

A project funded by the United Nations Development Programme/Global Environment Facility (UNDP/GEF) and executed by the United Nations Office for Project Services (UNOPS)

SOCIO-ECONOMIC SPECIAL STUDY

**The SESS Recommendations to the
Strategic Action Programme**

April 2000

Dr Kate Meadows
Socio-Economics Co-ordinator

Karen Zwick
Socio-Economics Facilitator

**Pollution control and other measures to protect biodiversity
in Lake Tanganyika (RAF/92/G32)**
**Lutte contre la pollution et autres mesures visant à protéger
la biodiversité du lac Tanganyika (RAF/92/G32)**

Le Projet sur la Biodiversité du Lac Tanganyika a été formulé pour aider les quatre états riverains (Burundi, Congo, Tanzanie et Zambie) à élaborer un système efficace et durable pour gérer et conserver la diversité biologique du lac Tanganyika dans un avenir prévisible. Il est financé par le FEM (Fonds pour l'Environnement Mondial) par le biais du Programme des Nations Unies pour le Développement (PNUD)

The Lake Tanganyika Biodiversity Project has been formulated to help the four riparian states (Burundi, Congo, Tanzania and Zambia) produce an effective and sustainable system for managing and conserving the biodiversity of Lake Tanganyika into the foreseeable future. It is funded by the Global Environmental Facility through the United Nations Development Programme.

Burundi: L'Institut National pour l'Environnement et la Conservation de la Nature
D R Congo: Le Ministère de l'Environnement et de la Conservation de la Nature
Tanzania: Vice President's Office, Division of Environment
Zambia: Environment Council of Zambia

Enquiries about this publication, or requests for copies should be addressed to:

*Project Field Co-ordinator
Lake Tanganyika Biodiversity Project
PO Box 5956
Dar es Salaam, Tanzania*

*UK Co-ordinator,
Lake Tanganyika Biodiversity Project
Natural Resources Institute
Central Avenue, Chatham, Kent, ME4 4TB, UK*

ACKNOWLEDGEMENTS

This report is based on the work of the four National Socio-Economics Co-ordinators:

- Dr Oda Sindayizeruka Université du Burundi, Centre Universitaire de Recherche pour le Développement Economique et Social, Bujumbura;
- Gérard Kitungano Centre de Recherche en Hydrobiologie, Uvira;
- Dr Claude Mung'ong'o University of Dar es Salaam, Institute of Resource Assessment;
- Munshimbwe Chitalu Environment Council of Zambia, Lusaka

and their national teams, drawn from local government departments, local NGOs, and national research institutions, who have worked long and hard in the field collecting data, and long and hard in the office analysing it and preparing their reports, often under difficult conditions. We hope we have done them justice.

We are grateful to Mamert Maboneza, Bahati Barongo, and Clement Mwelwa, Administrative Officers at the Bujumbura, Kigoma, and Mpulungu Stations for their logistical support of the teams, and for their patience and good humour, and to Dr Andy Menz, the Project Co-ordinator, and Ritesh Bhandari, the Project Officer, at the Project Co-ordination Unit in Dar es Salaam for their support throughout.

Thanks are also due to Dr Kelly West, the Scientific Liaison Officer, for her support and advice, and to the Special Study Facilitators, Olivier Drieu, Richard Paley, and Robert Lindley, for helpful comments on earlier drafts, and for good times on the lake.

Finally, we thank the people of the lake, who have so generously given their time, and taught us so much.

CONTENTS

ACKNOWLEDGEMENTS	i
GLOSSARY	iii
1 INTRODUCTION.....	1
1.1 Background	1
1.2 Aims	1
2 METHODS.....	3
3 SUMMARY OF FINDINGS	4
3.1 Fisheries livelihoods and practices.....	4
3.2 Agricultural land use and livestock.....	6
3.3 Deforestation, energy needs, and woodland management	7
3.4 Population and movement.....	8
3.5 Livelihood strategies	8
3.6 Protected Areas	10
<i>Box 1 – Further findings from the SESS to be considered when planning interventions</i>	11
4 SOCIO-ECONOMIC ISSUES AND RECOMMENDATIONS TO THE SAP	11
4.1 Alternative livelihoods, activities, and practices.....	12
<i>Box 2 – Alterations to existing livelihood strategies and alternatives to be investigated</i>	13
4.2 Poverty alleviation, social and economic development, and gender issues	14
<i>Box 3 – Social and economic development initiatives</i>	14
4.3 Sustainable fisheries and the facilitation of credit	15
<i>Box 4 – Problems with credit initiatives to support offshore fishing</i>	16
4.4 Sustainable agriculture and soil conservation	17
4.5 Sustainable woodland management	18
4.6 Governance, institutional factors, and market liberalisation.....	19
5 RECOMMENDATIONS FOR FUTURE PARTICIPATORY SE RESEARCH.....	19
6 CONCLUSIONS	21
Appendix A – SESS site and summary reports.....	22
Appendix B – SESS survey sites.....	23
Appendix C – Key findings from the SESS	24

GLOSSARY

Biodiversity defined in the Convention on Biological Diversity: “Biological diversity” means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

CIFA Committee for Inland Fisheries of Africa

Convention The Convention for the Sustainable Management of Lake Tanganyika - a draft prepared by LTBP

EIA Environmental Impact Assessment

Eutrophication a process in which increasing nutrient load in rivers or lakes triggers algal blooms which in turn result in de-oxygenation and a change in species.

Gazetted (e.g. Gazetted Forest Reserve) a legally established protected area, with boundaries published in the Government Gazette

GEF Global Environmental Facility

GIS Geographical Information System - a data base system for managing spatial information, linking maps to physical and socio-economic data

ILMC The Interim Lake Management Committee - of the ILTMB

ILMS The Interim Lake Management Secretariat - of the ILTMB

ILTMB Interim Lake Tanganyika Management Body proposed in the SAP - “Interim” pending the creation of a permanent authority under the Convention

LTBP Lake Tanganyika Biodiversity Project – full title “Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika”

LTFMP Lake Tanganyika Framework Fisheries Management Plan developed by LTR

LTMP Lake Tanganyika Fisheries Monitoring Programme - a component of the proposed Lake Tanganyika Framework Fisheries Management Plan developed by the LTR

LTR Lake Tanganyika Research Project - full title “Research for the Management of the Fisheries on Lake Tanganyika”

NWG National Working Groups of the LTBP

Ramsar The Ramsar Convention - aims to protect wetlands sites of international importance, the Malagarasi in Tanzania is in the process of being listed

SADCC the Southern African Development Co-ordination Committee

SAP Strategic Action Programme

TAC Technical Advisory Committee of the LTBP

TDA Transboundary Diagnostic Analysis - a planning framework used in GEF international waters programmes

UNDP United Nations Development Programme

1 INTRODUCTION

1.1 Background

This Socio-Economic Special Study (SESS) contribution to the SAP is based on the findings of the SESS activities undertaken during the course of the Project from 1995 to 2000. The resultant survey reports give indications of the socio-economics, livelihoods¹ and strengths and problems in villages around the lake and in the catchment area, which are summarised in section 3 below. This is followed by a discussion of socio-economic (SE) issues and the SESS recommendations to the SAP (section 4) and for further SE research (section 5).

1.2 Aims

The LTBP, to a large extent, has been concerned with environmental issues with the suggestion that human activities are threatening the biodiversity of the lake, namely:

- that changes in land use have led to an increase in the discharge of sediment into the lake which affects biodiversity;
- that pollution damages water quality and affects biodiversity; and
- that inappropriate fishing practices affect biodiversity.

Therefore the SESS was initially charged with changing human activities deemed detrimental to the maintenance of biodiversity². However, this led to difficulties in formulating a SESS that was participatory and developmental. The focus of the second phase of the SESS (1999-2000) was therefore shifted to a more exploratory, less prescriptive and more inclusive approach. It was postulated that if current livelihood strategies were understood, more sustainable practices could ultimately be suggested, tested, introduced and supported. The overall aim was to gain a better understanding of the reasons for unsustainable natural resource (NR) utilisation by an examination of practices and livelihoods, with a view to identifying ways of achieving:

- participation in sustainable fisheries, agriculture, and wider natural resource management by local communities;
- alternative livelihood and income earning opportunities; and
- awareness of the importance of sustaining lake resources, especially amongst local people and local and national institutions.

This was to be brought about through improving the baseline data, a core task in the initial stage of livelihood assessment³, through socio-economic studies aimed at providing **an understanding of current livelihood strategies**, and the constraints faced by local people in the sustainability of these⁴. The approach was to learn from the people of the lake region about their lives, assets, livelihoods, and aspirations – their own understandings of their

¹ A livelihood comprises the capabilities, assets (both material and social resources), and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the NR base.

² Initially the aims and objectives of the SESS were related to those of the Environmental Education component of the Project. Three broad strategies were outlined: changing villagers' practices; changing local governments' practices; and developing protected areas.

³ A fully inclusive assessment is costly and time consuming and therefore beyond the scope of this study. However, some indicators of livelihoods were established by the SESS.

⁴ Among others, the extreme poverty of much of the population in the lake region has been found to have contributed to the unsustainable use of natural resources. Short-term survival rather than the sustainable management of the lake and its catchment is the priority of most, particularly in the light of migration and movement aggravated by insecurity (see section 3 below).

poverty, and how they think that they can alleviate it and work towards more sustainable livelihoods.

2 METHODS

The first activity undertaken in 1995 was an extensive baseline review examining the existing literature on the social, economic, and sectoral features of the lake basin. From this, an analysis of the current SE situation (capital assets) of the region could be undertaken. As the other SSs assessed the **natural capital**, the SESS sought to gain an understanding of:

- **social capital** – the social resources (networks, group memberships, relationships, access to committees, etc.) upon which people draw as part of their livelihood strategies;
- **human capital** – the skills, knowledge, ability to labour, and good health important to the ability to pursue livelihoods;
- **physical capital** – the basic infrastructure (household and community) which enables people to pursue their livelihoods; and
- **financial capital** – the financial resources that provide people with different livelihood options (savings, access to credit, remittances, etc.).

By establishing the capital assets of people in the region, ways in which these can be developed to encourage diversification of livelihoods and changes in environmentally detrimental livelihood strategies could be inferred. Building up assets is a core component of empowering people to change their behaviour. By examining the dynamics of assets and behaviour and gaining knowledge of those who have alleviated poverty it may be inferred how this might be done across different groups.

It was also necessary to examine the contexts which define peoples' livelihood options, as well as the trends and local practices, and structures (organisations and government) and processes (laws, rules, and incentives) which affect livelihoods.

Preliminary fieldwork was carried out in conjunction with the FPSS in villages around Kigoma, Tanzania in 1996 and 1997, and in Zambia in 1997. Following this, two substantial Participatory Rural Appraisals were carried out in Wards in the southern portion of the Tanzanian coastline in 1997, and in 1998, road trips and institutional appraisals were carried out in Kigoma and Rukwa Regions in the wider catchment in Tanzania.⁵

The majority of fieldwork in all four riparian countries took place in 1999 and 2000.⁶ A combination of participatory methods and detailed household interviews were applied at village level at selected sites. Participatory methods were used to discover the broad patterns of activity that characterise livelihoods at village level, with focus group discussions being particularly successful. These highlighted village infrastructure and services, and gender differences, and facilitated the classification of households into broad income and SE groups. However, they were insufficient to establish livelihood strategy variations and hence household interviews were also undertaken with sample households. With these, there was necessarily a trade-off between data accuracy and sample representativeness. The former required the livelihoods of a small number of households to be investigated in greater detail; the latter required a larger sample size.

⁵ See Appendix A for list of reports, and Appendix B for map.

⁶ See Appendix C for key findings, and section 3 and 4 below for discussion.

Other restrictions were:

- difficulties in establishing household livelihood dynamics, especially with respect to seasonality, without spending a full year in the household/community; and
- difficulties in determining the contributions of absent household members.

Furthermore, as a result of the large area/population to be covered, including many different ethnic, socio-cultural, and political groups, compromises had to be reached between levels of participation, levels of detail, and the statistical representativeness of the sample sites. Geographical coverage was also limited in some cases by security concerns.

Different researchers in the four riparian countries favoured different emphases on the methods and approach according to their experiences, abilities, and interests⁷. The results discussed below are influenced by these variations in approach but not necessarily undermined.

3 SUMMARY OF FINDINGS

Four thematic areas for investigation on a national basis were identified:

- fisheries livelihoods and practices;
- agricultural land use and livestock;
- deforestation, energy needs, and woodland management; and
- population and movement.

3.1 Fisheries livelihoods and practices

The most common fishing gears are catamarans and lift nets, beach seines, gillnets, and various types of lines, although FPSS reports over fifty gears in use, and every niche is exploited⁸.

Lift nets used from **catamarans** were introduced in the north of the lake in the 1950s, and were brought to Tanzania in the 1980s by Burundian and Congolese fishermen following fish stocks, fleeing war, or both. They are less common in the south of the lake where they are restricted by high winds. This type of gear targets sardines offshore, is the most expensive to acquire, and is owned by only a few individuals who inherited it, or received credit through past schemes, or in a few cases, saved their earnings from farming or as hired crew. Some catamaran owners are investors who are not involved in the operation of the gear and may not even live in the fishing village. It is a lucrative business, with the division of the catch highly in favour of the gear owners. However, it is constrained by piracy, specifically by the theft of the outboard engines required to reach the offshore fishing grounds. Fishermen who have had their gear stolen are unable to fish at all, nor to repay any outstanding loans. Those who still have their gear fear to venture far offshore to the most lucrative and productive areas. In 1999-2000 it has also been constrained in Burundian waters due to the closure of the lake for security reasons.

⁷ National staffing was prioritised with external consultants kept to a minimum both to develop in-country capacity and to enhance the sustainability of project activities and extend limited resources. Whilst this was a strength, there were some difficulties in finding suitable staff, and in cross country collaboration.

⁸ See FPSS reports for technical information on the different types of gear.

Beach seines are mainly used at night with lamp boats to target sardines, but are also used during the day in inshore areas where they target all littoral fish⁹. They require less capital than lift nets, but ownership is still limited to more affluent households. They employ large numbers of hired fishermen, but the division of the catch is again highly in favour of the gear owners and, to a lesser extent, the lamp boat owners. They are important throughout the lake, but especially so in the south, where catamarans are less common. Their legal status has changed throughout the lake over the course of the Project, and remained unclear to both researchers and fishermen in 1999-2000. Lack of resources on the part of fisheries departments and lack of access to credit or viable alternative livelihoods on the part of fishermen mean that even where bans are in place and are understood, they are often unenforced and unenforceable, and the nets continue to be used illegally.

Different fishing activities peak at different seasons in different locations around the lake, and the sardine fishery is also dependent on the phase of the moon. When catches are high, prices drop, particularly during the rainy season when it can be difficult to process (sundry) the sardines before they spoil. **Gillnet** and **line** fishing occur throughout the year. They target large fish that can be sold for high prices in urban areas, although where markets or prices are poor, they are consumed within the household too. Line fishing in particular requires little investment, and is often undertaken in conjunction with other types of fishing, or as a fallback during periods of low catches, or by young boys. Although the impact of a single line fisherman on the biodiversity of the lake is minimal, their huge numbers are likely to make a considerable impact, although this is intrinsically difficult to determine, monitor, or manage.

Fishing is hard work, and hired fishermen, particularly beach seine pullers, are poorly paid, although they do have some access to cash. Many fishermen do not manage their finances well as there is a feeling that they can always return to the lake and earn more, with drunkenness a problem in some areas¹⁰. The state of the fishery varies. In some locations, particularly near refuges such as fishing exclusion zones off National Parks, catches remain high. In others, however, they have declined enormously, and some wealthy gear owners have diversified into other activities, such as shopkeeping and trade, or commercial farming elsewhere. The poorer hired fishermen have fewer options, and tend to remain in the lakeshore villages where their households depend on often marginal subsistence agriculture.

Fishing is also important to the economies of villages some distance away from the lake as men come to the lakeshore villages to work as hired fishermen, or even own gear. There is also an important trade in agricultural products and fuelwood in exchange for fish between villages in the interior and lakeshore villages.

There are markets for fresh fish in major urban areas, but in the majority of villages along the lakeshore, fish must be processed as supply exceeds local demand. Blast freezing facilities exist only in Mpulungu and Nsumbu towns in Zambia. The sardines are dried in the sun on specially prepared drying grounds, which are limited, and may be rented. When dry they can be stored and transported relatively well. Large fish are smoked which contributes to

⁹ They are widely hypothesised to impact on biodiversity and fish productivity through their use in the more species rich littoral habitats, capture of immature sardines, and damage to fish breeding and feeding grounds as they drag over the bottom of the lake.

¹⁰ *“They go fishing some days and as soon as they get some money they stop fishing to drink until they have no money left; then they go back fishing.”*
Fishermen at Kipili describing those at Katete, cited by Mung’ong’o. (PRA in Kirando Ward, 1997)

fuelwood availability problems. There have been attempts to introduce more efficient smoking ovens, but they have not been sustainable. However, where there are severe fuelwood shortages, local modifications have been made to improve efficiency. Women and children usually undertake processing. They are either paid in kind for their labour or purchase fresh fish to process and then resell. Processed fish is sold throughout the region, as far away as Dar es Salaam and Lusaka, with major markets in the urban/industrial areas of the Copperbelt in Zambia and Lubumbashi in Congo, as well as in Burundi. Lake Tanganyika sardines are highly prized and there is considerable cross border trade, much of it smuggled. Poorly processed fish, not suitable for human consumption, is sold as animal feed. Small scale processors and traders are often women who operate with only a few dollars worth of capital, and frequently make losses as a result of price fluctuations or spoilage, particularly in the rainy season. Large-scale long distance/cross border trade is highly profitable, but requires many hundreds of dollars worth of capital and is usually undertaken by men.

3.2 Agricultural land use and livestock

Around much of the lakeshore flat land suitable for farming is limited, often to no more than a strip a few hundred metres wide at the base of the steep slopes of the rift valley escarpment. The principal crop is cassava, which is grown primarily for subsistence, although a surplus may be sold. The principal cash crop, particularly in the north, is oil palm, although there is also some rice grown in river valleys. Other crops include maize, beans, and bananas. Where there is flat fertile land (e.g., in the Rusizi floodplain, Malagarasi delta, or at the mouth of the Lufubu) agriculture is more diverse. However, many lakeshore villages do not meet their non-fish food requirements and depend on trade with inland villages. Subsistence farming on its own as a livelihood provides for survival only, and is typically the mark of the poorest households.

Population growth and redistribution (migration) has resulted in land shortages in places, particularly where fishing has declined, resulting in the clearing of marginal land on steep slopes for new fields. This contributes to soil erosion, rapid runoff of rainfall, mudslides, flooding, and sedimentation of streams and the lake, reducing the productivity of both the lake and the hillside fields. In some areas fields are unusable after only two or three harvests, and new, even steeper slopes are cleared. In villages bordering National Parks, land issues generate tension between villagers and park authorities, although in general, tenure is relatively secure¹¹. In the wider catchment area in Tanzania agriculture is based on extensive shifting cultivation. As populations grow and agriculture expands the natural *miombo* woodland is cleared, which results in increased erosion.

Around the lake, farming is primarily undertaken by women and is more important to poorer families, although patterns vary. A lack of hill farming traditions and a perception that farming is still not as important as fishing, particularly to the wealthier or more influential members of many communities, has meant that there have been few efforts to improve it. Poor access to markets also limits people's attempts to increase or diversify production. Nevertheless, in some areas the arrival of new practices and technologies such as the use of animal manure or ox-drawn ploughs have had some impact. In Kigoma Region the TACARE Project has promoted better hillside practices, agroforestry, and vegetable growing.

¹¹ Except in Kibenga, in the peri-urban zone around Bujumbura city, which is increasingly urbanised; peasant farmers there now have to rent their former fields from the speculators to whom they sold them (usually at below value prices). Nonetheless it is expected that they will be developed soon, at which point peri-urban farmers will have to move elsewhere, or stop farming.

Oil palms are cultivated by men, usually from more prosperous households which can afford to set aside land for the five to seven years the trees require to reach maturity. In southern Burundi they are grown on plantations. Once they have reached maturity they produce two harvests per year for up to thirty years, and are extremely profitable. The oil is processed locally by women. Processing uses considerable amounts of fuelwood, which contributes to availability problems. In some areas the palm residues themselves have started to be used as fuel. In Kigoma Region the TACARE Project has introduced new high yield hybrids.

There are generally very few cattle kept in lakeshore villages as the terrain is not suitable and tsetse is widespread. However, in Burundi, cattle owned by well-off Bujumbura households are kept in the peri-urban zones of the city under relatively intensive conditions. They have been moved from the interior of the country as a result of the insecurity and face shortages of feed and pasture in the peri-urban zone, but there is a high demand for milk, and the activity is highly profitable. In addition, in Rukwa Region, in the southern part of the Tanzanian coast, Sukuma agropastoralists from the Central Plateau have brought significant numbers of cattle in recent years. In northern Congo, cattle keeping ended with the recent (1998-2000) insecurity, as most cattle were stolen. Goats and poultry are kept in most villages, although in small numbers and by only a small number of households. In the central part of the catchment area there is little cattle keeping due to the presence of tsetse. However, in the northern parts of the catchment in Kasulu District, where soils are poor, cattle are kept to broaden the subsistence base and to support cultivation through the use of manure, as well as a means of storing any accumulated wealth. Here, overstocking is a problem, which leads to soil compaction and/or erosion.

3.3 Deforestation, energy needs, and woodland management

As a result of clearing for agriculture and demands for fuelwood for domestic use, smoking fish, processing palm oil and producing traditional beers, there are fuelwood shortages in many lakeshore villages. Trade in fuelwood and other natural resources has been reported both within lakeshore villages and between lakeshore and inland villages. Inappropriate and uncoordinated burning also damages woodland resources, and in Tanzania in particular the villagisation programme of the 1970s locally exacerbated the problem by raising population densities in fewer, larger villages. Loss of tree cover contributes to soil erosion and rapid runoff of rainfall, which lead to mudslides, flooding, and sedimentation of streams and the lake¹². In the wider catchment area in Tanzania there is further pressure on woodland resources for curing tobacco, as well as for charcoal production around urban areas, and timber extraction where suitable species exist. Tanzania has also hosted varying but large numbers of refugees over the past 35 years, whose presence has further contributed to deforestation. In Zambia Forest Reserve land has been degazetted to allow for agricultural expansion, while in Tanzania Forest Reserves established for long term sustainable production have been over-harvested by the District Authorities who are supposed to manage them. These Authorities have become self-funding and experience difficulties in meeting short-term expenses.

¹² E.g., among the study sites, mudslide scars could be seen in Mwamgongo in 1999, and floods destroyed homes (146) and crops in Kirando in 1997, and in Kapoko in 1998.

3.4 Population and movement

Population growth and movement are primary contributors to sustainability problems. Slowing population growth may result from initiatives such as supporting less labour intensive subsistence activities, better social security systems, improved health care and childhood survival, and better education for girls. However, few such initiatives were happening at the time of research in lakeshore communities. Populations are young, and growing¹³. Many fishing communities have mobile members moving in response to changes in the abundance and distribution of fish, as well as changes in the local political and security situation, or the strength of other sectors in their national economies. As well as natural population growth, there is likely to be considerable in-migration to lakeshore areas in Congo (though it seems not presently around Uvira), and in Zambia, where the decline in mining has left many unemployed elsewhere in the country¹⁴. Migration to the lake occurs because line fishing and small scale sardine processing and trading are livelihoods relatively easily and cheaply adopted. Many fishermen are not attached to any one place, or interested in terrestrial issues such as agriculture or soil conservation, in part because they often have a strong identity as fishermen.

Increased migration due to insecurity in the region has contributed to the unsustainable exploitation of natural resources in certain areas. However, migration is not a new phenomenon and has been occurring in the region for many years, not only as a result of political and security problems (either internal or international migration), but also in order to diversify livelihoods. Seasonal migration occurs depending on fishing and farming seasons, with movement away during slack seasons and influx during periods of peak labour requirement. Circular migration occurs when people leave depleted rural areas in search of work that might last for more than a season but do not set up permanent living arrangements in the places they migrate to, although they may be there for many years. Permanent migration also occurs, usually of the better-educated or skilled household members leaving remote villages in search of permanent opportunities elsewhere¹⁵. Remoteness is associated with greater poverty and fewer livelihood options¹⁶. As well as for security, movement is part of the livelihood strategies of many of the region's populous.

3.5 Livelihood strategies

Fishing and farming are the primary wealth producing systems. Other economic activities serve more to redistribute wealth, either by spreading it more evenly through a community, or by concentrating it in the hands of a few. The relative importance of fishing, farming, and other activities varies not only from community to community, but from household to household and from individual to individual. It is influenced by tradition, the arrival of new immigrants with new technologies, and changing environmental situations and people's perceptions of them.

¹³ For example a growth rate of over 4% for the Province de Makamba in Burundi, and 4.3% for Rukwa Region in southern Tanzania, which give a doubling time of only 17-18 years. More typical is a rate of 2-3% in the Provinces de Bujumbura and Bururi in Burundi, 2.6% for Burundi overall, and 2.8% for Kigoma Region in northern Tanzania, but these still yield a doubling time of somewhere between 25 and 30 years.

¹⁴ (data from Nsumbu show in-migration, although this was not the case in the rather more remote Chisanza).

¹⁵ Although the peri-urban zone around Bujumbura city is host to relatively unskilled would-be migrants to the city who are unable to find the opportunities they had hoped for, and cannot afford the high costs of living there.

¹⁶ For initiatives, therefore, it may be valid to target as a priority more remote locations rather than those communities that already have diverse economic activities.

Livelihood strategies around the lake are diverse, complex, and dynamic. Although local economies are primarily based on fishing and farming, the total range of activities and income sources and the ways in which they are combined within households to support life are numerous and change with the seasons and changing circumstance. Most households depend on a diverse range of activities and income sources, and livelihood diversification was found in all locations surveyed and across ranges of income and wealth. Diversification occurs for many reasons including reducing risks/improving security, income instability due to seasonality, and the insufficiency of any one activity to support life or generate sufficient income, e.g., for school fees.

Fishing underpins the economies of lakeshore villages, but not all households are involved in fishing (e.g., only 31% in Makobola, or 36% in Kigongo), and the distribution of revenues is highly inequitable¹⁷. Some fishermen, such as the owners of lift nets or beach seines, or, to a lesser degree, owners of lamp boats or crew members on catamarans, bring home fish for their families and a considerable amount of cash. Others, such as line fishermen or beach seine pullers, bring home only small amounts of fish and rely on other activities to generate income.

Women from most households are involved in farming, primarily for subsistence, although many sell small surpluses, when available, to generate extra income. Many households produce sufficient food for their immediate needs. However, insecurity in Burundi and Congo has resulted in food security or sufficiency problems for the poorest who are not able to buy food. Cassava meal porridge (*ugali*, *nshima*) is the main staple food, with sardines the most common addition, although non-fishing families do not eat fish every day. Cassava meal porridge and fish are especially popular where fuelwood is scarce, as they require less cooking than other foods, such as beans. Men are also involved in farming to varying degrees depending on their other activities, and the crops cultivated. There is considerable trade in fish and agricultural products and fuelwood between fishing and non-fishing families within villages, as well as between lakeshore villages and farming villages in the interior. Cash crops such as oil palms are grown by the more prosperous households who also own fishing gear, and who may use hired labour.

Most households undertake a range of activities, either in parallel or on a seasonal basis, but also in an *ad hoc* manner when a need for extra income arises. For example, in Chisanza (as in much of the south of the lake) much fishing activity is seasonal, with many men fishing little or not at all during the rainy season, when they are more involved in farming. Women thus undertake more processing of fish in the dry season when the sardines are more available and the likelihood of them being spoiled by rain is less. They also make buns and fritters in the dry season, but not in the wet, when mangoes are freely available as snacks. During the rainy season, despite heavy workloads in the fields, women tend to brew beer more often, as opportunities for other income generating activities are reduced.

¹⁷ For example, a catamaran owner's share of the catch is typically four to six times that of a crew member; that of a beach seine owner is typically on the order of twenty times that of a net puller.

Large communities tend to support a greater diversity of livelihoods than smaller ones as there are more opportunities for specialisation¹⁸. The SESS has encountered salaried employees such as government workers¹⁹ other full time skilled workers, such as boat builders, carpenters, bricklayers, or drivers, and other individuals with specific skills which they use part time, such as outboard engine mechanics, or radio or bicycle repairmen.

Prosperous households, which typically own fishing gear, including outboard engines, often diversify into transport, trade, and shopkeeping, and reinvest their wealth in yet more productive assets and income generating activities. However such households comprise only a small fraction of lakeshore communities²⁰. Individuals from poorer households sell their labour, not only as fishermen and agricultural workers, but also as other low status labour such as fish porters or cleaners in larger fish markets, or bicycle taxi peddlers in the flat area of the Rusizi floodplain.

Income generating opportunities for women tend not to be as lucrative as those for men, but are also diverse, and most women try to generate at least small amounts of income for clothing, soap, medical care, and their children's school fees. Women undertake most of the processing of fish around the lake, and in Kigongo in Congo and Nsumbu in Zambia dominate the lower end of the fish trading business, with some exceptionally successful female long distance sardine traders encountered in Nsumbu. In Chisanza women from 30% of households brew traditional beers for sale in the village, while 23% collect firewood for sale on at least an occasional basis. Women around the lake are also involved in processing palm oil, embroidery and knitting, and the preparation of various cooked snack foods, which are often sold by children.

Many households experience difficulties in survival with little capacity to withstand shocks. In times of hardship or sickness, social capital is important with social networks used to access resources, and households depending on help from their relatives, loans, or "mutual aid". Few have savings, or are able to put aside money to invest in productive assets or new income generating schemes. Children in poor families are unable to attend school when there are insufficient finances to pay the fees. Moreover, children are often important contributors to the household economy through line fishing, helping with farming and fish processing, collecting natural resources for sale, etc.

3.6 Protected Areas

National governments need support in maintaining existing protected catchments or deltas (National Parks, Forest Reserves, etc) in the face of mounting pressures on them. Some areas have already been degazetted (Forest Reserve land in Zambia, degazetted to allow for agricultural expansion, and the delta section of the Parc National du Rusizi degazetted for agricultural expansion, housing, and light industry²¹). The SESS has found that Protected Area (PA) management tends to be of the top-down, paramilitary law enforcement type, with local people poorly informed about changes which affect them, and seldom consulted, or

¹⁸ The peri-urban zone around Bujumbura city, including Kilomoni across the border in Congo, supports the greatest diversity of livelihoods of the communities studied. Most activities undertaken there were also recorded in more remote villages around the lake, but some are dependant on the presence of the city, e.g., the digging of sand to supply the municipal water filtration system.

¹⁹ Teachers, clinic workers, policemen, immigration officers, tax collectors, etc.

²⁰ For example although some 44,000 fishers are estimated to be active on the lake, there are only about 3,000 catamarans (LTR). Allowing for the fact that a proportion of catamaran owning households own more than one unit, these figures indicate that this group probably makes up no more than 5% of households.

²¹ Both for political reasons, where governments rely on popular support in the short term.

given a voice. However, this need not preclude changing the philosophy of PA managers, helping local people to use resources outside the PAs more efficiently, and providing environmental education to both local people and government ministers in the future. PAs are important in terms of protecting catchments, and, where there are existing aquatic zones, in acting as fish refuges. However, the SESS has found that they do not relate well to neighbouring communities that bear the short term opportunity costs without understanding the long term benefits, many of which accrue elsewhere.

Box 1 – Further findings from the SESS to be considered when planning interventions

- The relative unimportance attached to farming by the most influential members of lakeshore villages, who tend to be the male owners of fishing gear.
- The relative unimportance attached to agriculture even by poor fishermen, whose households may depend on farming, due to a strong fishing identity and sense of machismo.
- The relative lack of interest in agriculture of mobile fishermen be they following fish stocks or fleeing insecurity in their places of origin.
- The low status of women who undertake more farming than men.
- The non availability of farming inputs/resources in rural areas.
- Lack of capital or access to small-scale credit on the part of subsistence farmers, particularly women.
- Lack of financial planning/management skills.
- Lack of knowledge by farmers, plus lack of extension services²².
- Extreme poverty, which may not allow people to forego present benefits even if they are aware that there are likely to be greater benefits in the future. However, lakeshore communities have been found to be very adaptive when they experience a new technology or practice that works²³.

4 SOCIO-ECONOMIC ISSUES AND RECOMMENDATIONS TO THE SAP

The SESS has shown that livelihood strategies in the region are complex and dynamic and that there are vast differences between the poor and wealthier populace. Overall, however, the rural people around the lake are some of the poorest in some of the poorest countries in the world²⁴. The first SESS Working Group Meeting in 1999 underscored that people *requested* development. Thus the SESS suggests types of development to be “encouraged” as opposed to “permitted”, with more emphasis on finding and promoting sustainable livelihood strategies.

The links between poverty and environmental degradation are well known. It is generally the poor who are most dependant on natural resources, and who also are most often unable to plan for the long term and to manage their natural resources sustainably due to efforts to meet their short term needs. Even where there is good understanding of possible future benefits,

²² There are extensive knowledge gaps about general development issues, technical issues pertaining to sustainable fisheries, farming, woodland management, etc., and environmental issues, and a serious lack of extension work. However, education and extension are not the only solutions; SESS has also recorded cases of local people who know what they should or should not be doing, but who are constrained by poverty or lack of alternatives from acting on their knowledge.

²³ E.g., lift nets, ox drawn ploughs, use of animal manure, etc., which have been/are being adopted without deliberate action on the part of specific development projects.

²⁴ E.g., per capita income in Kigoma Region, the northern part of the Tanzanian coastline, is 54% of the national average in Tanzania, itself a poor country. This average does not consider the highly inequitable distribution of this income.

the poor cannot afford to forgo any short term benefits. The environmental problems identified in the TDA of unsustainable fisheries and unsustainable agriculture and woodland management result directly from the poverty and lack of alternatives of the people living around the lake. Poverty leads to continuing environmental degradation; the degraded natural resource base is then less able to support life, which perpetuates poverty. **The biodiversity of the lake will *only* be managed sustainably and conserved through programmes of poverty alleviation, livelihood diversification, and social and economic development in lakeshore communities.** As such they should be a priority of the SAP.

Substitution possibilities for more sustainable practices must be identified, tested, introduced, and promoted, as this is a key factor in the diversification of livelihood security. Poverty alleviation in order to promote sustainable practices requires the widening of livelihood options by increasing flexibility and mobility, and reducing regulatory and social-cultural barriers on activities. However, new livelihood initiatives need to be tested in the region and approved by the communities, without which there is no guarantee of change of practice. The SESS suggests exploring the following issues and recommendations for **alternative livelihood strategies and support mechanisms in order to *encourage* people to change practices that damage the biodiversity of Lake Tanganyika. This need to be undertaken within a context that places poverty alleviation and general social and economic development as a priority in order to ensure sustainability of the natural resources base in general and the biodiversity of the lake in particular.**

4.1 Alternative livelihoods, activities, and practices

Activities that increase wealth or well being around the lakeshore in an equitable way, but do not cause increased erosion/sedimentation or increased fishing pressure should be supported by the SAP as they could alleviate the reliance on, and thus damage to, the natural resource base. Similarly, activities which add value at the lakeshore to existing fish or agricultural production should also be supported. Activities that bring revenue to the lakeshore area from others, either within the country or even from abroad should also be encouraged, as well as those that redistribute wealth more equitably within lakeshore communities.

Box 2 – Alterations to existing livelihood strategies and alternatives to be investigated

- Improved processing of sardines, e.g., promotion of "cleaner" methods to yield a sand and grit free higher value product. This has the possible additional benefit of increasing income of poorer households and women who are more involved in sardine processing.
- Solar hot air sardine dryers to produce a cleaner product, and perhaps even reduce loss from spoilage in rainy weather. This may have the additional benefit of increasing income (and reducing losses) of poorer households and women, who are more involved in traditional sardine processing.
- Where fuelwood is scarce, further investigation into improved fish smoking ovens (although existing designs are relatively efficient, particularly where there is a market in fuelwood) to allow this practice to continue to be feasible and economical. An additional benefit to women may be that the slower decline of fuelwood resources, reducing the rate at which their energy acquisition workload increases. However, there could be negative effects on the poorest, who depend on selling fuelwood or use it as part of their network of exchange in accessing other resources.
- Reduced damage to smoked fish by beetles that consume a large portion of the product.
- Production of fermented sardine products ("anchovies", Thai-style fish sauce, etc.) Currently there is not a market, but this could reduce losses from spoilage in rainy weather, should add considerable value, and can be transported easily. This has possible additional benefit of increasing income (and reducing losses) of poorer households and women, who are more involved in traditional sardine processing.
- Ice making businesses in urban areas and larger fishing villages to allow fresh iced (not frozen) fish to be marketed throughout the region. This would require education of fishermen and consumers, but would significantly increase the value of the *Lates* catch²⁵.
- Small scale aquaculture where fish catches are declining and conditions suitable.
- Improved processing of palm oil to yield a higher value product. This has the additional potential benefit of reducing nutrient load in the lake from better disposal of the highly polluting palm oil effluent. However, this may have negative effects on poor women who depend on (seasonal) paid work in the traditional processing industry.
- Improved processing of other cash crops/crops for sale, such as cassava, sunflowers, etc. This could include credits to small groups
- Improving land transport (enhancing physical capital assets) to markets for fish and agricultural products. Without this, the SESS has found that people are reluctant to diversify their farming activities, or even to aim to produce a surplus. This, however, must be planned to reduce negative environmental impacts during construction, etc. An additional benefit of increasing mobility and communications with other parts of the country is that it facilitates entry into other sectors of the economy. However, it also facilitates access to the lake by outsiders in the event of recession, etc. in the rest of the country that may increase pressure on natural resources and thus impact negatively on biodiversity.
- Non-wood forest/woodland products, particularly from a "rosary" of small village catchment protection areas/woodlands/woodlots.
- Savings and micro credit projects (enhancing financial capital assets) to allow the poorest, particularly women, to establish the kinds of income generating activities which are already undertaken by the less poor in lakeshore communities, for example, baking, embroidery, brewing of traditional beers, etc.

²⁵ Iced fish would be of higher value than those now blast frozen in Zambia, or canned fish, etc., and ice in insulated containers is more suitable than refrigeration for a fishery based on many small units. A possible constraint to the profitability, however, might be the seasonality of the catches, and the fact that there is no light fishing for 7 out of every 28 nights during the period of the full moon.

4.2 Poverty alleviation, social and economic development, and gender issues

The SESS further recommends that the ILTMB, through the SAP supports attempts to improve living standards and alleviate poverty, both through support of direct actions itself, and through raising the profile of the lake region. *Inter alia*, the national governments of the riparian countries should focus existing programmes and resources on the poorly served areas of the lake region, as well as attract the attention of international donors outside the traditional biodiversity sphere to the region. There are links between general socio-economic development, capacity to manage renewable natural resources, and reduced population growth rate, itself an underlying threat to the biodiversity of the lake²⁶. Important within these topics are improving health and education (enhancing human capital assets).

Box 3 – Social and economic development initiatives

- Improvements to the diet of poorer households, particularly those with less access to fish. An additional benefit is improving people's productivity and reducing medical bills, a major area of household expenditure. Specific ideas include:
 - promotion of poultry and small animal (goats, pigs, rabbits, etc.) keeping. These are currently not competitive with fish in price, but could be sold as a luxury to the more prosperous in the village, or in nearby urban areas;
 - promotion of legume proteins (beans, soy, peas, etc.) where conditions allow. This has additional soil fertility benefits and surplus could be sold, as they travel well. However, beans typically require a long period of cooking (i.e., more fuelwood), which must be planned for; and
 - promotion of zero grazed cows on a small scale where tsetse is limited to increase local consumption of milk. This is of less benefit to the poorest, unless there is a market in fodder, which could come from terrace edge binding grasses.
- Improved access to clean drinking water, which would reduce the incidence of waterborne disease. As well as repairing/maintaining existing facilities (e.g., pumps, etc.) and installing new ones, this could include investigation into methods of purification which do not depend on boiling, e.g. solar pasteurisation.
- Improved sanitation, which would reduce the incidence of waterborne disease. This could include the investigation of new techniques of pit latrine construction in sandy soils with high water tables, etc., and has the additional benefit of improving people's productivity, reducing medical bills, and reducing nutrient loads in the lake. Domestic pollution is a prime cause of health problems such as cholera outbreaks. Some villages fail to control pollution as a result of poverty (and associated lack of education, etc.), whilst in others it is due to cultural practices and unequal gender relations. Better disposal of rubbish, with additional soil fertility/conservation benefits from composting could also be included.
- Health education and improved delivery of health care services. This has the additional benefit of improving people's productivity and, through education, reducing medical bills.
- Improved access to formal education for both children and adults, particularly girls and women. This has the additional benefits of facilitating access to other sectors of the economy, reducing pressure on lake and lakeshore resources, and providing a channel for environmental education.
- Support to democratic processes, peace, market liberalisation, decentralisation of power to rural communities, new representative systems of governance, empowerment of rural people with support from NGOs, etc (see section 4.6 below).

Diversification of local economies is one of the most effective ways of improving the income generating capabilities of women and, by so doing, improving the care and education of children²⁷. To facilitate this, livelihood activities that are accessible to women and are based close to the home need to be supported. Women need to be better educated and equipped to access a wider range of livelihood activities and to meet their strategic needs. However, diversification can also exacerbate gender inequity when men dominate new more lucrative activities. Moreover, the rich (usually men) tend to have greater access to new initiatives and

²⁶ However, there are problems associated with increased in-migration to areas with improved resources.

²⁷ It is well documented that income governed by women is spent more on family welfare than income controlled by men.

some adverse gender effects have been associated with diversification. When men preferentially take advantage of diversification opportunities, women may be even more likely to be relegated to the domestic sphere or subsistence activities²⁸. Nevertheless, the benefits of diversification in the region generally outweigh the negative effects.

Gender equality may be achieved by improving the institutional context of public and private decision-making, minimising barriers, and ensuring fairness in the conduct of public agencies. Poor women must also be supported with opportunities to improve their assets and income-generating capabilities. For instance level of education, affected by gender distribution of household labour and income, has been shown to have a substantial impact on the diversification capabilities of individuals and households.

4.3 Sustainable fisheries and the facilitation of credit

The SESS has found that livelihoods are primarily based on the offshore (sardine and *Lates*) fishery, the inshore fishery, and farming. Other SSs have indicated that the inshore area is the most species rich, and that it is already locally heavily fished, leaving little capacity for expansion. A specific and high profile concern in the management of a sustainable inshore fishery is the use of beach seines²⁹. The SE implications are that beach seines employ many people, specifically men from poorer households and provide these households with fish for consumption, trade, or even occasionally sale. Beach seine pullers are some of the lowest "paid" fishermen, but this is considerably more attractive than a livelihood based on farming alone. Beach seines also provide much of the fresh sardines upon which the livelihoods and/or income generating strategies of the many processors and traders depend. Thus, where a widely used gear/practice is to be banned, SESS suggests that, where possible, it be phased out as alternatives are phased in, and that this is done in a participatory manner.

It has been suggested that an approach to reducing pressure on the species rich inshore fishery is to facilitate credit to fishermen to allow greater access to the offshore fishery where fishing is currently more profitable and there is less biodiversity of conservation concern³⁰. Producing a plan for the sustainable management of the offshore fishery is the responsibility of the LTR project, and has not been a major concern of the LTBP. Whilst the preliminary TDA identified excessive fishing in the pelagic zone as part of the threat to "Unsustainable Fisheries" it was ranked lowest of the "Medium Priority Fishing Problems" because it was not considered a threat to the biodiversity so much as a problem for the fishing economy³¹.

The SESS argues that problems in the offshore fishery/fishing economy bear directly on the future of the biodiversity in the inshore zone. The offshore fishery is large, and worth tens of

²⁸ Careful planning is required to mitigate negative effects on the most vulnerable. For instance, initiatives to promote improved processing of palm oil risk benefiting well off palm owners at the expense of the poor women who currently process the oil manually; such schemes *must* develop improved technologies in participation with *all* stakeholders.

²⁹ See FPSS reports for details on the use of specific gears/practices and their banning (or not). Beach seines are used over sandy-bottomed beaches which are limited in distribution and which have the lowest diversity of inshore habitats. Furthermore, although they are pulled in through the inshore area up on to the beach, they are mostly used at night with lamp boats that attract sardines offshore and lure them into the beach area and, when used this way, may be considered as part of the offshore fishery.

³⁰ The gear used for offshore fishing (lift nets and catamarans) is the most expensive, and SESS has recorded numerous complaints about lack of credit and/or requests for credit to allow entry into this more profitable arena.

³¹ "A third problem, excessive fishing pressure in the pelagic zone seems above all to be a problem for the fishing economy, but not for the biodiversity because few species are targeted and these species, although in reduced stocks, are not threatened with extinction." (Preliminary TDA, 1999)

millions of dollars annually. Although these revenues are not equitably shared, and do not impinge on every household, the offshore fishery is the backbone of the economy of lakeshore communities. If it were not managed sustainably, and fish stocks were to collapse, thousands of fishermen would be forced to turn to the inshore fishery and to farming for survival, possibly in a short period of time. The impacts on both inshore fish mortality and sedimentation rates would likely be devastating, and hardship and dislocation would also probably ensue. Thus the SESS recommends that the sustainable management of the offshore fishery be accorded a very high priority.

In terms of expanding the offshore fishery through facilitation of credit, indications from LTR are that fishing pressure throughout the lake is already “very high” in relation to sustainable yields, and that in some areas, lift net operations already need to be *controlled*, as opposed to expanded³². Thus SESS suggests that the facilitation of credit to fishermen to allow more of them to fish offshore be considered only in conjunction with the results of the LTR project and their suggestions for sustainable management of the offshore fishery.

Box 4 – Problems with credit initiatives to support offshore fishing

- Limited capacity of the fishery.
- “Natural” filling of capacity – the fleet has been expanding steadily for the past 20 years despite limited access to credit.
- Promotion of inequality³³ - although the SESS has found examples of offshore gear co-owned by extended families, etc., there do not appear to be any examples of co-operatively owned gear.
- Catamaran, lift net, outboard motor, anchors, lamps, etc. can amount to \$10,000, which is not “micro” credit. Those accessing such credit usually have collateral to start with, and are thus likely to have access to credit without facilitation. Less expensive gears used inshore are hypothesised to have negative biodiversity impacts, or are not as profitable to operate.
- Piracy - issues of theft of gear as well as personal security are important to fishermen in the open waters. The SESS has found that piracy is attributed largely to people based in Congo. This problem will not be easy to eradicate. As long as the current lawlessness in Congo continues, gear will continue to be stolen³⁴. Repayment will then be impossible for anyone who has received credit, unless they have forwarded collateral, which they will then lose. If there is some leniency clause i) the credit will not revolve, and ii) there may be arguments over whether gear has actually been stolen or merely reported as such to evade repayments. This adds to a history of unsuccessful fishing credit projects in the region, many started for political reasons, with little expectation of repayment.

If there were to be a credit project aimed at fishermen, it should include a direct buy out (and destruction) of the old gear – the object is not to facilitate more fishing overall, but to move fishing effort from the inshore zone offshore. If left in circulation, the old gear is likely to be handed down to other family members, resulting in no decrease in effort in the inshore zone, and an overall increase in the total fleet. The buy out would reduce the amount of loan, as the proceeds would be expected to go towards the new gear, but would be a one time payment, not to be repaid by the recipient. Depending on the targeted recipients, it might also be necessary to include training in financial management to those who lack capacity in this field. Furthermore, it will important to ensure that all stakeholders understand the proposed

³² “38. *Input or effort controls are indicated with respect to... the lift net fisheries throughout the northern end (over-exploitation risk to S. tanganicae on both west and east coasts north of Karonda).*

“39. *It is thus recommended that licensing ceilings be established for... lift net units in the north (waters north of Karonda).* (LTR TD/97, 1999)

³³ The SAP should support development but this should be sustainable and equitable social and economic development. SESS has found that revenues from the offshore fishery are very inequitably distributed, and given the high capital outlay, risk of piracy, etc., this is unlikely to change.

³⁴ The lake is only 50km wide, a short boat trip with a good engine, and the pirates are better armed than any marine police.

repayment schedules from the outset; past loan schemes have failed when recipients did not fully understand what was required of them, and considered loans as direct (free) grants.

In terms of formulating management plans for both the inshore and offshore fisheries, SESS has found that fishers are extremely diverse, and have many different needs. The SESS has also found that, where no acceptable alternatives exist, even criminalising of gear/practices (e.g., beach seine nets in Tanzania) is ineffective³⁵, except where extraordinary law enforcement efforts are made (for example, in Gombe Stream NP). The effect of such prescriptive enforcement without support to alternatives results in widespread hardship and deteriorating relationships between natural resource managers and users. Co-management will not be able to depend on "stick" methods, and as populations increase, will require alternatives ("carrots") to encourage people away, particularly as the fisheries are currently exploited on an open access basis. Areas that have diverse economies support more people for a given level of fishing, and thus, for sustainability, diversification will be essential.

4.4 Sustainable agriculture and soil conservation

Other SSs indicate that current farming practices are not sustainable due to high rates of erosion. Unless they change, they will not be able to support existing populations in the near future, let alone rapidly growing and/or migrant ones, and are likely to continue to compromise the production of both inshore and offshore fisheries. However, possibilities for diversifying livelihood strategies are limited for various reasons, such as the low levels of education the SESS has recorded around the lakeshore. Hence much of the population will continue to rely on agriculture in the foreseeable future. The problems are large, but at least theoretically tractable; except in Burundi, population densities around the lake are not as high as they are elsewhere in the region³⁶, leaving some room for expansion³⁷, although this may have to be above the escarpments on the surrounding plateaux. These developments must, nevertheless, be more sustainable.

With regard to sustainability, an important factor in conserving the lake's biodiversity is to reduce soil erosion, which will also contribute to improving agricultural yields over time. However, there is some confusion and loose usage of the term "deforestation" in relation to soil erosion, which must be clarified. Specifically, it is important to differentiate between removal of woody biomass for fuelwood³⁸ or other uses, where the grasses and scrub are left, and the clearing of land for agriculture, where all natural vegetation is removed and the soil is tilled and kept free of recolonising plants. The first is of concern to forest/woodland conservationists and users of the woody resource, but is not as significant a contributor to soil erosion (trees are more effective but secondary grassland can conserve soil). However, the second, clearing of land for farming, contributes significantly to soil erosion, particularly on sloping ground, and thus merits more attention³⁹.

Reducing soil erosion from cleared agricultural land can follow two paths. The first is to reduce erosion from existing fields, for example by modifying them to reduce the gradient

³⁵ Furthermore, where a law is only partially enforced, and this is widely perceived to be the case, there are increased opportunities for corruption on the part of those supposed to enforce it.

³⁶ For example, in Rukwa Region population density is only on the order of 10 people/km².

³⁷ In contrast to the fisheries, whose maximum sustainable yield is already being approached, in Rukwa Region, for example, only 3.3% of arable land is currently cultivated.

³⁸ For domestic use, fish smoking, charcoal production, tobacco curing, etc.

³⁹ The first may, however, lead to or encourage the second as the original usefulness of the land (source of woody biomass) diminishes, and the ease of clearing it increases.

(contour ridges, terracing, etc.)⁴⁰, or by trapping eroded material, for example in thick grassy borders. Erosion from existing fields can also be reduced by protecting the bare tilled soil with a mulch, or by planting permanent/tree crops (agroforestry) which do not require tilling each growing season and are able to bind the soil with their roots⁴¹. Cultivation along stream banks, which are highly erodible as well as subject to flooding, should be discouraged.

The second path to reducing erosion from cleared agricultural land is to make existing fields more productive so that new fields do not need to be cleared at the same rate. This can be through increasing yields of existing crops through the use of improved varieties and/or through improving soil fertility, for example through the use of green manure/composting, animal manure, intercropping with leguminous plants, etc. Use of artificial fertilisers is currently minimal, particularly amongst subsistence farmers who have little access to the cash required to purchase them, should they be available. Government schemes to subsidise prices have not been sustainable, and thus efforts are best directed at promoting the use of locally available natural materials⁴². Productivity can also be enhanced through introducing new crops that are of a higher value, either as food crops, or cash crops. Extension services should be supported to promote intensification and improved efficiency and sustainability.

Many of these interventions will be related and/or complimentary and should be geared towards improving the diets and/or income levels of the farming households involved. This is important to emphasis in the SAP as farmers are more likely to invest in an activity because it will improve their own livelihoods than because it will be of benefit to fish productivity or the conservation of aquatic biodiversity.

4.5 Sustainable woodland management

The SAP should support lakeshore communities in the sustainable management of wood resources, including protecting existing resources, reforestation, afforestation, agroforestry, and planting of trees in public areas and around homes in villages to make available sustainably produced wood and non wood forest/woodland products, and to reduce the workload of women, allowing them more time for other activities. This should be on a village/local level, with an emphasis on locating protected woodlands/woodlots on vulnerable slopes and/or above rocky aquatic habitats of high diversity⁴³. This has the additional benefit of soil conservation as trees are better than secondary grassland for this and the land will be less likely to be cleared for agriculture, reducing mudslides and flooding as well as sedimentation of the lake. However, there is a possibility of negative effects on poor women, who depend on selling or trading fuelwood. Past projects which provided fast growing exotic seedlings have failed due to insufficient follow up and lack of local ownership, and thus this will be important in sustainability⁴⁴.

As an adjunct to this sustainable management, there should also be support for more efficient domestic stoves, or promotion of solar cooking/pre-soaking of beans, etc., although these are more likely to succeed as compliments to, rather than replacements of, fuelwood. Alternative

⁴⁰ This is common in Rwanda and south-western Uganda, but not in the areas of the countries surrounding Lake Tanganyika, where hillside cultivation is a relatively recent response to population growth.

⁴¹ Furthermore, many tree crops do not require weeding after establishment which allows other plants ("weeds") to bind the soil as well.

⁴² This is particularly true when considering potential damage to the lake from overuse of under-priced (subsidised) artificial fertilisers.

⁴³ Examples of village protected forests/woodlands were recorded in Tanzania, set up by local bylaw.

⁴⁴ In Kigoma Region the TACARE Project currently has an active village nursery programme promoting local ownership, as well as promoting agroforestry.

income generating strategies should be promoted to locally based charcoal producers, although the SESS has found that most are based in urban areas far from the lakeshore.

4.6 Governance, institutional factors, and market liberalisation

During the course of the SESS it became increasingly evident that in order to conserve the biodiversity of the lake in the medium to long term, capital assets must be enhanced to allow livelihoods to be diversified to include more non NR based activities. This means a shift in focus from farming, fishing, sale of fuelwood, and other NR based activities to trade, manufacture, and services, and ensuring that remittances and other transfers such as pensions reach the targeted rural areas. This diversification can potentially conserve biodiversity in two ways. Firstly by providing options that make time expended on exploiting natural resources, such as farming or fishing, less remunerative than time spent undertaking alternatives, and secondly by generating resources that can then be invested in improving the natural resource base, as well as other capital assets.

Nonetheless, fishing and agriculture will continue to constitute the predominant component of the population's income. Therefore, even with a livelihood diversification support programme, other facilitating factors and constraints should be considered. For instance, difficulties were sometimes experienced when discussing SE alternatives with local leaders. Although some village and higher level government officers and employees were extremely helpful and enthusiastic, others were indifferent, or even unprogressive, particularly where leadership was male dominated, or unstable. Although some communities were easier to work with than others, village governments were generally institutionally underdeveloped, with a lack of or non-functional committees (weak social capital), which contributed to the difficulties of progressing the SESS to its ideal of problem solving and participatory planning. Insecurity and instability pose even further difficulties, particularly where there is a breakdown in the governance structures through which new initiatives for sustainable practices can be directed⁴⁵.

Institutional factors are also important, as a large number of institutions at different levels have a stake in the sustainable management of the lake (e.g., national government institutions, local government institutions, NGOs, CBOs, etc.). Local government institutions and CBOs in particular should be involved, but it will be essential to define who should be responsible for different management actions, and how institutions should relate to one another. The National Socio-economics Co-ordinators have begun the process of appraising the roles, strengths, and weaknesses of the relevant institutions in all four countries, and completing this is a priority for further action.

Finally, moves to support market liberalisation can also improve diversification options for both farmers and fishers. A participatory study in Tanzania in the early 1990s showed that increased options for non-farm income generation were regarded by villagers as the most significant change in their lives resulting from new economic policies (Booth et al, 1993).

5 RECOMMENDATIONS FOR FUTURE PARTICIPATORY SE RESEARCH

The national SESS teams in each of the four countries made significant progress in furthering their understandings of current livelihood strategies and the constraints faced by local people in the sustainability of these. Based on their work with lakeshore communities, they have

⁴⁵ Results from Congo in particular illustrate the difficulties in promoting sustainable livelihoods in the face of insecurity, instability, and the break down of law and order, all of which contribute to uncertainty.

produced preliminary suggestions for activities to support change (see section 4 above). The next part of the process of sustainable development is participatory action research in pilot locations to test these suggestions and refine their implementation before they are introduced more widely. However, there is also a need for further SE study, particularly considering the size of the lakeshore area. In the Burundi and Congo, the geographical scope of the survey was limited by security problems. Extending baseline research further is an obvious priority for future work, particularly as there are likely to be differences in both countries between the more urban areas studied to date, and the more rural areas thus far inaccessible.

Participatory research is a learning process, and during the course of the studies and subsequent analysis of the data, new issues and topics of importance have come to light. Notable among these, and of potential interest for future research are:

- further analysis of the complexities and diversities of household composition and the influence of this on livelihood strategies, including the prevalence of polygamy, the dependence on male labour of the more successful household survival strategies⁴⁶, and the different roles played by different household members, including children, who have been found to be important contributors to livelihoods in many areas;
- the factors influencing the dynamics of successful enhancement of capital assets, livelihood diversification, and poverty alleviation, particularly where this has included non NR based activities; and
- the complexity and dynamism of the fish processing and trading businesses, including the range of scales at which this is undertaken (from a plate- or bucketful, to transport boats carrying several tonnes across international boundaries);

Further studies of the heterogeneity of communities, and the factors influencing the livelihoods and activities of different SE groups are needed. Also important is analysis of relevant current and past projects and initiatives to determine the factors contributing to their successes (or otherwise), and strengths to be built upon and pitfalls to be avoided.

Future SE research and the action research to test interventions should include individuals from different institutions (government, NGOs, CBOs and other village institutions, and research institutions) as a priority to establish partnerships, strengthen linkages and co-ordinate activities. Consulting local partners with accrued knowledge of the region and developing improved communications can make the best possible use of limited resources. This is crucial to instigating change, as well as producing a result desired by the people of the region rather than suggested, or indeed imposed, by North based donor projects.

⁴⁶ Specifically, in the clearing of land for agriculture and in fishing.

6 CONCLUSIONS

The overarching conclusion of the SESS is that the unsustainable use of natural resources around the lake is closely linked to poverty, underdevelopment, and lack of alternatives. Biodiversity conservation needs to be linked with short-term economic viability as well as long-term economic sustainability. Villagers are unlikely and unable to adopt more sustainable practices if these threaten their present livelihoods and do not offer better economic prospects than existing practices. Natural resource management must be resourced, particularly in more remote areas, and there is a need for guidance in how this resourcing can be developed and sustained. However, where people are facing real short-term hardship, even restrictive legislation has been shown to fail to change practices where no viable alternatives exist.

The SESS livelihood and capital asset analysis undertaken for the LTBP is not an end in itself, and is only of value if it informs poverty alleviation *action*. Contributions to increasing the opportunities available to the Lake Tanganyika populace by building up the asset base are needed. People's options should be expanded, in addition to supporting the sustainability of the main livelihoods of farming and fishing. There is already a high level of both inter and intra household diversity of livelihoods that should be supported, particularly the activities of women in the informal sector. This can be done by working directly with local people to promote initiatives that support a more cohesive social environment, improved access to education and information technologies and better health and nutrition, better infrastructure, and secure access to financial resources. The people of the region have shown a good understanding of their problems and ways forward, and the need for improving the sustainability of their livelihoods. The final words rest with them:

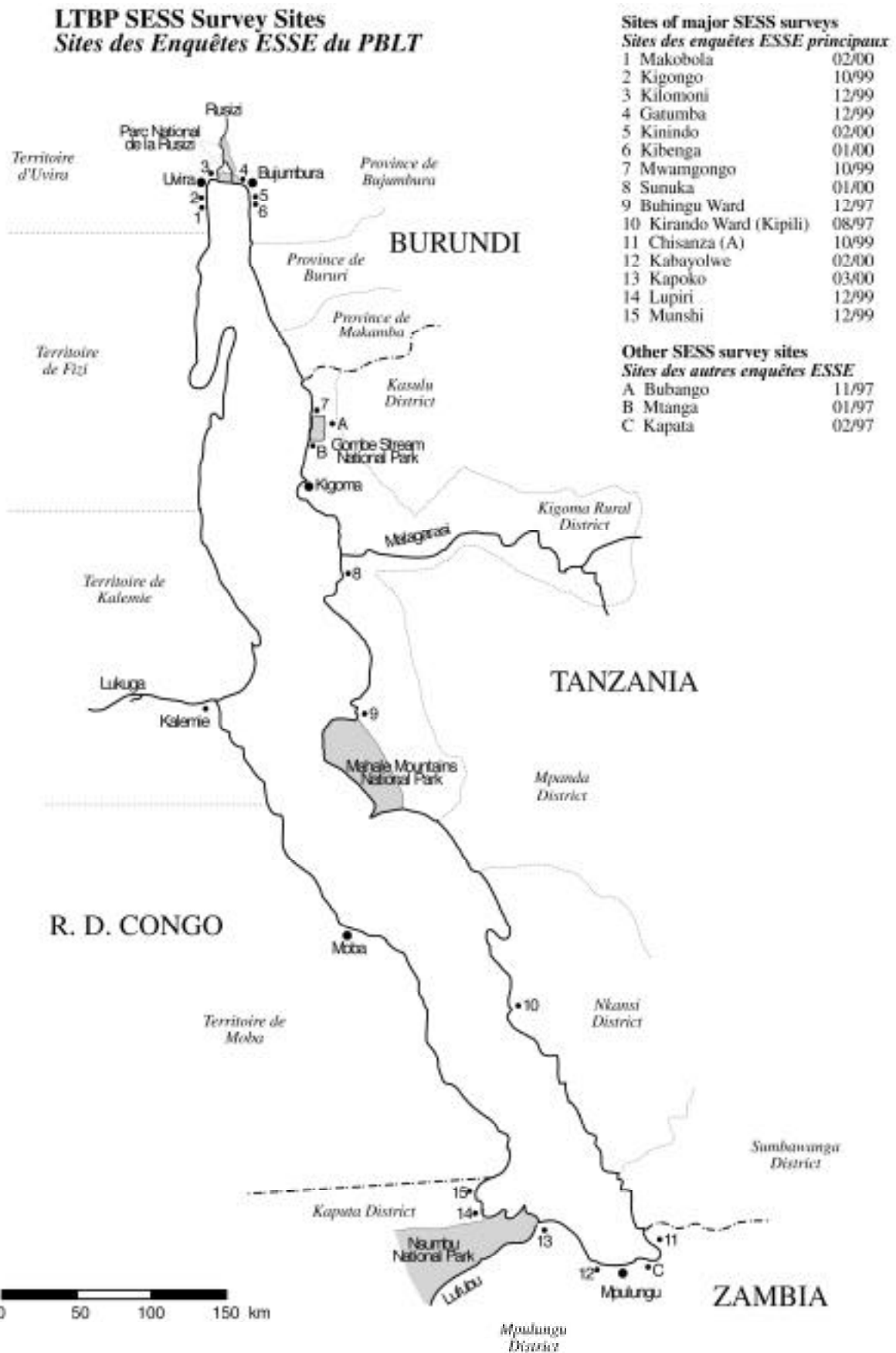
[We must find out] *“how do we balance the integrity of the environment on the one hand and the well being and advancement of people and their access to services on the other? Development often has adverse impacts on the environment or biodiversity so some people, usually outsiders, believe industries should not be developed. Here on the other side of the world [the lakeshore, Kigoma] we want our livelihoods improved. But how do we balance this with environmental sustainability? It is difficult, but we as an SE group must try to reinforce the message that it is the balance between man's activities and protecting the environment that is the important thing and not just protecting the biodiversity of the lake without improving opportunities.*

(Claude Mung'ong'o, National SE Co-ordinator for Tanzania
and elected SESS spokesperson, Kigoma, Nov 1999)

Appendix A – SESS site and summary reports

Burundi		
Sindayizeruka, O.	2000	Gatumba: Etude socio-économique du village de Gatumba, Bujumbura Rurale, Burundi
Sindayizeruka, O.	2000	Kibenga: Etude socio-économique du village de Kibenga, Bujumbura Rurale, Burundi
Sindayizeruka, O.	2000	Kinindo: Etude socio-économique du village de Kinindo, Bujumbura, Burundi
Congo		
Kitungano, G.	1999	Kigongo: Etude socio-économique du village de Kigongo, Territoire d'Uvira, RDC
Kitungano, G.	2000	Kilomoni: Etude socio-économique du village de Kilomoni, Territoire d'Uvira, RDC
Kitungano, G.	2000	Makobola: Etude socio-économique du village de Makobola, Territoire d'Uvira, RDC
Tanzania		
Walsh, M., L. Said, B. Marwa, & K. Banister	1996	Fishing in the River Mungonya at Bubango, Kigoma Rural District, Tanzania
Lwoga, C.M.F. (Ed.)	1997	Participatory Rural Appraisal in Mtanga village, Kigoma District: Principal findings
Mung'ong'o, C.G. (Ed.)	1997	Kirando: Participatory Rural Appraisal in Kirando Ward, Rukwa Region, Tanzania
Mung'ong'o, C.G. (Ed.)	1997	Buhingu: Participatory Rural Appraisal in Buhingu Ward, Kigoma Region, Tanzania
Mung'ong'o, C.G.	1998	Socio-economic & institutional appraisal of the Malagarasi-Luiche catchment, Kigoma Region
Mung'ong'o, C.G.	1998	Socio-economic & institutional appraisal of the Mpanda-Sumbawanga catchment, Rukwa Region
Mung'ong'o, C.G.	1999	Mwamgongo: Socio-economic survey of Mwamgongo village, Kigoma Region, Tanzania
Mung'ong'o, C.G.	2000	Sunuka: Socio-economic survey of Sunuka village, Kigoma Region, Tanzania
Zambia		
Damaseke, M.	1997	Chituta Bay – Kapata village PRA report
Chitalu, G.M., F. Ng'andu, & K. Zwick	1999	Chisanza (A): Socio-economic survey of Chisanza (A) village, Mbala District, Zambia
Chitalu, G.M. & F. Ng'andu	2000	Nsumbu: Socio-economic survey of Lupiri town & Munshi village, Kaputa District, Zambia
Chitalu, G.M.	2000	Kabyolwe & Kapoko: Socio-economic survey of Kabyolwe & Kapoko villages, Mpulungu District, Zambia
Summary reports		
Meadows, K & K. Zwick	1999	Summary and critique of the Socio-Economic Special Study 1996 - 1998
Meadows, K & K. Zwick	1999	Report of the first Socio-Economic Special Study Working Group Meeting (En)
Meadows, K & K. Zwick	1999	Rapport de la première Réunion de Groupe de Travail de l'Etude Spéciale de Socio-Economie (Fr)

Appendix B – SESS survey sites



Appendix C – Key findings from the SESS

	Burundi	Congo	Tanzania	Zambia
Fisheries livelihoods and practices				
Most common gears	Lift nets, lines (various types).	Lift nets, lines (various types), beach seines.	Lift nets, beach seines (which are illegal), gillnets, lines (various types). Vertical handlines for <i>Lates</i> important in the north.	Beach seines, gillnets, lines (various types). Lift nets less common than elsewhere; some owned by Zambians used in Tanzanian waters.
Methods of acquisition of more expensive gear	Inheritance of gear or wealth.	Farming income, inheritance. Some absentee owners.	Savings, inheritance, past credit from the Co-operative & Rural Development Bank. Some absentee owners.	Savings, inheritance, past government credit schemes.
Markets, processing and trade	The urban centre of Bujumbura absorbs a large quantity of fresh fish. Burundi is a net importer of dried sardines and smoked <i>Lates</i> from the entire Tanzanian lakeshore.	The urban centre of Uvira absorbs a large quantity of fresh fish. Congo is a net importer of dried sardines for consumption in the distant urban/industrial area of Lubumbashi. These come from the southern part of the Tanzanian lakeshore, and pass through Zambia to Lubumbashi.	Dried sardines and smoked <i>Lates</i> are traded with inland villages, particularly in the north, and are transported by rail through Kigoma as far as Dar es Salaam. Dried sardines and smoked <i>Lates</i> are exported to Burundi. Dried sardines are exported to the urban/industrial areas of the Zambian Copperbelt and Lubumbashi (in Congo) via Mpulungu. Large scale cross border trading, undertaken by men, can be very profitable.	Much of the <i>Lates</i> and other large fish caught are sold to the industrial fishing companies which blast freeze them and transport them to urban areas in the rest of Zambia. Sardines are dried and transported to the urban/industrial areas of the Copperbelt and Lubumbashi (in Congo). Some medium scale long distance trading undertaken by women.
State/perception of the fishery	Offshore fishery thought to have been overfished.	36% of households in one study site involved in fishing. Fishing activity reduced as a result of insecurity	Conditions/perceptions vary by location.	Offshore fishery thought to have been overfished, particularly by the industrial fleet. 56% of households in one study site involved in fishing.
Other comments	Fishing in open waters/at	Little is known about current	Conflict with NR managers	There is an industrial fishery

	night was suspended for most of 1999 for security reasons, resulting in an increase in fishing in lagoons, irrigation channels, etc.	fishing activities along most of the Congolese lakeshore.	over the no-fishing zone around MMNP.	based in Mpulungu and Nsumbu. Conflict with NR managers over the no-fishing zone around NNP.
--	--	---	---------------------------------------	--

Agricultural land use and livestock				
Crops	Cassava is the main food crop, plus maize, rice, bananas, sweet potatoes, beans, squashes, and vegetables and tomatoes. Cotton and sorghum are the main cash crops. Some use of hired labour.	Cassava is the main food crop, plus maize, bananas, groundnuts, beans, and tomatoes, all are mostly grown by women. Oil palms, grown by men, are the main cash crop.	Cassava is the main food crop, plus maize, bananas, and beans. Oil palms, grown by men, are the main cash crop. Rice is also grown as a cash crop in valley bottoms. In the wider catchment, tobacco is a major cash crop.	Cassava is the main food crop, plus maize, sweet potatoes/potatoes, rice, and groundnuts. Some millet also grown to make traditional beers. Greater diversity of crops in better soils in river valleys. Use of hired labour by the more affluent.
Land	The flood plain of the Rusizi is flat and fertile. Fields are owned under the "paysanneries aménagées" system.	Fields are inherited, or rented. Those without land work for others.	Suitable land very limited in the north of the lakeshore, leading to cultivation of the steep slopes of the rift valley. Some rental of rice fields.	Fields are cleared by men, or are inherited. As populations increase and soil is exhausted, new fields are cleared increasingly further away. Households without access to male labour are not able to clear new fields and suffer reduced yields.
Markets, processing and trade	Government price support/state run institution for cotton.			Sale and resale of cassava and cassava flour from rural villages to Mpulungu is the most common income generating activity. Lack of land transport makes marketing agricultural produce difficult, and deters people from diversifying or growing a surplus for sale.
Comments	Conflict with highly placed cattle owners over crop damage and arbitrary land seizure. Conflict with NR managers over crop damage	Problems in acquiring inputs (seeds), and poor soils/erosion.	Where steep slopes are cleared, there is rapid erosion. In Kigoma Region the TACARE project is promoting better hillside	Some problems with infertility or erosion; use of fallow periods and contour ridges. Problems of theft of crops in remote fields, and

	by hippos.		practices, agroforestry, high yield hybrid oil palms, and vegetable growing.	crop damage by monkeys. No extension service or access to inputs.
Livestock	Cattle owned by well off Bujumbura families kept in the peri-urban zone (stall fed). Sale of milk very lucrative. Castrated bulls used for ploughing and transport of heavy goods also highly profitable. Some ownership of small livestock/fowl.	Low levels of ownership of small livestock and fowl. Cattle all stolen or killed as a result of the insecurity.	Low levels of ownership of small livestock and fowl. Few cattle, except in the southern part of the lakeshore, where they have been introduced with the arrival of Sukuma agropastoralists from the interior. In most of the wider catchment, tsetse is widespread, which precludes cattle keeping.	Low levels of ownership of small livestock and fowl. Ban on cattle keeping in Mpulungu District as a cordon sanitaire to keep livestock disease from spreading from Tanzania to the rest of Zambia.
Comments	Conflict with NR managers over illegal grazing in the PNR. Problems of theft as a result of the insecurity.	Problems of inadequate veterinary care and theft as a result of the insecurity.		Poorer women interested in acquiring small credits to start raising fowl.

Deforestation, energy needs, and woodland management				
Deforestation		Clearing for agriculture, unsustainable use of wood.	Clearing for agriculture, unsustainable use of wood. Deforestation in the wider catchment as a result of extensive shifting cultivation, high fuelwood demands for tobacco curing, and the presence of refugees.	Clearing for agriculture, unsustainable use of wood.
Trade in natural resources	Trade in fuelwood, reeds and thatching grass.	Trade in fuelwood within villages.	Trade in fuel wood between lakeshore and inland villages.	Trade in fuelwood within villages.
Woodland management	Conflict with NR managers over illegal fuelwood collection in the PNR. Degazettement of National Park land in the face of land use pressures.	Local reforestation NGOs exist but lack funds	Over-harvesting of Forest Reserves by cash strapped District Authorities. Some village protected forest areas established through bylaws. In Kigoma Region the TACARE project has established village nurseries.	Conflict with NR managers over illegal fuelwood collection in the NNP. Degazettement of Forest Reserve land in the face of agricultural expansion.
Population, movement, and trade				
Composition of lakeshore communities	Populations fluctuate depending on security conditions, include internally displaced people. Fishermen highly mobile in response to changes in abundance and distribution of fish.	Populations fluctuate depending on security conditions.	Villages in the north often host large numbers of highly mobile Burundian and Congolese fishermen, and occasionally host large numbers of refugees in transit. Multi-ethnic communities all along the lakeshore.	Villages near the border with Congo occasionally host large numbers of refugees in transit. Trading centres with good communications subject to in-migration during times of high catches, and out-migration at others.