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EXPERIENCES OF LAND USE PLANNING IN ASIAN PROJECTS

Selected Insights

The Working Group on Land Use Planning for the Asian-Pacific Region

Deutsche Gesellschaft für
Technische Zusammenarbeit (GTZ) GmbH

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on Land Use Planning
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List of Abbreviations

AGILUP	Arbeitsgruppe für Integrierte Landnutzungsplanung
ASI	Asian Social Institute
BPP	Beneficiary Participation Programme
CIAD	Centre for Integrated Agricultural Development
CIM	Centre for International Migration
CLM	Community Based Land Use Planning
CUP	Cebu Upland Project
FAO	Forestry and Agriculture Organization of the United Nations
FGFP	Fiji-German Forestry Project
FORLUMP	Forestry and Land Use Mapping Project
GDP	Ghorka Development Project
GIS	Geographic Information System
GNP	Gross National Product
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
ICIMOD	International Centre for Integrated Mountain Development
IGWSD	Indo-German Watershed Development Programme
INDO-SFDP	India Social Forestry Development Project
ICRAF	International Council for Research in Agroforestry
IRDP	Integrated Rural Development Project
IRM	Integrated Resource Management
KfW	Kreditanstalt fur Wiederaufbau
LREPP-II	Second Land Resource Evaluation and Planning Project
LUP	Land Use Planning
LUPAM	Land Use Planning and Mapping Project
NARMS	Pilot Project Natural Resource Management by Self-Help Approaches
NWP-DZPDP	North Western Province Dry Zone Participatory Development Project
ODA	Overseas Development Administration
PAK-SFDP	Pakistan Social Forestry Development Project
PPSTN	Self Help Promotion in Food Promotion and Land Conservation in Critical Rural Areas
PRA	Participatory Rural Appraisal
SALT	Sloping Agriculture Land Technology
Pro RLK	Area Development Project for the Rehabilitation of Critical Lands and the Protection of Natural Resources and Environment
RRA	Rapid Rural Appraisal
RRD	Regional Rural Development
RRDP	Regional Rural Development Project, Kandy
RS	Remote Sensing
RSA	Rural Systems Analysis
SALT	Sloping Agriculture Land Technology
SFS	Sustainable Farming Systems Development
Siran FDP	Siran Forest Development Project
SWC	Soil & Water Conservation
TC	Technical Cooperation
TG-HDP	Thai-German Highland Development Programme
TST	Technical Support Team
UMC	Upper Mahaweli Catchment
UMWP	Upper Mahaweli Watershed Management Project
ZOPP	Ziel Orientierte Projektplanung (Objectives Oriented Project Planning)

Introduction 1

1.1 Context of Problems

Most Technical Co-operation projects in the Asian-Pacific region are facing problems of diminishing or already destroyed natural resources primarily due to the relatively high and growing population of their countries.

Projects where the emphasis is on planning, particularly in rural areas, therefore need to develop landuse planning and natural resource management techniques which are adapted and sustainable.

Where approaches and methods have been adopted which take into account the rapid changes and the needs of both planners and population, they are not widely disseminated, Though much experiences has been gained at the project level, it cannot be easily shared because is has not yet been put into an overall framework.

In order to address these problems, the AGILUP (Arbeitsgruppe Integrierte Landnutzungsplanung) was formed in 1992, on the initiative of GTZ Division for Multisectoral Urban and Rural Programmes (OE 425) and involves the following institutions:

- Pilot Project Environment and Natural Resource Conservation
- Pilot Project Natural Resource Management by Self-Help Promotion
- Working Group on Land Use Planning in Developing Countries at the Institute for Landscape Economics of the Berlin Technical University
- GTZ Division for Plant Production and Agricultural Systems (OE 423)
- the Working Group on Land Use Planning in West Africa.

The aim of the working group is to develop and operationalize land use planning guidelines and tools with the idea to make them available to a broader audience. In addition, the experience and

knowledge of project personnel should be integrated in to the activities of the working group. For this reason several workshops were organised in 1993 and 1994 in relevant regions in Asian-Pacific, East and South African, West African an Latin American countries.

During the Asian workshop in Sri Lanka in November 1993, the **Working Group on LUP for the Asia-Pacific Region** was established. The group comprises a "corresponding group" am a "core group". The role of the corresponding group is to provide relevant documents and other information of LUP related to the topics of the core group. In return, the members of the core group have the task to compile a state-of-the-art report on LUP in technical co-operation projects of the region. This led to an overview on the practical experiences in Asian projects which are summarised in this publication.

1.2 Landuse Planning in Projects in the Asian-Pacific Region

Most of the projects dealing with rural development follow and integrated approach often incorporating a landuse planning component.

- Projects of Regional Rural Development (RRD) with emphasis on natural resource management (TG-HDP, NWP-DZPDP, RRDP, GDP, CUP)
- Projects of Social Forestry (IRM, PAK-SFDP, INDO-SFDP, FG-FP)
- Projects of Natural Resources Management (UMWP, IGWSDP)
- Projects of Institution Development (LREPP-II, LUPAM, CIAD)

Experiences gained in landuse planning are relatively new; very often landuse planning is handled as one part of Regional Rural Development or Natural Resources Management. Landuse planning is seen as an approach either for the mobilisation/sensibilisation of users or as a technique for appraisal and evaluation of natural resources.

For example, land use planning was not considered in the initial project design of the Thai-German Highland Development Program (TG-HDP). However, there was a continuous development from crop replacement to a cropping system approach emphasising soil and water conservation to sustainable farming system development and finally community based land use planning including local watershed management.

The North Western Province Dry Zone Participatory Development Project (NW-DZPDP) in Sri Lanka, on the other hand, attempts to

introduce a participatory approach in all stages of planning and implementation of programmes benefiting the poor villagers who earn their living by practising shifting cultivation in the dry zone areas of the province. The strategy of the project is to apply Participatory Rural Appraisal (PRA) to appraise the selected villages and facilitate the process of development. Village Resource Management Plans are taken up by village level organizations (mainly informal interest groups) for implementation.

1.3 Methodology

During the Asian LUP-workshop in Kandy participants expressed in their requirements for a systematic framework for land use planning concepts based on project experience. Networking should be strengthened and the knowledge gained be more widely shared. A need for specific training in landuse planning **was** also declared.

As mentioned in chapter 1.1, a coregroup was formed which has the task to collect, evaluate and develop the experiences of the projects and disseminate them again. This publication is the outcome of the work of the coregroup. The core group has six German members who all have worked in GTZ supported projects dealing with rural development and land use planning in Asia.

As an initial step, a matrix showing specific experiences of the **projects was** developed. The main points were as follows:

1. Institutions
2. Tools for participation
3. Participation at the community level
4. Training requirements
5. Ecological sustainability

The members of the coregroup then asked the participating projects to contribute their experience in these areas. Projects from Thailand, Sri Lanka, Pakistan, the Philippines, India, China, Indonesia, Nepal and Fiji sent their respective material which included workshop documents, manuals, directories, project publications and technical reports. Most of the projects are supported by GTZ and some are financed by KfW or the Dutch Development Co-operation (detailed list see Annex).

In November 1994, the group met again in Cebu /Philippines. The material was screened and evaluated and a structure was

developed based on those documents showing, relevant experience. This structure forms the basis of this publication.

In March 1995, the group came together in Bonn/Germany to edit the preliminary version of the individual chapters. After having revised and discussed the chapters, the group had further discussions with AGILUP about the integration into the overall guidelines. These guidelines are seen as a frame for land use planning strategies whereas this publication focuses on practical experiences drawn from project activities.

1.4 Objectives

The objectives of this publication are:

- to share the specific experiences of Technical Co-operation projects in the Asian-Pacific region in land use planning
- to show typical problems occurring in landuse planning and how some projects have solved them
- to initiate a further discussion process and to share experiences with other projects and regions in order synthesise the overall framework.

The chapters in this publication are a selection of some aspects of landuse planning. They are not complete in the sense that solutions are offered for all the problems arising during planning and implementation of projects.

The publication is intended to reach not only GTZ-staff who work overseas, but also their counterparts and other person: dealing with landuse planning, many of whom have made valuable contributions to this publication.

1.5 Structure

The introduction chapter is an overview of the specific conditions of land use planning in Asian countries. The chapters which follow are based on project experience and focus on various aspects of land use planning in some Asian countries:

- The first assesses the role of institutions in the land use planning process. Sri Lanka is taken as a case study because it has examples of both governmental and private institutions dealing with land use planning.
- The second discusses the practical experience of using participatory and gender aware approaches in the planning

process.

- The next chapter examines one aspect of the interface between planners and beneficiaries; that is the role of incentives. Three different types are identified and evaluated.
- Then, the use of Geographic Information Systems (GIS) as a tool in decision making in business, government and scientific areas is examined. Emphasis is given to institutional set-ups and areas of intervention.
- Finally, the last two chapters focus on ecological sustainability and biodiversity.

1.6 Conclusions, Outlook

The ultimate aim of the Asian Working Group on Land Use Planning is to stimulate a further discussion process at GTZ headquarters, in Technical Co-operation projects and their co-operating organisations dealing with planning and implementation of activities, specifically land use planning.

The authors would therefore be happy to present this compilation to the other Asian working groups such as Gender and Development, M&E and Regional Rural Development.

They also hope that this compilation of experiences and insights will encourage continued networking of projects in the Asian-Pacific region in the field of land use planning. A second regional workshop, organised by a project which is member of the corresponding group is possible.

1.7 Acknowledgments

The authors would like to thank the various Asian projects who contributed their experiences to this publication. A detailed list is included in the annex. Every endeavour has been made to give a true representation of their experiences. Without their inputs this publication would not have been possible.

Special mention must be given to the GTZ pilot project Natural Resource Management by Self-Help Promotion. Those involved in this project advanced this work by giving personal advice, financial inputs and logistic help. Mr. Betke from AGILUP also provided the authors considerable help in reflecting their work. Other financial contributions came from GTZ headquarters and Asian projects such as UMWP, NWP-DZPDP, RRDP and CIAD.

2 Specific Conditions of Asian Countries

Dieter Albrecht

2.1 Historical and Present Aspects of Land Use in Asia

More than half of the world's population lives in Asia. This puts increasing stress on and is a great challenge for proper land use. Besides the size of the population and income, land use practices are related also to the availability of grain as a staple food and to the dietary needs and diet habits of the people. The institutional set-up for managing the natural resources plays an important role and political and economic decisions on a national level influence land use to a considerable extent. This article stresses the importance of ecologically sound land use practices and gives reasons explaining improper management of land use in the Asian context. Despite the vast spatial heterogeneity and differing natural factors of Asian countries influencing land use, a set of rather common frame conditions is given.

Humans have been transforming natural landscapes world-wide, both terrestrial and aquatic. The ancient civilisations in Asia have developed under specific natural and political peculiarities that have to be taken into consideration while changing agricultural practices. The land use and the natural conditions of production in Asia are relatively fragile, complicated and difficult to master. The most prominent problems are apparently like those in Europe: deforestation, flooding, desertification, soil erosion, acid precipitation, air and water pollution, eutrophication, sedimentation, and landscape fragmentation. The basic dynamic of change however is quite different.

Significant increases of production were traditionally and are also today only possible through collectively organised efforts, for example construction of irrigation systems, flood control and terracing. The organisation of the producers for community based use of natural resources was a question of survival of the traditional agrarian societies in Asia. It has deeply shaped the structure of their societies. The pressure for constant regulation requires continuous intervention into the natural conditions of production. As a consequence, a strongly centralised form of government developed. It had a tendency towards an authoritarian system, but also had centuries of sustainable forms of land use.

2.2 Causes of Improper Land Use

After fundamental changes in some Asian societies, the need for ecologically sound and sustainable land use is still obvious. With a successful promotion of productivity, increases in food production have effectively banned, at least for the present decade, the hunger scenarios of the fifties and early sixties. Growing agricultural production occurs regionally in Asia because of the "Green Revolution" and the commercialising of production with high external inputs. The dynamic processes of growth, in pursuit of an improved quality of life, have various impacts on the quality of natural resources. Improving social and economic standards of living more often than not contrast sharply with deteriorating ecological conditions and an alarming degeneration of physical resources both in urban and rural environments.

Photo 1: **Intensive wet-rice based farming systems provide the staple food in most Asian countries**

The situation will become more serious because East and South - East Asia are at the moment regions with strongly growing economies. In contrary to the booming economies those remaining nations with traditional structures of society and economy, stay as poorhouses. Indicators for the different economic conditions of selected Asian countries are given in tables 2.1 and 2.2. For comparison and better understanding, economic data of the USA, Japan and Germany as the three leading industrial nations are also given.

Table 2.1: Selected Indicators of Asian Countries with Booming Economies (1992 / 1993 / 1994)

	P.R. China	Indonesia	Malaysia	Thailand	Republik of Korea	Singapore	Taiwan	Hong Kong
Total population in 1000	1 152 428	1 194 617	19 239	56 868	44 508	2 789	20 454	5 919
Non-agricultural population in %	22	58	72	42	80	99	75	99
Agricultural population in %	78	42	28	58	20	1	25	1
Increase of popul. In % per year [1)]	1.2	1.7	2.4	1.5	0.9	2.0	1.0	2.1
GDP growth 1980-92/94 in % [2)]	7.6 / 11.4	4.0 / 6.7	3.2 / 8.1	6.0 / 7.4	8.5 / 8.1	5.3 / 10.2	7.8 / 6.1	5.5 / 5.5
Inflation rate 1980-92 / 1994	6.5 / 27.4	8.4 / 9.2	2.0 / 3.7	4.2 / 5.8	5.9 / 5.7	2.0 / 4.0	4.9 / 5.1	7.8 / 7.9
Per capita GNP in US$	435	645	3 230	2 085	7 250	18 025	11 236	18 500
Calorie intake / person / day	2 703	2 750	2 774	2 316	2 852	3 198	3 036	2 857
Foreign debt in billion US$ 1994	79.7	87.8	18.8	42.7	44.5	0 [3)]	0 [3)]	0 [3)]
Agricultural area in 1000 ha	1 490 071	22 500	4 880	20 130	2 070	1	895	7
Pecentage of total land area	7	12	15	39	21	2	25	7
Available par capita in ha	0.080	0.116	0.254	0.354	0.047	0.000	0.044	0.001
Irrigated agriculture area in %	50.91	36.67	6.97	21.86	64.01	0.00		28.57
Average grain yield in kg/ha	4 004	3 910	3 111	2 108	5 608		3 500 [4)]	2 000
Forest area in 1000 ha	33 333	108 600	19 352	13 500	6 464	3	571	22
Percantage of total land 1980/90	12 / 14	60 / 57	65 / 53	35 / 25	49 / 66	0 / 0	55 / 66	26 / 21
Forest per capita in ha	0.03	0.558	1.006	0.237	0.145	0.001	0.028	0.004
Income of the GNP in % from								
• Agriculture	27	19	29	12	8	0	3	0
• Industry	34	40	24	39	45	38	43	23
• Service	38	40	46	49	47	62	54	77

Sources:

China Agriculture Yearbook 1993
FAO Production Yearbook 1993
Wirtschaftshandbuch Asien-Pazifik 1994
Newsweek, Nov. 21,1994, p. 28-35 (GDP of ASEAN countries)
Asiaweek, Dec. 7, 1994, p. 17, 47, 48 and Nov. 17, 1995 (Natural forest area, GDP growth and other basic economic data for 1994)

Remarks:

1) Population growth is the percentage increase in one year and includes births, deaths, emigration and immigration
2) Gross Domestic Product (GDP) is the value of all goods and services produced in one year
3) Net creditors
4) Rice only, no other data available

Table 2.2: Selected Indicators of Asian Countries with Less Dynamic Economies (1992 / 1993 / 1994)
(in comparison with the data of the three leading industrialised countries)

	India	Nepal	Sri Lanka	Philippines	Pakistan	Bangladesh	Fiji	USA	Germany	Japan
Total population in 1000	896 567	21 086	17 984	66 543	128 057	122 210	759	261 000	81 200	125 400
Non-agricultural population in %	27	9	49	55	49	33	63	76	88	77
Agricultural population in %	73	91	51	45	51	67	37	24	14	23
Increase of popul. In % per year [1)]	2.1	2.3	1.2	2.3	2.9	2.2	1.5	1.0	0.7	0.3
GDP growth 1980-92/94 in % [2)]	4.2	2.9	6.9	4.1	4.0	4.5	1.7	3.4	2.8	0.2
Inflation rate 1980-92 / 1994	7.8 / 9.0	? / 9.2	11.0 / 12.0	14.1 / 7.9	7.1 / 12.2	9.1 / 3.7	5.6 / 5.2	? / 2.6	? / 3.0	? / 0.0
Per capita GNP in US$	310	180	550	850	440	220	2 100	25 200	24 900	37 500
Calorie intake / person / day	2 243	2 246	2 286	2 452	2 377	2 100	2 887	3 671	3 522	2 956
Foreign debt in billion US$ 1994	77.0	1.9	6.4	35.3	20.3	14.8	0.4	555.7	0 [3)]	0 [3)]
Agricultural area in 1000 ha	169 650	2 354	1 905	9 190	21 110	9 044	260	187 776	11 910	4 515
Pecentage of total land area	57	17	29	31	27	67	14	19	30	12
Available par capita in ha	0.189	0.112	0.106	0.138	0.165	0.074	0.343	0.72	0.15	0.04
Irrigated agriculture area in %	27.00	36.11	28.87	17.19	81.00	34.28	0.38	10.80	3.98	62.08
Average grain yield in kg/ha	1 995	1 871	2 996	2 108	1 958	2 513	1 124	4 305	5 800	4 488
Forest area in 1000 ha	68 500	5 350	2 100	10 000	4 050	1 890	1 185	286 200	10 412	25 230
Percantage of total land 1980/90	17 / 16	40 / 35	30 / 26	37 / 26	3 / 2	8 / 6	65	32 / 32	25 / 30	67 / 65
Forest per capita in ha	0.076	0.25	0.117	0.150	0.032	0.015	1.561	1.096	0.128	0.201
Income of the GNP in % from										
• Agriculture	32	52	26	22	27	34		3	2	2
• Industry	27	18	25	33	27	17		34	36	42
• Service	40	30	49	45	46	49		63	61	56

Sources:

China Agriculture Yearbook 1993
FAO Production Yearbook 1993
Wirtschaftshandbuch Asien-Pazifik 1994
Newsweek, Nov. 21,1994, p. 28-35 (GDP of ASEAN countries)
Asiaweek, Dec. 7, 1994, p. 17, 47, 48 and Nov. 17, 1995 (Natural forest area, GDP growth and other basic economic data for 1994)

Remarks:

1) Population growth is the percentage increase in one year and includes births, deaths, emigration and immigration
2) Gross Domestic Product (GDP) is the value of all goods and services produced in one year
3) Net creditors

All Asian countries have a fast growing population. If this trend continues unrestrained, it will create in and among developing nations a spatial structure with sharp contrasts of developed and less developed regions. This is the same for poor as well as rich regions with their corresponding social problems of poverty in the countryside, and slums, crime and prostitution in the cities. These problems exist - in different forms - in and around every Asian metropolis. Land use planning will concentrate on problems of land use in the countryside. Nevertheless, these problems are heavily influenced by the urban agglomerations.

Photo 2: Population Pressure in urban and rural areas a common problem of asian countries

Land Use Problems of the Urban Agglome-rations

In urban agglomerations, the growth of the industrial production causes far reaching problems. There is an increasing need for space, housing areas, leisure and recreation installations, transportation, infrastructure and energy and water resources. The demand for land and space leads to an expansion of urban agglomerations and causes a fragmentation of the landscape. It is the spatial manifestation of a dynamic economy with all the related consequences. Growing urban agglomerations "import" water and energy from far away rural areas. Their consumption depends on the protection of watershed zones outside their jurisdiction. Many countries face localised water shortages or have growing water supply problems. It must be also mentioned that the industrialised

areas "export" waste, sewage, noise and polluted air to rural areas.

The dynamic interplay between industry and agriculture constitutes problems other than natural resources for the countryside. The need of industrial labour arises, causing migration of workers in the direction of the industrialised agglomerations. Usually young men are the ones who migrate; those who stay back are women, old people and children. The burden of agricultural production that was before divided between men and women, now lies solely on them. As a consequence, rural areas show a tendency of human, intellectual and ecological impoverishment.

Land Use Problems in the Country Side

Apart from problems caused by the urban agglomerations, the rural areas themselves are confronted with regularly conflicting demands for their terrestrial and aquatic resources. Population pressure, poverty, and traditional or discriminatory property rights are among the most prominent causes of improper management of land use. Population growth in Asia is high and the area for agricultural use per capita is limited in view of the prevailing population. SUN (1989) summarises the most prominent reasons for improper management of land use.

Problems Caused by Population Pressure and Poverty are:

- Heavy demand on increasingly scarce land, forest and fish resource stocks.
- Expanding of cultivation to marginal areas, i.e. steep slopes, geologically unstable hillsides. It causes deforestation, soil erosion, sedimentation and alteration of hydrologic patterns.
- A vicious cycle of new land opening, rapid loss of fertility, initiation of a growing erosion and falling productivity.
- Unsustainable forest harvesting leads to denuded hillsides and soil erosion and diminishes the forest harvesting for future generations.
- Overexploitation of fisheries can result in depleting coastal and near shore fish stock.
- Uncontrolled disposal of agricultural chemicals, industrial waste and domestic sewage leads to surface and groundwater pollution. This affects the health of the rural population which results in very high economic costs for future medical treatment.
- Poverty and short-term horizons work against long-term

conservation and enhancement of natural resources, like terracing, replanting of forests or sustained fishing yields.

Problems Caused by Unclear Land Use Rights:

- Conflicting demands of the land owner and the land user cause unsustainable forms of land use.
- Unclear or conflicting ownership work against long-term conservation and enhancement of natural resources, like terracing, replanting of forests and sustained yield fishing.
- Women often have no land use rights.

In conclusion, all these processes consequently cause a decline of the local or regional potential for self-sufficiency. Traditional structures of property or unclear and complicated conditions of ownership enforce this tendency, which inhibit the access to or hinder the sustainable use of agricultural lands and water resources. In any case, women especially have a disadvantage in access and use of land. In some countries, rising income of non-agricultural occupations balance decreasing income from pure agricultural production. The then rising requirements on the limited land resources, the demand for energy, water and land for non-agricultural purposes are fast and are often in conflict with the goal of sustained food production. This is another reason for the shrinking potential of agricultural production areas. In addition to the pollution caused by the industrial agglomerations, small rural industries sometimes heavily pollute the surrounding landscapes as well.

2.3 Institutional and Organi-sational Problems

Land use planning does not act outside the framework of the given political power structure. The political conditions and the specific types of decision making, the existence or lack of implementing agencies, and the economic structures of a country also have a decisive impact on land use. Institutional co-ordination is required because people face pressure to find ways and means to organise the utilisation of their scarce resources in a more rational way. Problems of land use that are due to limited resources and a great population pressure find no simple solution by the spatial shifting of conflicts in other regions, a common practice in former times. Regional and interregional conflicts need institutionalised land use planning and land use co-ordination procedures. These institutions

become more and more important for harmonising conflicting land demands of the private and public sector.

For mediating land use conflicts, a functional administrative set-up of planning institutions and considerable improvements of their technical capacities is a prerequisite. In the process of identifying better alternatives for optimal allocation of land and water resources, a change of past procedures and a new understanding are necessary. Instead of using administrative pressure for introducing appropriate procedures for land use planning, market mechanisms will ease the implementation. As in Europe there is no lack of laws and regulations, the implementation and the institutional access for initiating decision making processes are crucial facts. For development aid projects it is important to combine a top-down approach with more participatory bottom-up procedures in order to avoid new social imbalances and the creation of other forms of poverty.

2.4 The Problem of Environmental Awareness

The environmental awareness, built up in the last 10 years in the western world, is still in a growing status in Asia. In Taiwan, for example one can find so called "pollution heavens", with no restrictions for production concerning the environment. Some rulers answer the environment conscious critics of the young generation, that every generation has to carry on its burden; this young generation carries the pollution. This attitude goes with the prejudice that environmental protection is an expensive investment which developing countries cannot afford.

International organisations often praise and give awards to developing countries for their efforts to improve environmental legislation. Because of a lack of public awareness for environmental protection, it is not surprising that there is a clear and distinct disparity between the strict environmental legislation and the actual situation. An exemplary description was written by LEE (1994) for the Republic of Korea. Feebleness and missing potential for implementing laws and regulations is one reason; ecologically controversial land use is one expression of this fact. Another noteworthy point is that the process of ongoing decentralisation in some countries enables institutions in rural areas, to some extent, to take over the task of land use planning.

Photo 3: **Natural forest coverage of Asian countries is rapidly disappearing due to the uncontrolled expansion of agricultural lands.**

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Institutional Aspects of Land Use Planning Conditions and Experiences in Sri Lanka

3

Robert Riethmüller, Angelika Fleddermann

3.1 General Institutional Framework in Asia

Most Asian countries now face conflicting demands for the limited amount of land available. Their current challenge, therefore, is how to make the most rational use of their scarce resources. For this reason **institutionalised land use planning and co-ordination** is becoming increasingly important as a means of harmonising the demands of private and public land users.

Asian countries share certain common features in the present institutional framework of land use planning (LUP).

- Most have a formal administrative structure for LUP both at national and district levels.
- LUP is generally seen as a technical process and follows a marked top-down approach. This is typical of traditional Asian administrative procedures and structures (see chapter 2).
- Governments have generally been unsuccessful in enforcing existing laws concerning the regulation of damaging land use practices.
- Government forest protection and management initiatives often conflict with traditional village land use rights. These are generally based on a pre-colonial practice of free access to forest resources.
- Farmers are discouraged from engaging in sustainable land management practices as the status of privately cultivated public land is often uncertain. In many cases title deeds, which could serve as bank collateral, are not available.

Many countries have well established land use planning and regulating institutions. Increasingly they also have access to more sophisticated technical facilities. However, this does not always appear to have eased the problems caused by complex and conflicting land use demands.

In the future land use planners must be more effective in mediating land use conflicts and identifying alternatives for land allocation. A new understanding of the role of land use planning is necessary.

The situation in Sri Lanka clearly illustrates many of these issues. Chapter 3.2 looks more closely at the institutional set-up of land

use planning and identifies some difficulties inherent in the present system. Chapter 3.3 and 3.4 examine case studies of the implementation of land use plans by foreign donor supported development projects.

3.2 Institutional Aspects of LUP In Sri Lanka

Two main factors have influenced land use planning in Sri Lanka:

- the existence of two distinct agro-ecological zones: the wet zone and the dry zone
- the development of two different agro-economic systems:
  - a plantation sector based on the export crops of coconut, rubber and tea
  - a traditional village subsistence system based on irrigated rice

The Evolution of Land Use Planning

During the colonial administration the plantation sector attracted heavy investment and government subsidies, and a well-developed infrastructure geared to the needs of the plantation industry was built up. Government support included specific legislation and procedures to benefit this sector e.g. to facilitate the acquisition of lands and the transformation of largely forested tracts of land into plantations. All this was in marked contrast to the lack of government support for the subsistence economy of the rural villages.

Photo 4: **Typical catena of traditional paddy fields, village home gardens, commercial tobacco plots with SALT contour hedgerows and pine reforestation at the mountain peak, Kandy District, Sri Lanka**

The **Crown Lands Ordinance** (1840) and the **Waste Lands Ordinance** (1897) created the legal base for setting up large export crop holdings. These laws restricted traditional land distribution and village expansion patterns. As population density increased in the 20th century this caused considerable problems.

Prior to the 1930s there was a period of rapid and largely uncontrolled expansion of tea cultivation into steep mountain sites. Then the colonial administration became concerned with the ecological as well as the economic risks of improper land use. These issues were addressed for the first time in 1935 by the **Land Use Development Ordinance.** This included provisions to protect the critical watershed areas in crown reservation lands and to regulate the use of public water sources such as streams and lakes. However, its greatest achievement was in mapping out all public lands and thereby establishing a legal as well as a technical base for the better use of public lands. Physical land properties and land suitability were recorded, and parts of the public domain were released to private land users e.g. landless villagers.

After independence there was an increased demand to regulate and plan the use of the land. This was the result of:

- The need to diversify land use on uneconomic estate lands.
- The land reform and other land alienation schemes aimed at providing landless farmers with land.
- The huge Mahaweli irrigation and hydropower scheme and the need both to propagate and enforce land conservation practices within the upper Mahaweli catchment zone.
- The need to protect the near shore and coastal zone along the south-west coast.
- The regulation of land use in urban areas and flood-prone zones along major rivers.

Institutionalised Land Use Planning

The foundation of improved land use planning lies in establishing a base of professional land use planners supported by appropriate technical facilities. However, it was also recognised that better inter-government co-ordination and co-operation was a crucial factor in more effective planning.

In 1978 the Government of Sri Lanka consolidated various land-related agencies and ministries to form a new Ministry of Lands and Land Development. Subsequently a **new Land Use Policy Planning Division** was also established. In 1979 District Land Use Planning committees were formally established in all 24 districts of Sri Lanka. Their mandate was to assess the present land use situation and to co-ordinate land use related programmes of government agencies. These were based on indicative land use development plans.

Technical land use planning offices have been set up in each district. These are staffed by a District Land Use Planning Officer, two to three trained land use planners and a number of technical drafts personnel. District land use plans have now been completed in most districts, and the District Land Use Planning Divisions are currently working on individual Sub-District land use plans. Additionally, they are often called upon to provide technical expertise to government projects and development activities.

Problems and Challenges

The following problems have been associated with the use of institutionalised land use planning techniques:

- Massive encroachment of public lands despite numerous government laws and regulations designed to protect critical watersheds.
- Apparent lack of political will to enforce existing regulations.
- The legal nature of plans drawn up by the District Land Use Planning Offices is often unclear. So the office lacks the legal means of enforcing recommendations with other government agencies.
- Numerous government agencies are involved in land resource management and land use planning. This leads to overlapping functions and responsibilities, and to unclear mandates.
- The sector agencies at the regional and sub-regional level are fragmented and have little tradition of activity and programme co-ordination. Land use planning officers have experienced difficulties in getting their plans recognised and taken into consideration by other agencies.
- The general criteria used to determine land suitability fail to take into account regional peculiarities. In densely populated mountainous areas this has resulted in unrealistic proposals.

Land use has been restricted on steep slopes regardless of population density and actual land demands.

- Institutionalised land use plans have little influence on private land use development.

Success or failure in land use planning and co-ordination is largely determined at the district and sub-district levels. Official land use plans have to match the objectives and proposals of the DS division authority medium term development plans. In addition they must be incorporated into the plans and activities of numerous line agencies, non-government project activities and finally those of private land users.

Photo 5: **Sri Lankan farmers use aerial photographs to identify the major types of land use in their villages**

Well-researched analyses and technically perfect plans are useless if land use planners fail to convince both public administration and private land users of the validity and significance of their findings and recommendations. This can only be achieved through the active participation of all of the concerned land use parties in the planning process itself. The participatory planning process is frequently used in foreign funded rural development and natural resource management projects. Chapter

3.3 and chapter 4 in more detail will analyse some of the experiences various technical co-operation projects have had using these techniques.

3.3 Project Experiences with Land Use Planning

Foreign funded Integrated Rural Development Projects (IRDPs) play an important role in Sri Lanka's rural development strategy. Their mandate is to improve the living conditions of the rural population in the least developed parts of the country. This is done through strategies of integrated area development, village self-help mobilisation and the institutional strengthening of local and regional public sector services. IRDPs operate on a district basis, identifying the least developed and most remote parts of the district as their target area. The average project duration is between 10 and 15 years. This is due to the complex nature of the IRDPs activities and the long gestation of project impact.

Integrated Rural Development Projects

In the mid-1990s IRDPs were in operation in 14 of the 24 districts in Sri Lanka. This covered most rural areas, with the exception of the north-eastern part of the country troubled by security problems.

Individual IDRPs have considerable flexibility in their approaches and strategies. However, the initial period of IRDP activities in most areas was characterised by an emphasis on improving the service delivery infrastructure. Roads, public water supply and irrigation facilities were targeted. Since the mid-1980s there has been a shift towards focusing more on the needs of rural areas and the approach has become participatory and self-help oriented.

IRDP: Experiences and Approaches to LUP

IRDPs have always been concerned with land use planning and natural resource management issues because:

- they often operate in areas with limited natural resources.
- unclear land ownership has resulted in a reluctance to adopt new techniques aimed at encouraging sustainable land management This has made it more difficult to improve farm productivity and income.
- DRPs are active in many sectors and so need to establish a comprehensive data base for their areas. These data bases include a wide range of physical and socio-economic indicators. A standard set of studies commissioned by an IRDP includes a land use survey and a regional land resource analysis. The newly established district Land Use Planning

Offices are frequently involved in this task.

Two main planning approaches can be distinguished. These reflect two very different sets of priorities. They are:

- the "institutional land use planning" approach
- the "participatory land use planning" approach.

The first approach is characterised by:

- strong involvement of, and close co-operation with the official land use planning authority in this case the District Land Use Planning Division.
- emphasis on a district-wide inventory of land resources, land use types and land use trends. Priority areas for resource protection and conservation are also identified.
- a "town and country" perspective of "organising" optimal land use
- emphasis on the use of sophisticated land use inventory and planning tools
- efforts to improve co-ordination and participation at district and sub-district government levels
- emphasis on "statutory" role of a land use plan e.g. to prevent environmentally destructive land uses
- implementation of land improvement or protection initiatives through government agencies, or under their guidance. High input from public sector.

Dutch government funded IRDPs in Nuwara Eliya and Ratnapura districts are both examples of projects favouring this approach.

The "Participatory Land Use Planning" approach incorporates the following elements:

- no or only minimal involvement of official or professional land use planning authorities.
- strong bottom-up planning perspective. Emphasis on the principle of land use planning both by and for the actual land users i.e. the local farmers.
- focus on land use planning within village or traditional community boundaries. This is in contrast to planning for large "functional" areas such as major river catchment or irrigation areas.
- use of simple, low-cost planning techniques to foster active participation and consensus finding among villagers.
- involvement of outsiders primarily as moderators and

facilitators rather than as advisors.

The "Participatory Dry Zone Development Project" (NWP-DZPDP) in the North-Western Province is a good example of this approach. More typical, however, are projects which adopt a hybrid form, combining elements of both institutional and participatory planning (see chapter 4.2).

The IRDP in the Moneragala district has been trying to promote bottom-up village planning and self-help mobilisation in order to identify proposals for communal or village-based development projects. These proposals are consolidated at the sub-district level and financial and technical support sought from the government, with counterpart funding from the IRDP. Project proposals are checked to ensure they do not conflict with the environmental protection recommendations in the sub-districts "indicative land use plans". These plans were also co-financed by the IRDP.

3.4 Land Use Planning with Private Companies

The Upper Mahaweli Catchment (UMC) which includes the sub-catchments of four reservoirs, is providing irrigation water for rice cultivation in lowland areas and contributes 60 % to the electricity supply in Sri Lanka through hydro power generation. In addition this area is home for 1/5 of the total Sri Lankan population. The demand on land and water of the UMC is thus determined by both national needs (irrigation and water) and regional and local needs (water for small scale irrigation, drinking, land for agricultural and non-agricultural purposes).

The largest single land use type in the UMC is estate managed tea as it covers about 20% of the area. Although the tea sector experienced a decline in importance in the Sri Lankan economy in the last decades, it remains a major foreign exchange earner and employer in the hill country.

The privatisation of the tea estate management in 1992 (the land is still owned by the government) resulted in increased pressure to make the estates more profitable. The main problems facing tea estate management today are a surplus labour force on many estates, poorly managed tea due to over-aged tea fields, low stocking density due to neglected infilling, a slow rate of replanting with high yielding clonal plant material and low soil productivity on many tea fields due to high soil erosion rates and severe soil

degradation. Because of these factors Sri Lankan tea production today is generally not economically viable. This has subsequently created increased interest by estates to start map-based land use planning which has resulted in co-operation between two projects, their Sri Lankan Counterpart and the tea estate management.

The Sri Lankan-German Upper Mahaweli Watershed Management Project (UMWP) and the Sri Lankan-British Forestry Land Use Mapping Project (FORLUMP) are both attached to the Environment and Forest Conservation Division of the Mahaweli Authority of Sri Lanka. Their aim is to contribute to a reduction in the level of soil erosion and soil degradation in the Upper Mahaweli Catchment and to a lower sedimentation rate of the reservoirs along the Mahaweli River.

Some FORLUMP objectives are the provision of land use maps at a 1:10,000 scale of land use, slopes, soils and base details, the mapping of erosion susceptibility and the development of appropriate land use planning procedures. The UMWP aims to identify and apply soil and water conservation measures and it gives initial support for the implementation of these practices to various co-operating agencies.

As tea is the main form of land use in the UMC, changes towards better crop management will have a major impact on the physical condition of the catchment. It is therefore in the interest of both projects to support the efforts of the tea estates to increase their productivity and to conserve their land resources.

Land Use Planning Process

The two projects, FORLUMP and UMWP, co-operate and supplement each other in assisting the superintendents of a Tea Estate Group to draw up a land use plan and implement it. The objective is to arrive at a mid and long term investment plan for tea.

Step 1: FORLUMP provides training in the use of maps and initiates discussion on land use and planning for tea estates with the aim of determining management objectives and identifying land use options (such as infilling and/or replanting of tea, afforestation, diversification of crop production and soil conservation). A list of planning criteria (such as land use and slope) and

other considerations (e.g. soil characteristics, tea yields etc.) is drawn up to aid the selection of land use options. The role of UMWP in this process is to provide information on biological soil conservation and soil fertility improvement measures. It assesses the economic viability of different land use options especially with regard to soil conservation and afforestation.

Step 2: Superintendents are provided with the relevant maps of their estate to draw up a preliminary land use plan on their own. Verification and confirmation is done using field investigation, checking office records and consulting representatives of the estate population.

Step 3: During a follow-up session, the land use plans in the form of a five year investment plan are presented by the superintendents and discussed with project staff. Budget requirements for each proposed land use option are added.

Step 4: Before implementation begins UMWP assists with an initial package for soil conservation (seed material for multiplication and test and demonstration plots).

Given the fact that only a few people (the superintendents of a Tea Estate Group) are responsible for a land area of 2,000 to 3,000 ha the elaboration and implementation of a land use plan is made easy. It has turned out that the land use plans were used by the superintendents as a tool to make their respective superiors in the Management Agent Company aware of the problems faced by the estates and of the feasible options to make them economically viable.

After the Management Company decides on a land use plan, the Plantation Monitoring Unit of the Ministry of Plantation Industries has to give its approval before implementation. The Mahaweli Authority, the counterpart of the two projects, has the right to comment and object to any land use change which would have detrimental effects on the catchment hydrology. Other sector agencies are not involved in the land use planning process and its implementation.

The main experiences derived from the above land use planning process with private companies are:

- Land use plans are more likely to be relevant for implementation when developed by land managers themselves (in this case private companies). The role of government agencies and projects in supporting this process is to supply information and tools.
- Where change of land use and resource conservation is the main objective of a project, a co-operation with land managers who can make decisions on a large area of land will achieve the fastest project impact.
- In case projects and government agencies do not have a mandate for law enforcement in resource conservation they have to offer support for land use practices which combine the objectives of increased profitability of land use with resource conservation so that land users will adopt these practices and an impact on the protection of land resources will be achieved.

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4 Participatory Approaches in Land Use Planning

Karin Janz

4.1 Background

Many GTZ supported projects in Asia now develop and use participatory approaches in all stages of planning and implementation of programmes. The aim is to make the projects sustainable by ensuring the participation of all beneficiaries, especially the poorer members of the population. As a consequence, the agenda of active participation, empowerment and poverty alleviation incorporates a differentiated view of development - where factors such as gender, ethnicity, class, age, and religion are taken into account - with important implications for the planning process.

Participation means the development of specific, adapted and dialogue-oriented strategies. The tools for participation described in this chapter show possible ways and means within this strategy. Most of the projects are working in rural development with land use planning components. Within this frame, they have tested and adapted several methods for participation and have developed their own, suitable approaches. The following projects and concepts were selected for presentation in this chapter:

- The CIAD in China has used participatory methods to carry out a **continuing situation analysis for village and township planning**. The identified needs are reflected in the project's training activities.

- The TG-HDP in Thailand carries out **Community Based Landuse Planning and Local Watershed Management** as a co-ordinated and integrated approach that fits into the existing government structure level. In addition, they use gender differentiated methods and approaches.

- The NWP Dry Zone Participatory Development Project in Sri Lanka has developed a concept of **Participatory Village Resource Management Planning**. It has an innovative character and therefore emphasis is given to training of staff at all levels. Detailed training guidelines especially for Participatory Rural Appraisal (PRA) for Village Resource Management Planning have been worked out.

- The Indo-German Watershed Development Program calls its approach **"Democratisation of Watershed Management**."

  Village self help groups were formed to develop common interests and action plans for their micro watershed management.

4.2 Participatory Tools in the Project Cycle

This chapter describes examples from various projects concerning the integration of participatory approaches into the project cycle:

- Situation and Gender Analysis
- Planning
- Implementation
- Dissemination

Examples from the Projects

The examples are selected because they all show specific project experience but have common denominators. They show tools that have been developed for the specific situation in the project and are embedded in an overall process for participatory planning. Some of the experiences were very successful, others still need time for further development.

Situation Analysis (CIAD, PR, China)

Project Purpose: The Centre of Integrated Agricultural Development (CIAD) aims at developing participatory planning approaches for rural development in China, lt operates nation-wide and is now approached by local and regional decision makers who seek advice in their fields of works. Locally adapted means are then developed in order to solve their problems. GTZ supported the CIAD from 1984 to 1994. Now, the Chinese staff continues these activities.

Context and Concept: Since 1990, the CIAD has carried out a participatory situation analysis in order to understand the needs and the potential of rural planning and extension. Special emphasis was given to testing and developing participatory training methods. The research questions to be investigated were:

- what are the problems and the potential of the farmers in the pilot areas of ClAD's activities?
- who are the actors in the local decision-making process?
- what are the problems and the potential of the local decision makers in the region?
- what are the needs, relating to these groups, concerning training for local planning and extension?

- what are appropriate methods for planning at the local level and training at the CIAD?
- what is the potential of the teachers and planners at the CIAD?
- what are the facilities of other institutions both national and international ?

The results enabled the CIAD to carry out adapted training courses in the fields of regional planning, training and extension, management and communication and agricultural techniques. It has developed a planning and training approach which is unique to the special situation where it is applied.

Examples of Participatory Techniques:

Workshops

Some villages, where CIAD has been active before, were selected and workshops for "Assessing Problems and Potentials" were carried out. Participants were women and men farmers and local decision makers. During the workshops, several participatory techniques such as visualisation, working groups and group presentation, buzzing groups, role plays and a revised ZOPP-methodology were applied.

Photo 6: **PRA workshop in China: a farmer participant explains the village resource plan and mobility diagrams**

Open Questionnaires

Semi-structured interviews were carried out with men and women farmers. More structured interviews were conducted with persons who work in the local administration.

Transects

In every village, transect walks were carried out, especially with "innovative farmers". During these walks the "innovative farmers" explained their ideas to the planners and extension workers.

Mapping and Diagramming

In villages and townships where CIAD will work in the future, Village Profiles based on discussions with village leaders and farmers were developed. They reflect the concepts from different perspectives such as male leaders, women cadres and poor, middle and rich male and female farmers.

In addition to statistics gathered from secondary sources, special maps and diagrams were drawn showing labour distribution of sexes, agricultural calendars of male and female farmers, village land use maps, mobility maps and diagrams showing the educational level of the population.

Identification of Pilot Areas and Key Actors

After several villages and townships had been assessed, seven of them were selected as pilot areas. One criteria for the selection, was the willingness of the local leaders to apply participatory planning approaches. In addition, in many villages, key actors were identified who are more innovative than others. They were promoted and supported to share their knowledge with other villagers.

Gender Analysis

In the pilot villages, gender analysis' were carried out focusing on the assessment on women's participation in rural development. It included topics such as women's participation in community and political development, women's participation in economic development, women and productive activities, women and credit, women and the environment, women and education and training, women's access to extension, decision making, problems and the potential of rural women.

Training of Trainers

All activities also served as a training in participatory approaches for the Chinese trainers and decision makers. For that reason students of Beijing Agricultural University or local staff of the Extension and Planning Bureaus always accompanied the team.

Assessment of Experiences

In general, all actors agreed that there is a need for a participatory planning approach. China still has atop-down planning system which requires the farmers to grow a certain amount of grain, cotton and oil seeds. That is why, in the beginning, participants of the workshops made the "government" responsible for all the problems they had. However, after the discussions within the situation analysis, they became aware that there are many problems that they can resolve themselves. Moreover, they saw that there are different perspectives of problems and potentials within the village (very often for the first time, men listened when; women presented their view and vice versa).

The farmers and local decision makers stated clearly which of the participatory methods they do not like: role play and picture drawing. Most of them expressed that they are afraid of loosing their face when they act as children (according to their opinion, drawing and playing is related to children), especially in the presence of different hierarchical levels. They also said clearly that they want experts from the Agricultural University, where the CIAD is located and from the GTZ who can help them with their cultivation and management techniques.

The CIAD responded and carried out several workshops, for regional planning, extension management and animal husbandry. Farmers were invited to go to the Agricultural University and to other villages in the region to discuss possible solutions to their problems. Since the GTZ support did not include actions at the local level, all these activities were financed by the local institutions. That is why they are more likely to be continued after the GTZ support has finished.

Originally the situation analysis was planned for the duration of one year. However, it became obvious, that each action brought new conclusions and implications. Now, CIAD conducts a

"continuing situation analysis" like a research-action-learning approach and evaluates and assesses every activity taking the previously mentioned research question into account.

Gender Analysis: (TG-HDP, Thailand)

Project Purpose: The TG-HDP carries out Community Based Land Use Planning as a coordinated and integrated approach. Special emphasis was given to the different actors in the villages such as poor, middle and rich men and women.

Context and Concept: Within the participatory appraisal approach, the project has developed the concept of Rural Systems Analysis. It is a useful tool to find out basic information about a community in order to plan and monitor projects. This information is also important for planners in order to know who they should be addressing in terms of the agricultural labour force and the people with special skills.

All techniques are applied in a gender and age-differentiated way. They include, at the community level aspects of village history, village maps, manmade and natural resources as well as human resources of the village. At the household level they include activity charts, family structures, access to groups and leadership, time use charts, annual labour calendars, the social network and households' perception of their own welfare.

Assessment of Experiences:

Some points on gender:

- Women are responsible for most reproductive tasks in the household; this applies to all economic levels.
- Women's work is broken into more numerous tasks than men's. Men have larger blocks of time available to them.
- Women do fewer tasks than men which lead directly to cash income, but in almost all cases women keep the money and can have the final decision on what to do with it.
- In wealthier households women have more decision-making power over the entire range of activities of the household.
- In poor households, women have less decision-making power over the entire range of activites in the household. The women has lower status within the household.
- Men have more contact with outsiders than women (e.g. government officials), except in the case of rich women who may have equal contact with outsiders.

Implications:

Attention must be paid as much to poverty as to gender when designing programmes with villagers.

- Attention must be paid to seasonal variations.
- It must be ensured that practical needs of all women are reached, not just the wealthier households.
- Ways and means must be developed in collaboration with the wealthier household to support the poor households in the village.
- Project and government staff must be sensitised to a combination of a gender/poverty approach.
- In many households, as men have more free time than women, it would be useful to raise the men's awareness about the amount of work the women are doing.

Photo 7: **Farmers in Hebei Province, China, study aerial photographs of their village before starting a transect walk.**

Table 4.1: Gender Differntiated Time Use Charts: Example of two Black Lahu Families in Northern Thailand

Summary of the daily work schedule based on a sample of six households

POOR FAMILY		DRY SEASON (Dec.-Apr.)		RICH FAMILY	
WOMEN (Head)	**TIME**	**MEN (Head)**	**WOMEN (Head)**	**TIME**	**MEN (Head)**
- Wake up	6:00	- Wake up	- Wake up	5:00	- Wake up
- Feed chicken	6:30	- Hunting	- Feed chicken	6:00	- Look after cattle in the forest
- Fetch water	7:00	- Blacksmith work (knife / diggin tools, axe)	- Fetch water	7:00	- Milling rice (service)
- Make cooking fire	7:30		- Cooking	7:00	
- Cooking			- Time to relax	8:00	- Breakfast
- Breakfast	8:30	- Breakfast	- Breakfast	9:00	- Walk to field (< 30 minutes)
- Washing dishes					- Field preparation for next season (cutting wood / burning) or
- Feeding pigs	9:00	- Walk to fields (up to 1.5 hrs)	- Feeding pigs	10:00	- Blacksmith
- Sewing clothes for New family members	9:30		- Sewing clothes for New family members		- Buying or selling cattle and pigs
- Look after children		- -Field preparation for next season (cutting wood / burning)	- Cooking	14:30	
- Washing clothes		- Looking after cattle	- Lunch at home	15:00	- Visit other villages
- Cutting banana trunk for pigs		- Cur firewood	- Cutting banana trunk for pigs		
- Pounding rice	16:30				
- Feeding pigs	17:00	- Return home	- Feeding pigs	17:00	
- Cooking	18:00	- Bath	- Cooking	18:00	- Resting
- Eating dinner	19:00	- Eating dinner	- Eating dinner	19:00	- Eating dinner
- Bath	19:30	- Talk to neighbours	- Sweeping / clean house		- Talk to neighboours or watch TV
- Talk to neighboours	20:00		- Talk to neighboours or watch TV	20:00	
- Go to bed	22:00	- Go to bed	- Go to bed	22:00	- Go to bed

Note:

Women look also after small children

Source: TG – HDP, Thailand

Planning (TG-HDPP Thailand)

Project Purpose: Land use planning was not considered in the initial project design of the Thai-German Highland Development Program (TG-HDP). However, there was a continuous development from crop replacement, to a cropping system approach emphasising soil and water conservation, to sustainable farming system development and community based land use planning including local watershed management (CLM).

Context and Concept: The objectives of Community Based Land Use Planning and Local Watershed Management are:

- To increase the mutual understanding among government officials and farmers about present land use systems and constraints.
- To stimulate awareness about ongoing degradation processes and the need for improved management or conservation of limited resources.
- To stimulate discussions about land use problems and their possible solutions among farmers and between farmers and government officials.
- To facilitate and support individuals and the community in better planning of land use changes and monitoring of the esults of activities implemented by farmers.
- To facilitate the process of achieving agreements between villagers and government officials on villages boundaries (esp. in forest reserves, national parks and wildlife sanctuaries) and to agree on how the forest and village land should be managed.
- To improve co-operation among rural planners in the highlands in order to achieve a better co-ordinated and integrated development approach.

The CLM-process includes the following working steps:

Step 1: Preparation phase

Step 2: Introduction of the CLM process in the villages

Step 3: The CLM process and activities of the land use planning team

Step 4: Data processing and mapping

Step 5: Presentation of results for policy decision making

Examples of Participatory Techniques:

Village Survey and Mapping

During the introductory phase of the CLM process, the land use planning team initiated surveys using Participatory Rural Appraisal (PRA) methods or Rural Systems Analysis (RSA) methods to collect data not retrievable from secondary sources.

The mapping of the village area is done during field visits and farmer interviews in order to identify the target areas in the village map and to cover at least 90 % of the forest and agricultural area utilised by the villagers, the mapping includes the approximate identification of the village area and the village sketch map establishment.

Construction of the Topographic Model

Two types of models were developed: the Styrofoam model and the clay and cement model.

Both models can be used as a participatory planning tool to discuss:

Photo 8: Villagers in Northern Thailand identify main village landmarks on a topographic model.

- improvement of village infrastructure

- improvement of land use and reduction of erosion
- demarcation of village boundaries
- land use planning for the whole watershed area

CLM Village Meeting

Village meetings are held regularly in order to discuss the ongoing CLM process with the villagers and the land use planning team. In addition, activities for implementation, from farmers' requests, are identified and planned.

Land Use Maps and Measurement of Identified Land Use Categories

Intensive villagers discussion will lead to some decisions concerning the different land use categories. Then, land use maps are establish by using means like ground measurements, aerial photographs, satellite images and global positioning systems.

Assessment of Experiences:

CLM aiming at developing a coordinated an integrated approach that fits into the existing government structure government structure at field level. It enhances the co-operation between farmers and planners from the different agencies. It promotes participatory land use planning by villages and government officers.

However, legal framework conditions such as citizenship and land use rights of farmers and the prohibition of land use by farmers in the highland areas are still unresolved. In addition, government officer still have limited skills to work with hilltribe farmers in a participatory manner.

Implementation: (IGWDP, India)

Project Purpose: The Social Centre in Ahmednagar is one of the, main actors in the Indo-German Watershed Development Program (IGWDP), financed by the German KfW (The German Development Bank) and GTZ. Originally, it worked for the social and economical uplifting of the rural poor, mainly the small and marginal farmers of weaker sections of the society. From 1984, the Social Centre has changed its role to become a facilitator, for awareness creation among the rural families and organisation of farmers into community and comprehensive village watershed development.

Context and Concept:

The Creation of Village Watershed Committees

First, several villages were selected which are remote, not easily accessible and affected by drought and famine. After a process of awareness and trust building by the Social Centre, a contact person in the village was selected. This person should be interested in public/social work and service, has the ability and potential to organise people and not be associated with a political party. Then village meetings were organised to identify problems and look for strategie store solve them. Emphasis was given to the participation of weaker groups (landless and women who usually do not participate in public meetings). Villagers were also informed about government schemes and how to participate in those.

After these initial village meetings (gram sabha), Village Watershed Committees (VWC) were established consisting of representatives from each settlement in the village together with representatives of women and landless. The VWC takes decisions about the watershed development in the respective villages, e.g. a ban on free grazing, a ban on tree cutting within the village boundary, or the provision of free labour on the basis of two person days per months.

In 1989, the government launched a scheme called "Rural Development through Labour Power". The VWC decided to participate in this scheme. The Social Centre gave the assurance that it would work with the people and would undertake complementary finance where government provision did not exist.

The VWC is now the local actor in implementing activities such as contour bunding, soil conservation, welfare schemes such as building of houses, raising poultry etc. Since the area is drought affected, priorities are given to the development of water resources and the establishment of wells. Income generating activities such as dairy development, horticulture and pasture development, improved agricultural techniques and non-farm activities were jointly decided and implemented.

Assessment of Experiences:

In the first three years of implementation, the majority of villagers, especially the landless and farmers with rained farms have profited from a regular and reasonably substantial income created by programme activities. Farmers decided how to develop their agrigcultural resources, horticulture was introduced and wasteland was planted with locally adapted species. This led to an increase of employment and farm income, and, in turn, migration was reduced.

In addition, the impact on the social situation of the marginalised groups is evident. They are not only represented in the VWC, but they also actively participate in decisions concerning village matters. The backward castes now participate in all village festivities and religious ceremonies unlike in the past.

Members of the VWC have acquired expertise in soil and water conservation and are now capable of maintaining the conservation structures built. They have also become familiar with various government departments, banks etc.

Regular village and VWC meetings have led to a continuos monitoring of decisions taken and implemented. The social responsibility of the leaders has been enhanced and strengthened.

Villagers now actively promote the benefits of Watershed Development to other villages and have already started preparing neighbouring villages to establish a VWC.

In general, people have become more active in promoting their own economic, cultural and social interests as can be seen by the improvement in functioning of existing indigenous institutions a well as by the establishment of new organizations.

Dissemi-nation: (NWP-DZPDP, Sri Lanka)

Project Purpose: The North-Western Province Dry Zone Participatory Development Project (NWP-DZPDP) aims at initiating participatory planning processes at village level in order to facilitate a more problem- and poverty-oriented implementation of a large-scale foreign funded poverty alleviation programme. Thereby it is expected that the experiences made will persuade villagers to co-operate more and to mobilise their own resources.

Context and Concept of Participatory Activities:

The core of the project is the so-called "Beneficiary Participation Programme" (BPP). The BPP initiates and facilitates village-level planning workshops where communities identify their problems and constraints in the use of village-based resources (primarily land and water) and agree on priorities and activities in order to address these problems. The planning process is facilitated by interdisciplinary teams of government officers, the "Technical Support Teams" (TST). They utilise participatory tools and methods such as "Participatory Rural Appraisal" (PRA) to facilitate the process of problem analysis, prioritisation and activity planning. The resulting "Village Resource Management Plans" are taken up by village organisations (mainly informal interest groups) for implementation. The officers who are members in the TST have the tasks to facilitate the planning process and to negotiate the assistance provided by the project. Later they are also responsible to provide assistance to those interest groups whose activities fall under the technical responsibility of their agency.

The Beneficiary Participation Program Unit conducts PRA-based training workshops for the members of the Technical Support Teams. The TSTs then facilitate the planning meetings in the villages and the preparation of the Village Resource Management Plan by the villagers.

The training workshops have the following objectives:

- To develop working skills and confidence amongst the participants in facilitating participatory village activities using relevant PRA techniques.
- To provide sufficient opportunities for each participant to become familiar with the PRA techniques appropriate for the village planning process.
- To initiate an attitudinal change among the participants to understand the need to learn from villagers and to assume the role of facilitators rather than planners and implementors.
- To enable the TST to negotiate the project assistance by making them familiar with the conditions and criteria for project support for particular activities.
- To help participants in formulating their own step by step working modules for their activities under the project.

- To develop skill and confidence among the core trainers in conducting PRA workshops for the TST members.

Example of Tools Used

At the training workshops, the following PRA techniques were taught and exercised (detailed description of PRA techniques see SCHÖNHUTH/KIEVELITZ):

Participatory Mapping/Modelling

- Seasonal Analysis
- Wealth Ranking
- Venn Diagramming
- Matrix Scoring/Ranking
- Transect Walk
- Visualisation of Changes and Trends
- Semi-structured Interviews

Assessment of Experiences:

Participatory planning processes have occurred in about 50 villages. The experiences are as follows:

- The TSTs had some difficulties in facilitating the process of preparing village resource management plans. They were not confident in moving on from appraisal to participatory planning. This was partly due to lack of an appropriate method, as PRA instruments are mainly geared towards appraisal, but did provide little assistance in the establishment of plans. Partly it was also because they were not used to negotiating with villages face to face about the assistance being provided by the project, which sometimes also required to reject a request made by villagers. The usual situation would be to accept the request in the village and to reject it later by a decision made in the office, where nobody has to take the personal blame for saying no.
- Another problem was that the planning process was kept very open, and as a result problems were prioritised where the project could not provide any assistance, because it was designed to render services only within a rigid package of components based upon strict delivery criteria. Thus the village planning process generated high expectations among

the people who spent their valuable time for the establishment of plans, which the project could not support or where the government agencies were very slow in providing assistance.

- Although people accept participatory concepts and behaviour during training courses, once they are back in their normal working system, many resort almost entirely to their previous styles and behaviour.
- The changes required to realise true participation in government development projects are so fundamental that sufficient time and resources must be provided in order to give the approach a fair chance to survive the early stages in project planing and implementation.

4.3 Where Are Participatory Methods Successful?

Participatory techniques can be used to moderate land use conflicts (between farmers with rained fields and farmers with irrigated farms, between men and women, between grain farmers and livestock farmers). Very often village meetings with a moderator/facilitator using visualisation techniques, form the first opportunity for the different parties to listen to each other and to understand the respective problems - the first step towards common planning. It becomes obvious that the role of the outsiders now has to change, too. Whether expatriates or national counterparts - both have to change from simply giving orders to implement predetermined plans, towards acting as facilitators - a learning process which has to be included in every project. Participatory approaches are also applied in the discussion of natural resource management. For example, if a decision about using land for agriculture or for tourism has to be made - joint trekking and mapping by villagers and planners can create the beginning of a sustainable planning process.

With regard to land use planning tools, these have to be combined with participatory techniques. The use of GIS technology, for example makes it easy, to overlay a soil classification derived from local knowledge with the scientific classification for the same area. But so far only very few projects have gained experience in this field. The aim of these projects dealing with sustainable land use planning should be to combine "scientific" and "indigenous" knowledge.

4.4 What are the Limits and Constraints?

Very often projects have just started to initiate concepts of participatory planning. If real participation means empowerment, it has to be a long process. Projects must be careful that PRA is not reduced towards a workshop on PRA which is carried out without any follow-up activities. In some projects participatory methods may not be supported because government does not support them, or the target group itself may not be interested in such methods because it resents the idea of a planning exercise anyway. In this case, special emphasis must be given to adapt methods and techniques to the local situation. One possibility is to integrate local decision makers into the development of the participatory strategies as much as possible.

Most of the Asian countries follow a strict top-down planning process. The planning organisations are fairly large, very hierarchically organised and their institutional culture is based on old traditions. They are often resistant to change. There is a danger that the transition to more participatory approaches is merely following a fashion and in practice little may have changed.

In addition, there is a pressure to achieve targets from all sides from GTZ as well as from the implementing institutions and local politicians. However, participatory planning can only be carried out with a significant shift in many areas including role reversal and this will take a long time. It should be made clear to all decision-makers that participatory planning is a long process and not a blueprint that can be implemented anywhere and anytime.

4.5 The Need for Integrating the Gender Approach

According to a GTZ evaluation in July 1994, only 7,2% of the projects carried out a gender specific analysis of the target groups. The picture in Asia is similar. Even in projects, where participatory methods are regularly applied, it is not clear whether these methods equally approach women and men, poor and richer members of the community.

A survey conducted on two development projects involved with natural resource management in India revealed that PRAs are unlikely to be equally accessible or open to all sections of the community. Initial PRA activities of the projects have rarely involved a full cross section of the village community. In the Kribco

Indo-British Rained Farming Project very few women attended the firs PRAs, their involvement was discontinuous and they did not have a role in the planning sessions.

Photo 9: Women usually perform specific tasks in the agricultural production cycle. A Gender Analysis will reveal specific details

Caution is needed, however, in treating "women" as a single group as shown in the example of TG-HDP time use charts. Women's access to the public meetings of PRA would vary with age, marital status, religion and class.

There is therefore a need for a significant modification of the PRA methodology in terms of social context, timing and techniques and careful adaptation to the local conditions. Participatory methods could increase the opportunities for women's participation. There is a need to create non-public environments in which women staff spend time. Once participatory methods are adapted to the needs of women, they enjoy expressing their needs and abilities through this route.

Two important points must be stated:

- The results of gender analysis should be used at all stages of the project cycle including discussions with government officials. Gender analysis itself is no guarantee that project objectives will be reached, the information must be used to design appropriate project and interventions.
- Women farmers themselves should provide the answers to questions about women farmers. Men tend to understate their

wives' roles and may be unable to describe accurately the task in which they do not directly participate. Moreover, responses should be verified by direct observation as women sometimes play down their own agricultural role.

Some projects in Asia have already developed successful tools for integrating the gender approach in their activities, however, these activities are generally not related to land use planning (e.g. the gender approach in agricultural extension of the Bondoc Development Program in the Philippines). Nevertheless, these approaches and experiences can be easily adapted to the needs in participatory land use planning.

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5 Role of Incentives in Resource Conservation Projects

Angelika Fleddermann

5.1 Introduction

Projects promoting resource conservation measures, e.g. soil conservation, often provide farmers with incentives to introduce practices which do not give immediate economic benefits and which they would therefore not apply on their own volition. It is assumed that land users only need initial support because once the economic benefits become obvious, they will continue to maintain the conservation practices.

Farmers are provided with various kinds of support not only by projects but also by non-governmental and governmental organisations. Unlike most other countries in the Asian Pacific region for example Thailand, the Sri Lankan economic policy, especially in the agricultural sector, has been characterised by its welfare and subsidy programmes for the last 3 decades. Farmers are therefore quite used to receiving external support. Standard programmes implemented by various organisations also include subsidy schemes for soil conservation measures. However, many farmers cultivating steep, erosion-prone slopes do not qualify for these schemes (e.g. small holders cultivating vegetables or other upland crops).

In this study incentives are defined as "any support provided by projects or government organisations in exchange for the adoption of measures which are environmentally desired". Incentives range from free inputs (seed/plant material, fertiliser) to monetary payments. Training, excursions and extension are considered to be part of any agricultural programme and therefore not considered as incentives in this paper.

This chapter compares the incentive policy of three projects, in Thailand and Sri Lanka and of one private company in Sri Lanka and analyses the successes and failures of their support. As all four agencies mainly promote soil conservation, the analysis focuses on incentives for these measures.

5.2 Description of Incentive Policy for Soil Conservation

In table 5.1 the differences of the incentive strategy of the three projects are presented according to the following criteria: objectives of resource conservation, beneficiaries of the support, scope of implementation, kind and extent of support, commitment by the farmer, type of agreement between project and target group and justification for incentive policy.

The incentive policy of the private company is similar to that of one project (case B) although their financial contribution for the purchase of plant material for soil conservation measures is less. The company assists tobacco farmers (their target group) with soil conservation measures in order to restore its bad public image as being the cause of large scale land degradation. The company's own field instructors strictly monitor the adoption of the measures. Farmers do not receive any input for growing tobacco and the company does not buy back the leaves if the farmers do not maintain the conservation measures. As a result of this rather strict handling of incentives, within 5 years 3000 ha of tobacco land in erosion-prone areas has been covered with hedges as a biological soil conservation measure.

Photo 10: Typical SALT hedgerows in a tobacco field neat Kandy, Sri Lanka

Table 5.1: General Description of Support to Land Users for Resource Conservation Measures

	Project A	Project B	Project C
Observation of resource conservation	- Promotion of new farm enterprises to substitute illegal Opium cultivation - Reduction of soil erosion and degradation to reduce sedimentation of reservoirs in the lowland areas and deterioration of the watersheds (highland-lowland interaction) - Protection of natural forest	Reduction of soil erosion and degradation to protect the watershed and to reduce the sedimentation of reservoirs (highland.lowland interaction)	- Stabilisation of yield levels and farm income - Conservation of land resources - Protection of micro-tank catchments
Beneficiaries of the support	1. Small holders, cultivating rainfed upland land 2. Extension worker	1. Small holders (0.5 – 1 ha) 2. Tea estates	Small holders, mainly cultivating upland rainfed land
Scope of implementation **(No. of beneficiaries / area extent)**	300-400 farmers in 60 villages	1. 3,000 farmers in 6 years addressed through various agencies 2. 20 tea estates	300 farmers in 35 groups (30 villages) 1.5 years
Kind of support	1. Inputs (fertiliser, improved tree crop varieties, seeds for soil conservation); plus monetary incentives in case s + w conservation measures were correctly implemented plus payments to the village fund after 1990: free inputs, no monetary payments 2. Incentive payments (3:6) after '90: no payments	1. 1988 – 92 planting material, 1992 to date financial contribution 2. Seed material	Planting material: - for soil conservation - for the improvement of farm productivity, (mainly seeds of new varieties) - for the establishment of private nurseries (mother plants)
Extent of support	1. 1987 – 90: free inputs for the cultivation of min. 3 ral (0.5 ha) of land and incentive payment acc. to correct implementation of the package (Class A 1,000 B/rai; Class B 500 B/rai; Class C no payments) 2. 1987-90: Per 2-300 m of grass strips EW received 3,000 B. up to a max. of 15,000 B. (3:6)	1. Until 1992: plants / seeds for soil conservation measures for 1 ac of land and tree seedlings; to date: financial contribution equal to costs of purchase of planting material 2. Seeds for establishing a seed multiplication and demonstration plot	only on a test basis, as much as necessary to test an innovation
Committment by the farmer	Implementation of a fixed package of different conservation measures on at least 0.5 ha.	Implementation of a hedgerow system (Slooping Agriculture Land Technology) on at least 0.5 ha of land	Innovations have to be tested and evaluated, experience shared with a farmer group and seed material passed on to other farmers
Type of agreement	Verbal announcement of conditions and criteria, use of visual aids	1. With single households, written 2. no agreement	verbal, with group in meetings (results visualised on charts)
Justification of incentive policy	- Incentive payments as compensation for the yield loss (to cover the risk) - Inputs and incentive payments to achieve a fast and overall visible impact - Motivation of extension worker	- Demonstration effect on other farmer - Small holders can not afford the financial and labour input on their own as they are living on the poverty line - Some species suitable for soil conservation are not freely available	- "Low incentive policy" in order not to undermine Self-Help activities and group formation - Farmer should test new innovations on a small scale thus only small quantities of inputs required

The project B and the private company only provide inputs as incentives for the implementation of soil conservation measures. Farmers are expected to contribute their own labour and to bear negative effects such as temporary income reduction due to the loss of a part of their land. The project A supported farmers with additional monetary payments to cover the risk of applying insufficiently tested soil conservation measures. Project C expects farmers to pass on the inputs which they received from the project to other farmers, after they have experienced the expected benefit.

The need for **monitoring** the adoption of resource conservation measures for which incentives have been paid, depends on the extent of the support. Close monitoring is done in cases where monetary payments depend on the quality of the implementation, e.g. project A paid the incentives only to farmers who adopted a whole package of relatively strict measures (see table 5.1).

After the introduction of the financial contribution, project B and the private company alike pay farmers in two installments (64% 3 months after inception and 36% after 1 year). The second installment depends on the successful maintenance of the conservation measures. In the case of project C, monitoring is limited to self evaluation by the land users with the aim of learning from each other and to find out which innovations are appropriate under different conditions.

5.3 Conclusions

The experiences projects had with the incentive policy chosen depends, among other factors, on the degree of support given.

High degree of incentives

During the time when monetary payments were given, project A experienced a **rapid adoption** of the conservation package. However problems also emerged. Communication between farmers mainly **focused on the mode of incentive payments** rather than on their experience with the conservation package. Furthermore the project felt that the package, with it's rather rigid measures, **hampered an adaptation process** of the technology. If farmers were not strictly following the implementation procedures of the conservation measures, they would not qualify for monetary payments. Consequently, the project introduced a more flexible

approach where inputs were provided in order to first test new practices on a small scale before being approved and implemented on a larger scale. In general a high degree of incentives especially monetary payments necessitates projects having to **invest a lot of personal and physical resources to monitor farmers** activities. The projects mentioned here do not specifically emphasise that a high degree of support could be **contradictory to other project objectives** such as self-help promotion, but for this reason other projects tend to use a lower level of incentives.

Low degree of incentives

Project C and also project A, in the later stage, experienced a **slow initial implementation of conservation measures** due to the low level of support. The **rate of adoption is normally unpredictable,** which causes projects problems as they have to show visible results at some stage to counterparts and donor agencies.

Even if projects give only a little support, many farmers adopt the conservation measures with the ulterior motive of **assuring their land use rights.** Understanding their motives is therefore important to the sustainability of their activities (example project C). After the project A stopped giving monetary payments, they found out that 60% of the farmers still maintained the conservation measures. Some farmers did so because they feared they would jeopardise their land security and ID cards. Another example is the privatised estate sector in Sri Lanka where the application of biological erosion control seems to be more sustainable because the long term use of land resources is guaranteed. Another factor to secure the long-term maintenance of biological erosion control is the **economic viability of the whole farming system.** If a project does not identify economically viable enterprises **the sustainability of resource management measures** can not be assured (see also chapter 7).

The **objectives of the promotion of resource conservation measures** influence the type and extent of incentives given to land-holders (see table 5.1). Many projects, as for example, project A and B and the private company which tend to use a high degree

of support to encourage farmers to adopt soil conservation measures are often under pressure to achieve a high adoption rate. They need to produce a visible effect in terms of physical structures in the field in a short period of time, because they have to cope with external pressures from governmental institutions or the public and/or they are expected to considerably contribute to a reduction of "on - and off-site" degradation. According to the experience of project B which has to produce a notable positive impact on the land area, shows that to initiate the multiplication effect as well as for large-scale implementation, payments to land users are indispensable.

Other projects (like case C) are not primarily directed towards an off-site impact. Here land degradation is significant only because in the long run it decreases the income of the land users themselves. The pressures from outside are less and therefore more time can be given for farmers to experiment with innovations themselves.

From the four examples described in this paper it can be deduced that **the incentive policy of projects** depends on the objective of the project programme and specially on the objectives and reasons of the promotion of resource conservation measures. In detail it depends on whether,

- the expected benefit is only on-site or also off-site
- the expected adoption rate is slow and on a test basis or fast and complete ('as recommended')
- pressures other than from the counterpart and donor agency are lacking or prevailing (e.g. law enforcement).

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6 Institutional and Organizational Aspects of Geographic Information Systems (GIS) in Asian Projects

Elke Eller

6.1 Introduction

Over the past decades the technology of Geographic Information System (GIS) has developed rapidly. In business, government and science it is nowadays accepted as helpful decision-making tool. There is an increasing concern for spatial aspects in development planning, urgently needed to deal better with intersectoral disparities, regional imbalances and inequalities.

Efforts have been undertaken in the past to develop land information and geographic information systems to support land management issues. The application of GIS in the planning context is also increasingly acknowledged in developing countries.

The introduction of innovative tools can be effective, if they are an integrated part of structures and working processes. In Asia, the identification of appropriate institutions and functional organizational set-ups are main concerns in this context, rather than the installation and maintenance of hardware and software.

6.2 Institutional and Organisational Environment

Five Asian projects were selected introducing a variety of GIS types from **Project-oriented** to **Institution-supporting** at different institutional levels (table 6.1).

Project-oriented GIS operate within the framework of a specific project only. They could assist, for instance, a project to answer specific spatial questions. A **Project-oriented GIS** has a time limitation and is restricted for use within the confines of one project. Its integration is easy and – in most cases – not aimed at reaching sustainability.

Institution-supporting GIS are usually integrated in the structure of planning institutions. The systems are installed permanently to improve the overall planning capacities of the organization. Some **Institution-supporting GIS** offer services to outside users (**Service GIS**).

The selected projects are either **Institution-supporting GIS** or **Service GIS** (table 6.1). The Sri Lankan project FORLUMP targets

GIS for specific applications in a defined area (Upper Mahaweli Catchment) and is implemented at the Mahaweli Authority.

The LUPAM project in Indonesia divides decision and implementation of the project at two different institutional levels. The National Land Board (Jakarta) is the line agency, whereas the pilot provinces are located in Kalimantan and Sumatra.

The FOMISS project in Sarawak, Malaysia uses a GIS for forest management issues. The project strengthens the capacities of an existing GIS Unit in the Sarawak Forest Department.

FORLUMP, LUPAM and FOMISS are **Institution-supporting GIS**. FORLUMP is a combination of both **Institution-supporting** and **Service GIS**, which allows the project to generate additional funds from outside users.

Typical **Service GIS** are ICIMOD / MENRIS and GIS Cebu Province. These are usually established at higher provincial or national levels.

The demand for a **Service GIS** results mainly from the following problems:

- Fluctuation of personnel;
- Maintenance of hardware and software;
- Sustainability is unclear.

Five Asian projects with strong GIS components are shown in the table below:

Table 6.1: Types of GIS in selected Asian projects

Name of Project	Mountain Environment & Natural Resource Information System (MENRIS at ICIMOD), GTZ	Land Use Planning & Mapping Project (LUPAM), GTZ	GIS Cebu Province, GTZ / CIM	Forest & Land Use Mapping Project (FORLUMP), ODA	Forest Management Information System Sarawak (FOMISS)
Land	Nepal	Indonesia	Philippines	Sri Lanka	Malaysia
Type of GIS	• Institution-supporting GIS (ICIMOD) • Service GIS	• Institution-supporting GIS (BNP)	• Service GIS • Institution-supporting GIS	• Institution-supporting GIS • Service GIS	• Institution-supporting GIS
Area	Hindu-Kush-Himalaya region covering Afghanistan, Bangladesh, Bhutan, China, India, Burma, Nepal, Pakistan	East- and West-Kalimantan, Sumatra	Province of Cebu, other provinces countrywide	Upper Mahaweli watershed, other divisions and villages outside watershed area	State of Sarawak
Main objectives	• Establishment of information network between countries • Collection and exchange of spatial data • GIS training	• Establishment of central training center with decentralized offices • GIS / RS training • Development of methods for land use mapping & planning	• Establishment of a provincial database • GIS training • Thematic & topographic mapping • Consultancy services	• Mapping of land use & vegetation types for Upper Mahaweli Catchment • Development of case studies for land use planning • Measuring & monitoring of reservoir sedimentation and river transported sediment to gauge the extent of siltation	• Mapping & monitoring of forest resources • Forest function mapping • Establishment of information network with State GIS • Decentralization of GIS to Regional Offices (2nd phase)
Problems during implementation	• Coordination between organizations	• Data exchange • Institutional coordination • Unclear mandate for land use planning	• GIS management • Data availability and reliability • Data transfer • Fluctuation of personnel • Sustainability	• Sustainability • Provision of services to other organizations	• Data quality • Data transfer • Intra- and inter-institutional cooperation & coordination • Maintenance of hardware & software

6.3 The Pros and Cons of Geographic Information Systems

A GIS works with objects and phenomena of the real world. It allows the direct access to data, which can be updated and changed at any time.

Models and scenarios can be easily developed, and the consequences of spatial decisions can be forecasted. GIS is an important decision-support tool for disciplines that deal with spatial data.

In many GIS projects, however, a strong focus on technical aspects leaves out institutional and personnel issues. The technology is only used to cover existing institutional problems.

There is often no clear definition of objectives, which creates the sustainable use of GIS extremely difficult.

In addition, the unwillingness of institutions to cooperate and share information because of power struggles complicates the GIS implementation.

6.4 Case Studies GIS Cebu Province

In 1990, the GTZ started to identify project locations where GIS technology could be implemented in rural development projects. At the same time, the provincial government of Cebu, located in the central Philippines, was interested to establish a provincial GIS, which could be administratively linked with the Cebu Upland Project.

Prior to project implementation a short-term mission, which took place in July 1991, identified the technical and institutional framework of the project.

The basis of cooperation was a “Letter of Intend” between the GTZ and the provincial government and was signed in 1991. A common understanding between involved parties defined the provincial GIS as follows:

"A comprehensive database of geographic information for Cebu, serving all institutions and operating within an inter-institutional framework that is not dominated by one agency and that is designed as a model for other provinces.

The first project phase emphasized on hardware and software installation and training for personnel.

A second short-term mission took place in 1992 and evaluated the progress of the project.

The mission identified the main problems as follows:

1. High turnover of personnel
2. Government “red tape”
3. Lack of flexibility in the services the project provided to users outside the province
4. Insufficient and / or not reliable database

These problems in combination with the fact that GTZ funds would expire in 1994, the evaluation mission recommended to privatize the project.

The provincial government of Cebu recognized the need for a feasibility study, which was conducted in 1993/1994. Its main purpose was to analyze the market for potential users of GIS products and to give options which the institutional and organizational structure the GIS Cebu Province may undertake.

Managerial and staff problems, the coordination and cooperation of planning institutions were identified as main problems.

The study team recommended the transformation of the project, from a government into a non-government organization (Science Foundation).

Initial meetings of a so-called “*Board of Trustees*”, composed of members of the provincial government and the private sector and headed by the provincial governor took place to elaborate the “*Articles of Incorporation*”. In addition, the Board of Trustee supported the application of a CIM expert, who would be employed as GIS Manager.

In January 1995, the GIS Cebu Province was converted into a non-stock, non-profit foundation. The technical equipment was turned over to the foundation as usufruct for a period of 50 years. After 4 years of operation, the foundation has reached a broader clientele outside the province of Cebu and generates its own financial resources.

Forest Management Information System Sarawak (FOMISS): The forest monitoring system

Background: The problem

Tropical rain forests are one of the most important habitats in the world for animal and plant species. The enormous diversity of species is both a problem and a benefit from economic and social points of view. In addition, rain forests contribute greatly to the climatic balance as stabilizing their underlying material.

However, rainforests are not inexhaustible natural resources. The belief in an endless wealth has made man unaware of future consequences. It is internationally recognized that tropical forests are a fragile ecosystem, and that their destruction will have irreversible consequences for the global environment.

Each year either harvesting or shifting cultivation practices degrades some 17 million hectares of tropical forests. To show how to reduce or prevent this, the causes that lead to the ultimate extinction of forest must be examined. The humans destroying forests can be generally divided into different categories:

- Native (or indigenous) groups (usually also inhabitants of the forest)
- Groups from outside
- Traditional foresters
- Timber companies

These groups are known to modify, manipulate or destroy natural forest ecosystems. Despite the perception of the forest as a fragile ecosystem however, one should be careful in assuming that it is a non-renewable and unmanageable resource. Approaches towards sound forest management that can be sustainable in long-term have been developed and tested in recent decades. For example, forest zoning involving the designation of forest functions facilitate sustainable use of materials to the local and wider communities.

In addition to technical approaches that promote sustainable use and conservation of tropical forests, some steps towards a more global awareness has also taken place. The UNCED Conference in Rio (1992) set a worldwide example with the adoption of Agenda 21. This supports and promotes enforcement of sustainable use of the Earth’s resources.

Sarawak has a total area of almost 12,5 million hectares, and is one of the largest states in Malaysia. It is located in the western part of Borneo and is separated by the South China Sea from Peninsula Malaysia.

Presently, forest covers a total of about 70% of Sarawaks' land, so is the main land use. The remaining land is under agricultural use (permanent agriculture (oil palm), shifting cultivation) and urban and rural settlements.

The land under forest is legally divided into

- *Permanent Forest Estate (PFE) that is designated for sustainable timber production (6.5 million);*
- *State Land Forest (2 million ha) that belongs to the State of Sarawak and is designated for conversion into any land use form;*
- *Totally Protected Areas (TPA) that include national parks, wildlife sanctuaries and nature reserves.*

Sarawak's forests are still one of the most important resources for the State's economic development, providing almost 50% of the Government's revenue, 28% of export earnings and 25% of employment.

Sarawak's declared program to conserve some 10% of its forest as totally protected areas needs institutional support. The Forest Department, lacking sufficient qualified staff, requires strengthening of its capacities to implement its forest policy.

It is thus crucial for the Forest Department to assess and monitor the forest cover regularly to be able to integrate information about forest changes into a forest management system that aims at being sustainable. To ensure this, it is essential to obtain a clear understanding of the extent of forest cover changes and its consequences. In the long-term, it is crucial for Sarawak to obtain, develop and apply techniques to monitor natural resources as a basis on which to establish a durable and rational policy for forest management.

Objectives and expected results

The overall objective was
to establish a forest monitoring system in the Sarawak Forest Department using modern technology

The main approach was to develop and test a forest monitoring system in two pilot areas, Upper Ulu Baram and Batang Tinjar. The techniques can then be applied for a forest monitoring in the entire State of Sarawak.

The objectives were achieved by

I. Developing a reliable technique for monitoring forest cover in the two pilot areas;
II. Producing maps which will serve as the basis and support of forest management systems;
III. Assessing and analyzing causes of forest cover changes in the pilot areas;

Methodology

Selection of pilot areas

In the first place, it is essential that the pilot areas represent typical conditions in Sarawak.

The pilot areas represent two main land divisions in Sarawak, State Land Forest and Permanent Forest Estate.

While State Land Forest can be converted into other land use forms for agricultural use or development projects, Permanent Forest Estate shall legally remain under forest.

The changes in these areas are expected to be significantly different.

Identification and acquisition of data and information

The extent of changes of forest resources in the pilot areas were estimated and assessed on the basis of multi-temporal remotely sensed data.

Initially, a data survey was conducted assessing the availability of satellite imagery, their resolution and multi-band capability.

In addition, other spatial and descriptive data, particularly on the socio-economic factors of the Ulu Baram, supported the analysis of the causes of forest change.

Furthermore, an inventory, which was conducted by the FOMISS project and the National Parks and Wildlife Office in 1998, enhanced further the information about the pilot area. The multi-

disciplinary inventory team generated information about terrain, soils, tree stands and wildlife presence / absence.

Digital Classification and Visual Interpretation of acquired satellite imageries

Digital image processing was applied to extract outputs according to themes, e.g. land use, vegetation classification and geological features. The mathematical formula allowed the numeric pixel information from remotely sensed digital data to be retrieved and changed. The results, however, can only be as good as the computer operator.

For many reasons, results of a visual interpretation cannot be compared with these of a digital classification, delivering an accuracy of maximum 75%. The digital classification (un-supervised and supervised) was used to stratify major land use classes and to identify test areas to be visited for ground truthing. After a preliminary field visit, visual interpretation was carried out to enhance the classification output. This interpretation can either be carried out on screen by displaying the respective image in the background, or manually by tracing the different land use classes and digitizing the results.

With such multi-temporal land use classification and interpretation of the results, information on land use change were obtained by applying a developed co-incidence matrix from one classified image to the other.

Identification and acquisition of attribute data

Attribute data of the pilot area in Ulu Baram were identified. These focused mainly on socio-economic information, notably:

- Legal framework
- Historical and recent land use practices
- Dependence on these practices
- Social structure within local communities

A socio-economic baseline study, which was carried out in the Ulu Baram area in 1998, applied an in-depth survey of the present situation in the communities, collecting descriptive data on present land use practices, social structures within the longhouse communities of various ethnic groups. In addition, a pilot project on village mapping that was carried from November 1997 until March

1998 gave further information about the spatial distribution of shifting cultivation areas.

Documentation and preparation of reports

A comprehensive planning and documentation procedure was applied. First, an additional directory within the Forest Information System (FIS) allowed intermediate results of the digital classification and the visual interpretation to be stored. This directory was kept until completion of the project.

Second, the progress and problems encountered were documented regularly following a standard procedure. Such documentation allowed the status of implementation to be monitored.

Organizational integration

The research activities were an integrated part of the Malaysian-German FOMISS Project, and is a crucial linking measure to allow other projects to maximize the used information to develop tools for sustainable forest management.

The FOMISS Project provided in its 2nd phase a total of 8 PM (Person/Month) for the GIS implementation at the Forest Department including an overall evaluation of the GIS Unit and its individual projects.

The Forest Department assigned a Senior Officer to carry out the study.

7 Sustainability in Land Use Planning - Balancing Economic Needs and Ecological Necessities

Wieland Künzel

7.1 Economic and Ecological Aspects of Sustainability

Sustainability has become a common concern, however the real meaning of the term is still often vague. Various definitions have been proposed by botanists, agronomists and economists. Moreover, the meaning changes when applied at the farm level to the national economy or to the global ecosystem.

Sustainability of farming practices involves aspects both of ecology and economy. Often, the concentration on one leads to the detriment of the other. The introduction of leguminous contour hedgerows on sloping ginger land in Fiji, for example, led to significant reductions in erosion, and improvements of the soil fertility status. The government and donor agencies liked the system, due to its long-term positive ecological effects. At the same time, however, crop yields declined due to nutrient competition and scouring effects on the upper slopes. Most farmers abandoned the practice after a short time because it cost them money (NAKALEVU, 1994). Can we call such a system sustainable? The following definition exemplifies some of the different meanings of sustainability when viewed from the economic or the ecological perspective.

Definition of Sustainability

Ecological Perspective	Economic Perspective
• maintain/enhance production potential	• maintain/enhance production
• reduce environmental risk	• reduce production risk
• maintain/enhance biodiversity	• maintain/enhance product diversity
• be socially acceptable	• by socially acceptable

From an ecological point of view, a system is sustainable if it maintains or enhances the long-term agricultural production potential, which includes aspects like soil physical properties, availability of nutrients, build-up of humus, etc. Environmental risks like soil and wind erosion should be minimised. Biodiversity should be enhanced, both in the plant and the animal world.

Unfortunately, such systems are not necessarily economical to implement.

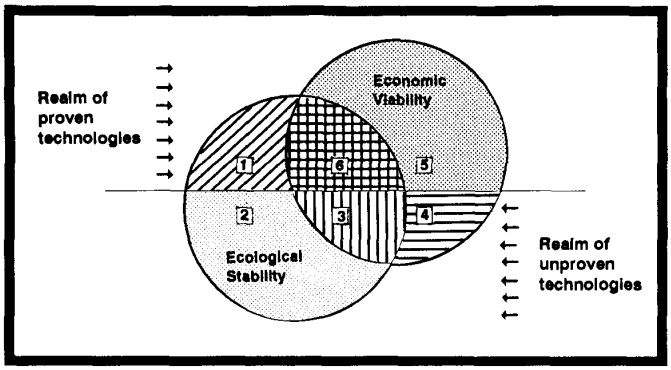
The economic view of sustainability is quite different. Production levels and income have to be maintained. Risks due to seasonal drought, plant diseases, etc. should be minimised. A high diversity of products helps to achieve this. Ecological degradation is not problematic, as long as land is available. A system which fulfils these requirements is the slash-and-burn agriculture practised in the remaining natural forests of the South Pacific Region. Needless to say, with rising population densities these systems are not ecologically sustainable.

Development projects usually look for systems that are ecologically sound and economically viable at the same time. In classical agricultural research or extension projects, new technologies or crops may be introduced, in the hope that they prove to be as beneficial as they have been under similar ecological or social conditions elsewhere. If they fail, better solutions will be sought. The situation faced by the land use planner is substantially more difficult, because he has to propose systems that are not only ecologically sound and economically viable, but also already proven under local conditions. Take, for example, the case of "cut-and-carry" fodder production for smallholders. There are many areas where such a system is practised, and it can be ecologically sound as well as economically productive. But if it does not exist in a given area already, how can the land use planner be sure that it will work? The researcher, and also the extension worker, can go ahead and try the system out. As a land use planner, however, this option has to be dismissed until it has been proven locally. The map should not be "coloured" with production proposals unless their potential is known. This requirement significantly reduces the range of available options to the land use planner, as the figure 7.1 illustrates.

7.2 Tried and Tested: Some Lessons Learnt

There are far too many factors influencing the ecological and economic conditions of a given area, and the technological choices available to give generalised advice. There are, however, certain "trends" that have emerged from field experience, which might be of assistance to the land use planner (GARRITY, 1994).

Table 7.1: The Interface of Economic Viability, Ecological Stability and Proven Technologies



Area	Characteristics	Fiji Example	Potential measures	Implications for land use planning
1	Ecologically stable, technically possible, but not economical	Ginger between narrow contour hedgerows. Low erosion, low yields	Provide subsidies	Disregard, unless financial compensation for farmers is assured
2	"Ecological wonder-land", but without proven technology and not economical	Vanilla / pepper intercropped with leguminous hedgerows on slopes	Consider long-term trials to develop the missing technology	For research stations only
3	Economically viable and ecologically sound, but proven technology is missing	Taro with leguminous trees for mulch and weed control	Verification trials	Urge agricultural service to test technology immediately
4	Profitable misuse of land by newly introduced technologies	Ginger monocropping on steep slopes	Promote improved farming systems, usually conservation measures	Propose more ecologically sustainable forms of land use
5	Profitable misuse of land by traditional technologies	Kava cultivation in natural forest, using ring-barking for tree removal	Promote improved farming systems, usually involving intensification	Propose more ecologically sustainable forms of land use
6	Ecologically stable, economically viable, technologically proven	Taro upslope, ginger downslope, crop rotation with cassava and yams	Extension & promotion	Include in land use plan

Change No. 1: The engineering approach has not yielded to conservation farming on smallholdings.

Erosion control, irrigation and drainage used to be the domain of surveyors and heavy machinery, sometimes leading to a radical reshaping of the landscape. Such mechanical measures can be

quite effective, but experience has shown that they tend to be inappropriate for smallholders, mainly because the ability to maintain any large structures is missing. In the past, many projects have failed because they relied too much on earth-moving activities, and gave too little attention to "living" barriers. Biological measures like natural vegetative strips, grass bunds and tree hedgerows are now widely accepted as being more appropriate and effective. Extensive literature is available from GTZ, FAO, ICRAP and others. Vegetative barriers should always be considered first, before mechanically altering the landscape.

Change No. 2: Alley cropping is diversifying towards a much more robust array of hedgerow options.

This special type of land use is also called contour hedgerow intercropping. Trees are planted in a dense strip along the contour, and food or cash crops are grown in the "alleys" in-between. Trees are pruned regularly for green manure, which adds biomass to the soil in the alleys. Because of their close spacing, the plants also act as barriers to erosion. Firewood and fodder can be harvested from the branches. The system was promoted as a form of agriculture suitable for tropical sloping lands, leading to sustainable or even increased outputs.

Now however it has become clear that these expectations were not justified. Contour hedgerows can reduce erosion significantly, but this does usually not lead to increases in crop production (SINGH & KONZEL, 1994). Competition by the trees for sunlight, water and nutrients often actually lead to yield reductions. Continued inputs of external nutrients (fertiliser or dung) are necessary. The systems are very labour intensive, and most farmers abandon them after some time. While hedgerows serve an important role in erosion control and wind protection, it can be detrimental to use them to the extent that whole fields are covered, leading to alley cropping systems.

Photo 12: **Example of a sustainable upland farming system introduced in the hill tribe settlement region of Northern Thailand**

Photo 13: **Highly productive and ecologically sustainable multi-storey farming system, Philippines.**

Change No. 3: The basic objective is shifting from soil fertility management to the maintenance of farm production levels.

Soil erosion and land degradation were often seen as the primary reasons for exercises in land use planning. Such activities were in line with many national development objectives and agricultural policies, and it was assumed that local farmers share this concern. It has become increasingly clear, however, that exploitative agriculture might well be the logical choice for farmers under certain conditions, even if this practice might have grave negative long term consequences. Slash-and-burn cultivation in natural forests is a well-known example. In order to secure the active support of farmers for conservation farming, it is imperative that their primary concerns are addressed first. In most cases, these are improvements in income rather than ecological sustainability. Land use planners therefore need to accept aspects like the promotion of labour-saving technologies or improved access to markets as valid aims of the planning process.

Change No. 4: The top-down watershed management approach is yielding to a bottom-up approach with a farmer and community focus.

In the past, many land use planning exercises were based on the watershed as a geographic unit. Several local communities might be affected at the same time, some more than others, and some only partly. Experience has shown that such a planning approach will rarely be adopted. The local population has to be actively involved in any land use planning process, and the entire area used by a given group of people needs to be considered. The area affected by the land use plans needs to be based on socio-economic units, rather than landscapes. Techniques have been developed to assist in bottom-up planning. Participatory Rural Appraisal (PRA) methods have been engaged in many projects, and specialised approaches like Community Based Land Use Planning and Village Land Use Planning have been tested. See the related chapter on "Tools for Participation" for more details.

Change No. 5: Farmers are considered capable to independently evaluate and adapt conservation measures themselves.

Even with careful planning, it is usually not possible to develop extension-ready "solutions" to land use problems. Many projects have failed in trying to implement "packages" that were meant to be applicable on each farm within a certain area. It is preferable to

offer a range of possible solutions to farmers, making it clear that these are in the stage of experimentation (or verification), and that the technology still needs to be refined for each respective location. Farmers in many countries have shown the ability to evaluate and improve conservation measures by themselves. What is necessary is sufficient time to build up experience, and a willingness by the extension agency to observe and listen. Land use planning under such conditions is an evolving process. The land use planner must be willing to redraw the map as farmers start to take up - and change (!) - his/her recommendations.

7.3 Summary

Land use planning should lead to land-use systems that are sustainable in both economic and ecological terms. Also, the technology needs to be locally proven and available. Only in certain circumstances will all these conditions be fulfilled, but farmers can assist this process through their own adaptation and development of technologies. Vegetative, low-maintenance erosion barriers have proven more sustainable than engineered solutions, so have participatory planning tools. Land use planning has become more community focused, more open to small-scale interventions, and more flexible to incorporate technologies developed by the local population.

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Towards Sustainable Land Use and Biodiversity

8

Dieter Albrecht

8.1 Aspects of the Global Situation of Biodiversity and Land Use

Conserving **biodiversity** is of fundamental importance for the sustainability of land use, even if there is not yet a consistent scientific proof of the relation between biodiversity and sustainability. Even to define sustainability is a difficult task. In contrast to the conventional mechanistic and static scientific view of the world, sustainability opens the view to a holistic view facing a more complicated pattern of causes and effects of destruction. The hereby increased demand for a multidimensional approach has its roots in the increased complexity of the topic. Some scientists even consider the demand for sustainability as an illusion. (HABER 1994).

Preserving biodiversity must be considered as an important issue for the survival of humankind. In today's definition biodiversity encompasses the whole range of biological diversity from genetic diversity, species diversity, and ecosystem diversity up to the diversity of ecological interactions. The loss of biodiversity is only one manifestation of the poor management of natural resources.

Recent studies suggest that there is a correlation between biodiversity and the stability and resilience of an ecosystem.

The negative effect of **land use** on divers ecosystems and ecological interrelations is a well-documented fact. More than 36% of the world's terrestrial landscape have been converted to crop- and pastureland. Approximately 40% of what is categorised as forest and woodland is either plantation or secondary forest. Much of the remaining land is increasingly fragmented. All this man made or human influenced ecosystems have a deteriorating biodiversity.

Perhaps the most poignant parameter of intensive land use is the catastrophic rate of soil and fertility degradation, corresponding to 17% of all vegetated land during the last 45 years.

Human influence on natural biotas is not only restricted to terrestrial landscapes. Each year, humans use 8% of the world's available fresh water. World exploitation of marine fish has

increased by 35% since 1979. Fresh water fisheries has expanded 85% during the same period and 60% of the world's main fish stock may be exploited beyond their ecological and economic optima. (MORRIS 1995).

8.2 Guiding Principles and Indicators

Concerning land use, we have to accept that there is no single optimal sustainable design which is appropriate for every situation. Sustainability is not a fixed state of harmony, but rather a dynamic process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change must be relevant to the future, as well as present needs. It seems to be ensured only in a well-defined setting for a certain time and scale in a specific socio-economic, cultural and natural environment.

SACHS (1992) defines five dimensions of sustainability which should be taken into consideration when dealing with land use: **economic, social, spatial, cultural and ecological sustainability.** Key indicators and trends in the different dimensions of land use may help to monitor the direction of change.

Later in this article, a set of key indicators are presented with a checklist of sustainable or unsustainable directions of change at a given time, location and situation. They can serve as an input for elaborating more detailed and precise indicators on site for specific purposes, such as early **warning indicators, sensitivity indicators, process indicators for land use and indicators of ecosystem sensitivity or vulnerability** according to the prevailing conditions. In general, ecological processes are unpredictable so that every forecast has a certain degree of uncertainty. Therefore neither 'threshold values' nor 'critical levels or loads' are given. Nevertheless, it is important to stress the managerial aspect of indicators, especially for an action oriented approach for land use planning. Questions like the following have to be answered: 'Where and when are we on the level of harm to sustainability and, if so, for whom in what sense?', 'Are we inside or outside a long-term sustainability realm?' and 'What are the strategies to stop the destruction?'.

Ecological Sustainability Needs:

COSTANZA (1991) shows that individual incentives that guide behaviour are often inconsistent with overall systems goals. People directly concerned are nevertheless the most important actors for ecological oriented land use, especially poor people. They are the ones with the real choice for the direction of development. Their basic needs must be ensured in two ways. This means that:

Participation in Planning and Implementation

- Ecologically necessary measures must be economically feasible and
- Economic targets must be ecologically compatible.

A dialogue orientation in planning and decision making with all people involved in land use gives sustainability a chance to meet both economic requirements and ecological necessities. Ecological 'action groups and project groups' should examine all land use for its ecological compatibility in order to assure its ecological and economical sustainability. These groups should have the power of veto for making local and short-term goals and incentives consistent with regional, national and long-term goals.

Ecological Sustainability Requires Monitoring of Biodiversity and Human Impacts

BARRET and ROSENBERG (1981) stated that there is a lack of sensitive indicators to detect environmental stress in the early stages of ecological change.

LUBCHENCO et al. (1991) observe that current research efforts are inadequate for dealing with sustainable systems that involve multiple resources, multiple ecosystems and large spatial scales. Much of the current research focuses on commodity-based systems with little attention being paid to the sustainability of natural ecosystems surrounding the human-made ecosystems and whose goods and services currently lack a market value.

Examples of intensified efforts of land use planning need to be mentioned, e.g. where integrating timber and cash crop plantations into less disturbed ecosystems is practised by promoting appropriate management systems for the buffer zones as well. Other examples are natural reserves or game parks where a high degree of biodiversity and economic interests are successfully combined.

For preserving biodiversity, which is synonymous with the capacity of self-regulation and thus a precondition for the sustainability of a

region, it is important to monitor human impacts, the initiating force for changing ecosystems and biodiversity. The monitoring of biodiversity in correlation with the intensity and frequency of human impacts on a region may help prevent irreversible damage.

Van LEUUWEN (1966, 1967) differentiates between:

- Less intensive and decentralised impacts over a longer period of time. Regions under such an influence are traditional areas for agriculture, forestry and pasture. In general they are stable and sustainably productive.
- Intensive and concentrated impacts over a shorter period of time. Regions under such an influence are densely populated areas with urban-industrial systems.

For a practical approach, GLOWKA et al. (1994) propose forms of participatory monitoring to identify areas of biological richness predicting richness of less-known organisms by using known patterns of better characterised organisms, for example birds. If an area is rich in one life form, it is probably also rich in other forms. Any prediction needs to be confirmed by on-the-ground studies.

8.3 Checklists for Monitoring Biodiversity and Sustainability of Land Use

In the following, six dimensions of human impacts through land use with their main components are listed below:

- the physical dimension
- the spatial dimension
- the economical dimension
- the social dimension
- the cultural dimension
- the biological dimension

Indicators, trends of change, and respective constraints, related to the above dimensions, are compiled in different checklists. They are compiled in the same way and face the complexity of land use planning. The compilation is meant to give a practical framework for the development work on site.

The Physical Dimension

The correlation between input and output for the process of production can be described relatively easily. For the ecological side-effects of a production system however, it is very difficult to accurately classify the quality of the indicators which are related to the different outputs of human activities. For instance, UNEP defines 100 different indicators solely for air pollution. The impacts

are often interlinked and the regions or local areas affected have a different sensibility for reacting. Also impacts can be immediate or far reaching and different in time and scale.

Large scale production, small scale production, and their interaction are the major driving forces influencing the dynamics of land use patterns. In the following, special emphasis is put on the characteristics of the respective type of production and its related indicators (see table 8.1). As far as possible specific constraints are mentioned. It has to be stressed that no threshold values are given. Tolerable interference in ecosystems has to be determined on local, regional, even national consensus and has to be adjusted over a certain period of time.

Table 8.1: The Physical Dimension of Human Impacts and Indicators for Land Use

PHYSICAL DIMENSION	
ASPECTS of HUMAN IMPACT	**INDICATORS AND TRENDS**
Large Scale Production for External Markets	
Inputs	• External / artificial inputs of energy, matter, information, capital and labour. • Consumption of external resources, water from distant reservoirs, energy from central power plants, fossil fuel for machinery, soil, air, external capital, labour and management.
Outputs	• Agricultural and industrial products mainly for external consumption. • Waste, sewage, air pollution, noise, chemical residues and heavy metals accumulating in the area treated or untreated. • Far reaching intensive interference in ecosystems with high frequency causing acid rain, climatic change, ozone depletion.
Constraints	• High dependence on external inputs • Stress and shock mainly caused by external factors
Small Scale Production for Subsistence or Local Markets	
Inputs	• Consumption of locally available mineral resources and raw materials, local energy, sunshine, water from local reservoirs, soil, air, local fuel and machinery, internal labour, capital and indigeneous knowledge.
Outputs	• Agricultural and handicraft products mainly for local consumption, recycling practices, waste, sewage with local impacts only
Constraints	• Stress and shock mainly caused by climatic factors

The Spatial Dimension

The spatial diversity of an ecosystem is increasingly important for land use and regional planning as well as for the development of agriculture. Regions with great spatial and genetic diversity generally show a greater ability in self-regulation than those regions that are no longer spatially and genetically diverse. Self-regulation means that ecosystems have the ability to buffer and compensate human influence within certain limits without being destroyed. Regionally, human influence may favour increased local diversity, but habitat losses and the management of exploitable systems tend to level species richness and spatial heterogeneity. In addition, ecosystems in tropical and subtropical zones are more fragile due to a lower buffer capacity to compensate human impacts than ecosystems of temperate zones. In the tropics, species are disappearing fast.

From an ecological point of view, biodiversity can be considered as the foundation of sustainable agriculture. Aiming at sustainability for a community or a region bring distinctive landscape patterns apart from agro-ecosystems into play. Their ecological processes and interactions determine the mosaic of spatial and temporal patterns of natural and managed systems. From an ecological point of view, the most pressing problem is the adverse influence of urbanisation and industrialisation on natural resources. The crux is the number of people with an established industrial system dominated by the Western world (see table 8.2).

MARGALEFF (1968) classifies the relation between industrial systems and their surrounding systems as ecological exploitation. Due to the natural law of entropy, the less complex subsystem of an area surrounding a populated area gives energy and information in terms of natural resources (fresh air, water, food, raw materials) to the highly complex industrial system. In return it ruins the surrounding area by leveling or destroying its former ecological qualities through garbage, noise, traffic, and emissions. MOONEY (1981) describes how the Vavilov centres of high genetic potential, all situated in developing countries, are; exploited. Their genetic resources are only monopolised by some Western companies.

HABER (1994) describes this mechanism with the flow of mineral resources and feed stuffs from developing countries to the

European Union and comes to the conclusion that sustainability as a concept is an illusion.

Table 8.2.: The Spatial Dimension of Human Impacts and Indicators for Land Use

SPATIAL DIMENSION	
ASPECTS of HUMAN IMPACT	**INDICATORS AND TRENDS**
Large Scale Industrial Production	
Urbanisation	Landscape characterised by spatial distribution of heavily modified ecosystems with different degrees of high productivity and their interaction, manifested as the: • Proportion of rural to urban areas and the relation of rural to urban people. • Landscape fragmented by transport, house building and facilities for recreation causing the sealing of soil surface and natural areas to shrink and become endangered. • Strong influence by far reaching, frequent and intensive irreversible human impact causing levelling of spatial and structural heterogeneity and biodiversity.
Small Scale Production	
Rural Areas	• Mainly agro-ecological production systems with moderate productivity. • Spatial and strucutral heterogeneity of landscapes based on productive and protective ecosystems often linked with high biodiversity. • Local, moderate human impacts with less intensity and low frequency. • Adverse impacts caused by unreasonable spatial distribution of production and small scale industries.
Natural Habitats	• Endangered by population pressure and far reaching agricultural and industrial outputs.

The Economic Dimension

For an ecologically oriented direction of development, the formulation of ecological goals for agriculture alone is only of little help when it is incorporated in a purely economically oriented industrial production systems. The impacts of industrial systems and their large scale production are specially harmful if they are not controlled by environmental restrictions and laws for reduction damaging pollution. On the other hand, small scale and subsistence production should not be idolised because it can also be environmental destructive and is often linked with poverty. Special emphasis should be given to restricted buffer capacities,

fragility and low resilience of ecosystems in the tropics and sub-tropics (see table 8.3).

Table 8.3: Economic Dimension of Human Impacts and Indicators for Land Use

ECONOMIC DIMENSION	
ASPECTS of HUMAN IMPACT	**INDICATORS AND TRENDS**
Large Scale Production	
Market Oriented Production	• High productivity of agricultural and industrial systems with intensive external inputs • Monoculture and mining mainly for external markets. • Intensive Use of natural resources with long-term ecologically harmful side-effects. • Externalisation of environmental costs. • Use of external capital, labour and management • Short time frame, high rate of return. • Interwined in the world market, dominated by Western industrialised countries.
Trade Constraints	• Strong influence on the world market • Deterioration quality of natural resources due to short-term profit orientation.
Small Scale Production	
Subsistence Production	• Less intensive and internal inputs, moderate long-term productivity, perhaps ecologically harmful side-effects. • Use of internal capital, labour and management. • Diversified agricultural and handicraft production units for subsistence of local markets. • Maintenance of ecological qualities due to long-term orientation, but low income, and poverty.
Trade Constraints	• Local or regional trade. • Lack of funds for improving living conditions.

The Social Dimension

CONWAY and BARBIER (1990) introduce three indicators for measuring sustainability as far as agricultural production is concerned: Productivity is defined as the output of valued products per unit of resource input. Stability indicates the constancy of productivity in the face of small disturbing forces, and equability verifies the evenness of distribution of the productivity of the agricultural system among the human beneficiaries (see table 8.4). The indicator 'equability' is of great importance, because a world in which poverty is endemic will always be prone to ecological and other catastrophes. This shows the social dimension of sustainability and calls for an equity-oriented policy. When putting

it into practice, the question is When are the limits of an unacceptable lack of equability reached?'

The relevance of this question for the beneficiaries is crucial because different interests are involved. Nature conservation groups aim to protect nature, consumers are biased towards consumption, while employees are biased towards job security. Poor people struggling for survival have different interests than rich people. The indicators of productivity, stability and equability for sustainability are affiliated to all of them with special but sometime contradictory expectations. The question to be asked are 'What is considered to be positive development?' and 'Sustainability for what and for whom?' Sustainability must strive for a certain balancing of social conflicts and a fair distribution of income and power. Migration is an indicator that an unacceptable lack of social and economic equitability is prevalent.

The appropriate handling of social conflicts implies a certain degree of democratic structures. To obtain institutional or organisational sustainability, the ecological orientation and the targets have to be fixed at the national level (legislative level), at the regional level (controlling level), and at the local level (action level). The question is, whether the executing agencies on the different levels are able to identify appropriate solutions and to propagate and support conservation measures.

One has to bear in mind that there is always a contradiction between central and local interests. Interests are fixed to titles of ownership and the possibility to execute institutional power.

Table 8.4: Social Dimension of Human Impacts and Indicators for Land Use

SOCIAL DIMENSION	
ASPECTS of HUMAN IMPACT	**INDICATORS AND TRENDS**
Large Scale Production	
Land Tenure System	• Concentration of land, money and power, absenteeism.
Institutional and Power Structure	• Handling of political and economic hierarchical power by national, mainly male elite; capital and land owners dominating society.
Management Behaviour	• Use of external hired labour and external management and knowledge, limited interest for ecological orientation, short-term profit orientation.
Population Growth	• Lack of family planning results in high pressure on natural resources. • Increase in population results in a growing number of landless people and increased rural unemployment.
Migration	• Mainly males from the countryside migrate into the cities. • Children and elderly people have to take over the whole burden of agricultural production, which was formerly divided between men and women. • Destruction of former agricultural production potential.
Small Scale Production	
Land Tenure System	• Traditional male dominated structures and social strata, local influence for distribution of land and money, low level of subsistence, poverty.
Institutional and Power Structure	• Tradtional structure of power, male or female dominated.
Management Behaviour	• Use of local knowledge, distribution of labour between men and women, long-term orientation to maintain the natural life support system.
Population Growth	• Ecological capacity for supporting a certain amount of people distorted by the introduction of medical treatment practices, such as vaccinations, causing increase of population with simultaneously stagnating or declining agricultural production.
Constraints	• Lack of family planning results in high population pressure on natural resources. • Traditional land tenure. • Institutional inappropriateness and weakness to identify, propagate and support conservation measures.

Photo 14: **Cut-flower cultivation close to a major urban market, Philippines.**

Photo 15: **In impoverished rural areas with high out-migration, the remaining population often has to carry an additional burden: the lack of male family lalour for agricultural activities.**

Photo 16: Often overlooked in land use planning the interests of the landless, but land resource dependant, section of the rural polulation. Here: sugar cane workers in the Philippines.

Photo 17: Tea plantation in the highland region of Sri Lanka ecological and economical stability is highly dependant on good management practices.

The Cultural Dimension

The cultural dimension is mainly characterised by its related value system. The concept of nature of the West with its ideology of supremacy and dominance over nature consequently leads to the exploitation and destruction in natural resources. This behaviour differs substantially from other concepts of nature which originate in Asia. Even if it was not always common practice, the ideal human approach was one in which activities lead to harmony with the surrounding landscape and society. This difference has to be taken into consideration. In addition, sustainability in the cultural dimension aims at keeping the diversity of regional and national cultures and habits as a heritage of human development (see table 8.5).

Table 8.5: Cultural Dimension of Human Impacts and Indicators for Land Use

CULTURAL DIMENSION	
ASPECTS of HUMAN IMPACT	**INDICATORS AND TRENDS**
Large Scale Production	
Value System	• Use of external resources and internationalisation of production. • Adoption of the Western concept of domination and exploitation of nature and its related cultural values and production practices. • Loss of cultural identity, indigenous knowledge, cultivation practices. • Change of dietary habits.
Small Scale Production	
Value System **Constraints**	• Use of internal resources based on traditional concepts of nature with its related cultural values. • Conservation of indigenous cultivation and medicinal knowledge and traditional dietary habits. • Stagnating traditional values and power structures and / or strong influence of Western dominated values inhibit the people indigenous to an area from creating a new way of development themselves.

The Ecological Dimension

In the history of humankind the industrial revolution and the simultaneous rapid population growth initiated a decisive quality change for developing human dominated ecosystems. From an ecological point of view it was the transition from living in 'mature' ecosystems towards growing ecosystems with high net primary production (NPP). Based on the development of corresponding agricultural production technologies, the rapid increase of NPP was the precondition for the steep increase of population.

The objective for agriculture was to feed a growing population by producing constantly high yields with intensive cultivation on relatively small areas. High yielding agrarian systems are only sustainable with the constant input of energy from external sources or systems. The original ecological system is reduced to a restricted assemblage of crops, pest and weeds. Hallmarks of these managed systems are low species diversity; the infusion of large quantities of water, energy and nutrients to maintain them; and the extraction of additional energy, biomass, and nutrients. Wherever this change took place, the principle of sustainability was abandoned step by step and the inherent sustainability of ecosystems was exceeded irreversible. Regional sustainability was endangered if not illusive. The impact was positive in the sense of increasing productivity and stability for a certain period of time and negative in the sense of destroying biodiversity and the capacities for sustainability in the long run. This trend was intensified and accelerated where and when industry became the dominating system of production.

Table 8.6: The Ecological Dimension of Human Impacts and Indicators for Land Use

ECOLOGICAL DIMENSION	
ASPECTS of HUMAN IMPACT	**INDICATORS AND TRENDS**
Large Scale Conventional Production	
Ecosystem Dynamics	• Fast growing less diverse, uniform and highly productive ecosystems with well defined and stable site boundaries for agriculture, fishery, and forestry with few natural areas. • Animal husbandry in highly artificial environments. • Use of large amounts of chemical input like mineral fertilisers, pesticides, herbicides, growth regulators etc. • Harmful residues of different types in soil and water. • Leaching of minerals, eutophication by nitrogen and phosphorus in soil and water, low organic matter in soils. • Linear energy, nutrient and food web.
Management Dynamics	• Open system with high external input and high energy flow. Drastic change in management endangers biodiversity.

ECOLOGICAL DIMENSION	
ASPECTS of HUMAN IMPACT	**INDICATORS AND TRENDS**
Biodiversity:	• Loss of terrestrial and marine species and ecological functions such as the capacity for soil and water conservation. • Loss of indigenous species, medicinal plants and knowledge • Loss of forest cover causing erosion and loss of soil fertility. • Loss of water, fertility causing reduction of yields. • Loss of wind breaks, shelter, ecological niches causing degradation of habitats.
Far Reaching Influences	• Import of high yielding varieties (HYV) as technological packages causes replacement of indigenous genetic resources, change of nutritional value and taste of products. • Export of genetically unique plants and animals. • Loss of sensitive or unique habitats due to fragmentation of landscapes. • Desertification, acid preparation, climatic change, ozone depletion.
Constraints	• Highly productive but fragile ecosystems, susceptible to stress and shock, low buffer capacity.
Small Scale Traditional Prod.	
Ecosystem Dynamics	• Moderate productivity of divers ecosystems for agriculture, fishery and forestry often with well defined, stable site boundaries adn mixed with natural areas. • Animal husbandry in natural environments. • Use of organic fertilisers and recycling practices, low application of pesticides, herbicides, growth regulators etc. • Divers energy, nutrient and food web. • Ecological niches often linked with very specific biodiversity, endangered by interference of human activities.
Management Dynamics	• Relatively closed system with internal input and low energy flow, slow changes in management in time and scale are buffered by the ecosystems resilience capacity

Biodiversity	• Likely to be maintained and supported for:
	  • Appropriate farming systems with locally adapted livestock and cropping systems: hunting, handicraft production, off-farm employment are part of a local system and farming techniques:
	  • Intercropping, rotations, agroforestry, silvopasture, green manure, conservation tillage, biological control, integrated pest management.

Local or Regional Influences	• Exchange of locally available resources for production, consumption and trading.
Constraints	• Productivity low, but stable ecosystems, resilience relatively high depending on climatic conditions.

8.5 Conclusion

The concern about conserving biodiversity and sustainability is new. Originally the term 'sustainability' described the management of land resources in forest areas. Recently the term has been used in a broader sense and now refers to 'sustainable development' in general. It increases the complexity of the issue so that sustainability is not longer fixed to biological and geo-chemical-physical environments. The new view is greatly influenced by societal and political considerations and also puts societal values into focus. It suggests that human activities of the present generation should respect the needs of future generations to maintain the life support system of humankind. Sustainable development as a goal rejects policies and practices that support current living standards by depleting the productive basis for the future. It also introduces responsibilities for the reversibility and irreversibility of environmental destruction and confronts us with our own behaviour.

In contrast to the conventional mechanistic and static scientific view of the world, sustainability introduces a more holistic view with complicated pattern of the causes and effects of destruction. The increased demand for a multidimensional approach has its roots in the increased complexity of the topic. It seems that **monitoring biodiversity** and its related **key indicators and trends** of different dimensions, combined with basic **principles of action** such as **peoples' empowerment** and **participation in planning and implementation** Is possibly one way to manage a complex system of ecologically oriented land use where sustainability has a chance. The basis for monitoring biodiversity is **research, education** and the **training** of everyone involved in land use planning. It is not possible to indicate threshold values because land use planning acts in a complex field of different interests. The **dialogue orientation** is necessary to reach or maintain an acceptable degree of social and economic justice.

The checklists presented above aim to clarify the different dimensions of sustainability and the complexity of land use planning in order to give a practical tool for the development work on site.

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Annexes

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The following projects have provided their experience. They have sent papers, workshop reports, technical papers, training manuals and project documents. This experience as documented in - the reports has been integrated in this publication.

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Photo 1:	Village school children, Thailand (Robert Riethmüller)
Photo 2:	Rice-vegetable farms, Banaue, Philippines (Robert Riethmüller)
Photo 3:	Pioneer settlers near Khao Yai national park, Thailand (Robert Riethmüller)
Photo 4:	Meda Dumbara, Kandy District, Sri Lanka (Robert Riethmüller)
Photo 5:	Meda Dumbara, Kandy District, Sri Lanka (Robert Riethmüller)
Photo 6:	Yunnan, Southern China (Karin Janz)
Photo 7:	Hebei Province, China (Karin Janz)
Photo 8:	Nam Lan, TGHDP sponsored village resource planning workshop (Christoph Backhaus)
Photo 9:	Minipe D.S. Division, Kandy District, Sri Lanka (Robert Riethmüller)
Photo 10:	Patha Dumbara, Nuwara Etiya District, Sri Lanka (Robert Riethmüller)
Photo 11:	ATLAS-GIS at Provincial Planning Unit Central Province, Kandy, Sri Lanka (Robert Riethmüller)
Photo 12:	Nam Lang, Northern Thailand (Christoph Backhaus)
Photo 13:	Laguna, Luzon island, Philippines (Robert Riethmüller)
Photo 14:	Cebu City, Philippines (Robert Riethmüller)
Photo 15:	Boljon Municipality, Cebu, Philippines (Robert Riethmüller)
Photo 16:	Negros island, Philippines (Robert Riethmüller)
Photo 17:	Nuwara Eliya District, Sri Lanka (Rainer J. Blank)