihood components from these intervening variables. In table 2 we expand on some of this information.

**Table 2.** *Critical Intervening variables. Some ideas on how they might be measured.*

<b>Intervening Variables</b>	<b>Measurable variables – direct, proxy, indicators</b>
Components	
<b>Social Capital (internal)</b>	
Organizational capacity	Number of local organizations present
	Interest representation – degree by which stakeholder interests are expressed/manifested through formal organizational channels
	Technical capability of organization on resource management and livelihood
	Administrative capacity of organization (planning, budgeting, monitoring and evaluation)
Decision-making Processes	Autonomy of decision-making seen in the frequency by which the organization relies on its own resources and expertise, and not from external sources
	Level of participation of members in the process—particularly of women and non-elites
Cooperation and networks of trust towards collective action	Number of issues, including but not limited to resource management and livelihood, wherein the different stakeholders are in agreement/are not in conflict
	Number of instances wherein conflict, if ever present, was effectively managed
<b>Social Capital (external)</b>	
Interaction with external organizations	Number of external organizations present
	Interest representation – degree by which stakeholder interests are expressed/manifested through these formal external organizational channels
	Technical capability of these organization on resource management and livelihood
	Administrative capacity of these organization (planning, budgeting, monitoring and evaluation)
<b>Markets and Property Rights</b>	
Market Access	Time-distance travel to main market towns
	Market information infrastructure-availability
	Money markets – credit/loans
Tenurial arrangements	Timber and fuelwood related institutions
	Non-timber forest products institutions
	Efforts at enforcement and levels of compliance
<b>Political Context or Niche</b>	
Power	Capacity as potential or track-record in influencing policy
	Way community is viewed by centre – provincial or national
	Autonomy – level and form of decentralization
Geographical	International border – openness to trade, frequency and seriousness of disputes and military conflicts
	Timber resource, watershed and conservation priorities in area

<b>Dependency</b>	
Forms and Degree	Economic dependence on forests – as proportion of incomes over year and during critical periods
	Cultural dependence on forests – presence and frequency of forest-related ceremonies, practices not related to extraction/consumption
	Extent of other livelihood options
<b>Disturbance</b>	
Forms and patterns	Actor-defined disturbances – frequency, predictability, severity
	Cumulative effects of multiple disturbances
	Change in natural disturbance regimes as result of human actions (eg. Fire frequencies)

### ***Sources of Data and Analysis***

#### ***Sources of Data***

The sources of data to be used in each of the case studies will vary depending on availability of information from earlier research. They will likely include:

#### Techniques

Use of secondary data – published papers, reports, government and local community data

Field observation

Key Informant Interviews

Household surveys

Focus group discussion

#### Triangulation

Community validation

**Table 3.** Example analytical framework with data requirements and approaches (from Philippines Case Study Plan, A. Contreras).

Domain of Analysis	Research Design		
	Data Needed	Data Sources	Research Instrument
<b>Analysis of Livelihoods</b>			
Resource utilization and Productivity	Livelihood Activities <ul style="list-style-type: none"> <li>• Forest-based (w/in forests)</li> <li>• Forest-dependent (raw materials from forests)</li> <li>• Forest-displacing (land-use competing with forests)</li> <li>• Non-forest</li> </ul> Nature of Production process <ul style="list-style-type: none"> <li>• Primary production</li> <li>• Processing</li> </ul> Activity profile (Who does what when and where?)           Resource profile <ul style="list-style-type: none"> <li>• Level and quality of productive resources</li> <li>• Level and quality of biodiversity</li> <li>• Relationships between livelihoods and biodiversity</li> </ul>	Key Informants <ul style="list-style-type: none"> <li>Households</li> <li>Secondary material</li> <li>Field observation</li> </ul>	Key informant interview <ul style="list-style-type: none"> <li>Household survey</li> <li>Field checklist/Maps</li> <li>Focus group discussion</li> </ul>
Products distribution and Marketing	Product distribution <ul style="list-style-type: none"> <li>• Household consumption</li> <li>• Markets</li> </ul> Nature of markets	Key Informants <ul style="list-style-type: none"> <li>Households</li> <li>Secondary material</li> </ul>	Key informant interview <ul style="list-style-type: none"> <li>Household survey</li> <li>Field checklist</li> <li>Focus group discussion</li> </ul>
Support Systems	Infrastructure support           Access to Credit Facility           Local institutions	Key Informants <ul style="list-style-type: none"> <li>Households</li> <li>Secondary material</li> </ul>	Key informant interview <ul style="list-style-type: none"> <li>Household survey</li> <li>Field checklist</li> <li>Focus group discussion</li> </ul>

<b>Modes of Production Analysis</b>			
The form of appropriation of economic surplus	Nature of class formation <ul style="list-style-type: none"> <li>• Subsistence</li> <li>• Petty commodity</li> <li>• Capitalist</li> </ul>	Key informants Households	Key informant interview Focus group discussion Household survey
The degree of division of labor	Class division of labor Gender division of labor	Key informants Households	Key informant interview Focus group discussion Household survey
Level of development of forces of production	Presence of class consciousness Level of organization	Key informants Households	Key informant interview Focus group discussion
<b>Mode of Governance Analysis</b>			
Mode of institutionalization	Nature of social capital Strength of local institutions Presence of policy and mediating external institutions Forest culture	Key informants Community	Key informant interview Focus group discussions <ul style="list-style-type: none"> <li>• Stakeholder analysis</li> <li>• Institutional analysis</li> </ul>
Mode of constitution	Nature of distribution of power in the community Level of control and influence of community over forest management	Key informants Community	Key informant interview Focus group discussions <ul style="list-style-type: none"> <li>• Stakeholder analysis</li> <li>• Institutional analysis</li> </ul>

### **Case Studies**

This section has been deleted from original version of guide as essential background information already reproduced in main body of report.

### **Work Plan**

#### Timetable and Milestones

**Table 4.** Revised timetable of Activities for the Project.

Activities	2002										2003	
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Project preparation (finalize contracts, set up accounts, finalize timetable with team)												
Initial Planning meeting, Chiang Mai, Thailand			14-15									
Piloting of survey instruments												
Case study field campaigns												

Side-meeting at Montaine Mainland Southeast Asia III Conference, Kunming, China					23-4 1/2day						
Analysis and Writing Workshop, Chiang Mai, Thailand										15-18	
Electronic exchange of progress (1pg) + tentative findings – matrix								1- Nov			
Reporting back to local study areas and villages											
Final synthesis and presentation workshop, Chiang Mai, Thailand											27- 28
Final reports to APN											

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## **APPENDIX 3: SYNTHESIS WORKSHOP**

### **International Workshop on**

**“Biodiversity and Sustainable Livelihoods in the Uplands of Asia”,**

**11-15 February 2003**

**Siam Commercial Bank Training Centre, Chiang Mai, Thailand**

#### ***Rationale – Background***

The mountain areas of South and Southeast Asia are very important for conservation of biodiversity as they are often the only places with significant areas of forest remnants, as most lowland plains and larger inter-montane valleys have been completely cleared of native vegetation for agriculture and cities. Expansion of lowland commercial agriculture, plantations, logging activities and immigration into forest margin areas, remains a threat to the remaining forest in the uplands. Public concern over forest loss and its potential consequences for watersheds, however, has resulted in increased political pressures to maintain high forest cover in upland areas, often with a very restricted view on how this should be achieved.

The people living in the uplands are culturally diverse and often from different ethnic groups than those that dominate the rural lowland landscapes and political structures in the cities. By conventional indicators many groups rank among the poorest in each country. For most of the past century the indigenous and ethnic minorities have been outside the mainstream development concerns of government, but have nevertheless shown a remarkable capacity to adapt their land-use systems and culture to a wide variety of challenges and opportunities. Wars, harassment, population growth and the promise of more secure livelihoods elsewhere, also led to significant movement and resettlement of villages.

As a consequence of the growing interest in conservation and control of forest lands the activities of upland people have come under much closer scrutiny. The critical policy dilemma can be stated as: how best to combine conservation and development or production goals in upland landscapes? The initial reaction from most governments has been to consider ways of limiting access to land, timber, and other forest products. What impact does this have on livelihoods?

A conceptual framework based on sustainable livelihoods appears particularly appropriate for addressing these issues in the uplands, because it starts with assets and strategies of the poor, looks at ways of supporting their knowledge, skills and expertise, and acknowledge that vulnerability to disturbances are caused by various social structures and processes. A livelihood can be defined as the capabilities, assets or resources, entitlements and activities required for living. A livelihood is sustainable when it can cope with and recover from stresses and shocks (i.e. is resilient), maintain or enhance its capabilities, assets and entitlements, while not undermining the natural resource base.

Access to forest resources has often had an important role in securing livelihoods. Apart from direct harvesting of timber for construction materials and cash, non-timber products are often very important components sources of cash or exchange income for upland societies. A significant part of forest products are used within households and thus are easily under-estimated by market-related surveys. Finally, not only goods, but services, such as the watershed forests of the Karen, may be actively managed by villagers.

A few studies suggest a potentially important roles for forests and biodiversity in promoting resilience of livelihoods following crises. On the other hand, access, use and dependence on forest

products and services is often changing rapidly with market integration, off-farm employment opportunities, new land-use practices and watershed and forest policies that restrict access.

Biodiversity within other land-use systems is also significant and in any case distinguishing “forest” from “non-forest” in many of these settings is problematic. Various multiple-cropping systems including trees, or planting of shrubs within naturally regenerating forests is common. A large diversity of aquatic plants and animals are also found in aquatic systems, including rice paddies, and stream margins.

In this workshop we will discuss evidence about the changing role of biodiversity in sustaining the livelihoods of upland people. We are particular concerned with identifying the key intervening variables which influence how interactions between biodiversity and livelihoods lead to different sustainability outcomes in different places.

The workshop is organized around a set of case study analyses for a one-year pilot collaborative project on “Sustainable Livelihoods and biodiversity in the uplands of Southeast Asia: a multi-cultural assessment of resilience, risks and opportunities” sponsored by the Asia Pacific Network for Global Change Research (APN). In addition, a number of other researchers working on similar questions have been invited to share and exchange their findings.

**Programme**

The workshop programme lasts for three days (11-13 February) with the first two days being centred around a series of case study and invited presentations with substantial amount of time for discussion and further comparative analysis in smaller working groups. On the third day involves a less formal, but nevertheless, valuable opportunity for site visits and exchanges in some upland villages near Chiang Mai. Altogether we anticipate there will be 20-25 participants.

Immediately following the workshop the members of the APN-sponsored case study teams will meet on the 14-15 February to reflect on the discussions of the workshop and consider ways to revise and synthesise their findings.

***Tentative Working Group Guiding Questions***

<b>Changing Dependencies</b>	Does the weakening of direct and local dependencies on biodiversity increase or decrease likelihood of successful biodiversity conservation for larger-scale society?
<b>Institutional Re-design</b>	What have been the main institutional features of settings where biodiversity (or components of) have been eroded versus those where it has been maintained? How are success and failure linked to livelihood outcomes?
<b>Livelihoods and National Development</b>	How has greater integration into markets and the state affected the resilience of upland livelihoods? Has it created new winners and losers?



## WORKSHOP Program

11 February	Theme and Purpose				Format
0830-0900	<b>Introductions</b> – informal introductions of participants				Early morning tea-coffee break
0900-1030	<b>Overview</b> Biodiversity and Sustainable Livelihoods – Hypotheses and Introduction (Louis Lebel)  <b>Case Studies</b> China Case Study (Xu Jianchu) Commentary (Carol Stock)				Presentation (30 ) with discussion (15)
1030-1100	Break				
1100-1230	Philippines Case Study (Antonio Contreras) Commentary (Levita) Thailand Case Study (Carol Stock) Commentary (Maikhuri)				Presentations with group discussion
1230-1330	Lunch				
1330-1500	Invited Paper #1 (John Bamba) Commentary – Antonio Contreras Invited Paper #2 (Lilao Boupao) Commentary – Xu Jianchu				Presentations with Group Discussion
1500-1530	Break				
1530-1700	Vietnam Case Study Paper (Le Trong Cuc) Commentary ()  India Case Study Paper (Saxena) Commentary (Po Garden)				Presentations with Group discussion
	Group Dinner				
12 February					
0900-1230	Changing Dependencies	Knowledge Systems	Institutional Re-design	Livelihoods and National Development	Parallel Working Groups
1230-1330	Lunch				
1330-1500	<b>Working Group Reports and</b>				
1500-1530	Break				
1530-1630	<b>Synthesis Discussion (Louis)</b>				Lead Presentation with Discussion
13 February	Field Trip with On-site Presentations and Discussions				

<b>14<sup>th</sup> Feb</b>	<b>Goal</b>				<b>Format</b>
0900-0930	Proposed Agenda  Reach agreement on additional synthesis themes requiring analysis in working groups				Plenary
0930-1230	Social Capital	Ecosystem Functions	Land-use Policy	Market Access	Working Groups (Break any time)
1230-1330	Lunch				
1330-1500	Working Group Reports and Discussions  Writing assignments				Plenary
1500-1530	Break				
1530-1700	Time for small teams and individuals to write-up summaries from WG1-8:				Individual Small Group Writing Time
1800-2100	Dinner – Ping River Boat Cruise				Leave at 1800
<b>15<sup>th</sup> Feb</b>					
0900-1030	Provisional synthesis + proposed outline for synthesis chapter				Presentation (Louis) + Discussion
1030-1100	Break				
1100-1200	Plan of Action – : <ol style="list-style-type: none"> <li>1. Timetable and process for completion of case study chapters and synthesis chapter</li> <li>2. Outputs-products from project: book vs special issue? ; Ideas/interests in additional comparative analyses (as papers)</li> <li>3. Proposals for continuation of sustainable livelihoods network – thematic focus, organization, targets, next steps</li> <li>4. Opportunities for presentation of project papers               <ul style="list-style-type: none"> <li>• Politics of the Commons Meeting</li> </ul> </li> <li>5. Other Matters –               <ul style="list-style-type: none"> <li>• New Journal-Sustainability Science</li> <li>• Network continuation proposal</li> </ul> </li> </ol>				Closing Plenary
1200-1300	END! Lunch				END OF MEETING
1300-	Free-time – own arrangements – buses down to Chiang Mai – own relaxation – writing time				

### ***MEETING VENUE AND ACCOMMODATION***

The meeting will be held at the Siam Commercial Bank Training Centre, a hillside resort about 25km outside of Chiang Mai town. Accommodation will be within the same set of buildings as the meeting. The meeting rooms are on the same floor as the main lobby and entrance, but on the opposite wing from the accommodation.

The organizers have already booked accommodation for all participants. In case you need to contact the Centre directly the address and contact details of the venue are:

Siam Commercial Bank Training Centre  
198 Moo 4 Hang Dong – Samoeng Road  
Hang Dong District  
Chiang Mai 50230  
THAILAND  
**Tel:** 66-53-365-256, 365-257  
**Fax:** 66-53-365-256

### ***Airport transfers***

For those arriving at Chiang Mai airport we have arranged transfers from the airport to the meeting venue. The journey takes 25-30 minutes. There will be students waiting to meet you at the arrival exits. They will be holding signs “APN Sustainable Livelihoods & Biodiversity Meeting”. Please keep a look out for them. They will help you get into the right vehicle.

Please make sure you inform us about your arrival information beforehand if there are any changes from the tickets we bought for you. If for some reason you don't meet anybody at the airport, a reliable taxi service is also available, directly near the domestic arrivals gate.

If we are supporting your travel to the meeting and you have purchased your own tickets then please bring receipts and bank account details.

### ***Meeting Facilities***

In the main meeting room there will be a high quality LCD projection unit available to hook up to laptops. The SONY unit I have usually doesn't require re-booting between switches of computers, so it is a convenient way to update and present material. An overhead projector, flip-charts and a slide projector will also be available. If you need anything else please let us know beforehand.

We will set up all small computer room with desktop computers, printers and internet connection for use by participants. A small secretariat team will be on hand to help with ticketing.

A small allowance in Thai baht to cover taxis, departure taxes, and meals while travelling will be given to each participant on the first morning. If you have to pay unusually high departure tax etc. then please keep receipts. We will pay for your accommodation and meals during the meeting. Have a safe trip and look forward to seeing you in Chiang Mai.

My contact details are:

**Tel:** 66-(0)53-265-103  
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## Literature Cited and End Notes

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