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**SOCIO-ECONOMIC SPECIAL STUDY
Report No. IV**

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**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)**

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.

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)

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Tanzania: Vice President's Office, Division of Environment

Zambia: Environment Council of Zambia

Lake Tanganyika Biodiversity Project Socio-Economic Special Study Report Series

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¹ See Appendix A for contact information.

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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

LTFMP 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) comprised a variety of activities undertaken during the course of the Project from 1995 to 2000. The resultant survey reports give indications of the socio-economics, livelihoods², and strengths and problems in communities around the lake and in the wider catchment, which are summarised in sections 3 and 4 below. This is followed by a discussion of socio-economic (SE) issues and recommendations for actions and interventions (section 5) and further SE research (section 6).

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 natural resource (NR) use, specifically 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 biodiversity³. 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 and assets 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 NR utilisation by an examination of practices and livelihoods, with a view to identifying ways of achieving:

- participation in sustainable fisheries, agriculture, and wider NR 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 assessment⁴, through SE studies aimed at providing an understanding of current livelihood strategies and the constraints faced by local people in the sustainability of these⁵. The approach was to learn from the people of the lake region about their lives, assets, livelihoods and aspirations – their own understandings of their poverty, and how they think that they can alleviate it and work towards improved and more sustainable livelihoods.

² 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.

³ The aims and objectives of the SESS were initially linked 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.

⁴ A fully inclusive assessment is costly and time consuming and therefore beyond the scope of this study. However, indicators of livelihoods and assets were established by the SESS.

⁵ Amongst others, the extreme poverty of much of the population in the lake region has been found to have contributed to the unsustainable use of NRs. 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).

Although this approach is not unique, at the time of the Project's conception there was a focus on environmental protection with less attention to sustainable development⁶. This exclusive focus on the 'saving the environment' stems from a history of paternalism reminiscent of colonial administrators in sub-Saharan Africa who frequently associated accelerating soil erosion, deforestation and rangeland deterioration with peasant ignorance and short-sightedness. Accordingly they attempted to regulate land use with conservation norms developed in the North under different social and ecological conditions. Often such "colonial" conservation efforts not only ignored the needs of the communities living in or adjacent to game and forest reserves, but also in many cases deprived them of means of subsistence through eviction or restrictions on their access to rangelands, forests, and fisheries⁷.

This approach to environmental conservation continues to be applied today⁸. For example, fisheries management initiatives have primarily involved banning specific fishing gears or methods considered to be destructive. Such legislation has tended to be applied nationally with little regard to local environmental or SE conditions, and with little or no consultation with those affected. This has resulted in poor compliance, as fishermen feel they have few or no alternatives open to them, and has had limited success due to lack of resources on the part of those mandated to enforce the law, a particular problem in such a large and remote lake as Tanganyika. Despite this lack of success however, this type of management action remains in favour with many central government officials with little knowledge of the lake⁹.

Respect for local conditions is crucial as in addition to varying environmental conditions, different localities have different institutions that regulate access to resources and the division of labour and production. Local populations are stratified in a variety of occupational and status roles. Lineages, ethnic or religious identification, class, age, and gender, as well as linkages with markets and political authorities outside local communities all influence which social groups are most relevant to consider in a given locality when trying to understand livelihood issues and their relations with NR management. Moreover, many rural societies in developing countries are undergoing disruptions as they become increasingly incorporated into regional, national, and international markets, power structures, and conflicts. In attempting to understand better the processes and relationships contributing to NR degradation and the social implications of this, these factors have to be considered. In this SESS we have tried to take some of these factors on board. Although there have been considerable constraints, the national teams have adopted good methodologies and have produced significant and interesting results.

⁶ The two are NOT mutually exclusive, but indeed should be linked.

⁷ Ghai, G. (1994). Environment, livelihood and empowerment. *Development and Change* 25(1):1-11.

⁸ Barraclough, S. (1995). Social dimensions of desertification: A review of key issues In: *Social aspects of sustainable dryland management*. D. Stiles, Ed. John Wiley & Sons; Chichester pp. 21-79.

⁹ For example, at the TDA meeting held in Arusha in March 2000, strengthening prohibitive legislation at national level remained a priority, especially in fisheries.

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 SSSs 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 activities 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 successfully 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 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.¹⁰ However, the majority of field work in all four riparian countries took place in 1999 and 2000. 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, as well as 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 size¹¹.

Other restrictions were:

- difficulties in establishing household livelihoods 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.

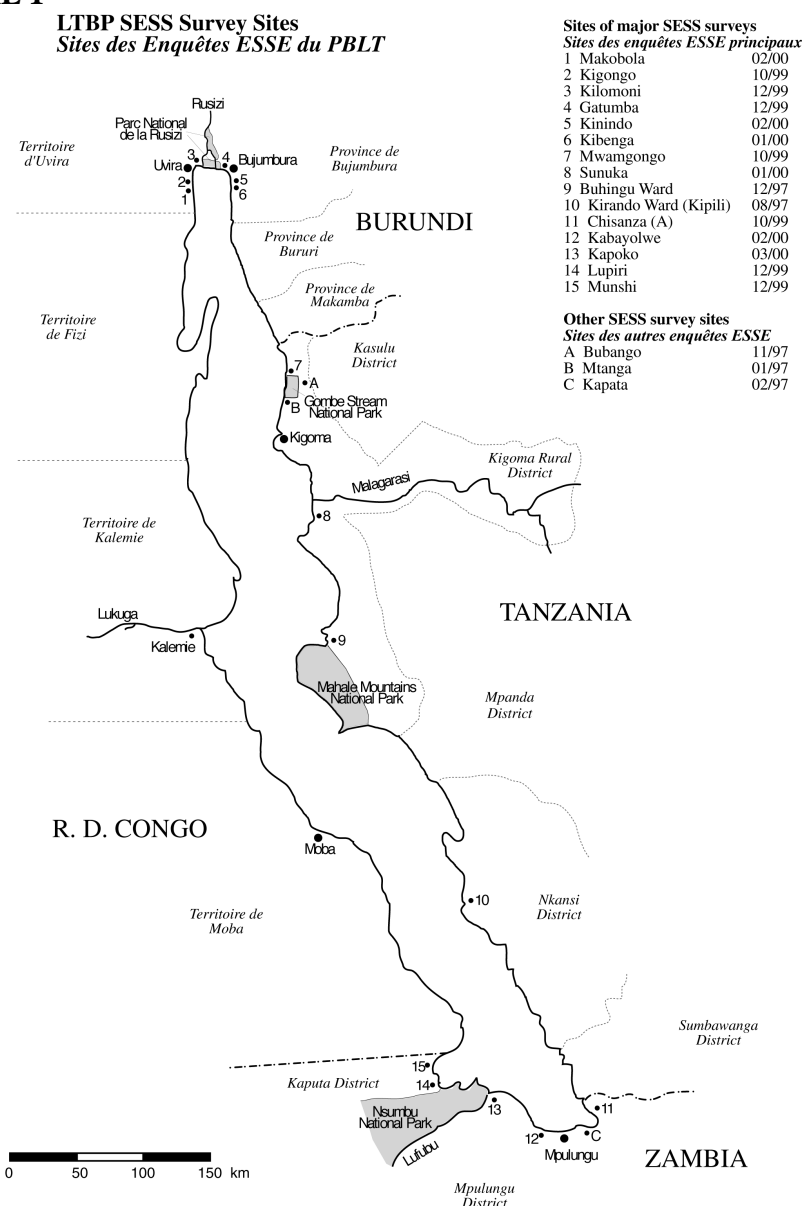
¹⁰ See Appendix B for schedule of key field activities; see below for map.

¹¹ See page i for list of reports; see section 3 below for general discussion of findings; see section 4 below for summaries of findings by country.

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. The sites surveyed are illustrated in Figure 1 below.

Different researchers in the four riparian countries favoured different emphases on the methods and approaches according to their particular experiences and interests¹². The results discussed below are influenced by these variations in approach, but not necessarily undermined.

FIGURE 1



¹² National staffing was prioritised with external consultants kept to a minimum to both develop in-country capacity and enhance the sustainability of project activities and to extend limited resources. Whilst this was a strength, there were some difficulties in finding suitable staff, and in cross country collaboration. See section 4.1 below.

3 DISCUSSION 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.

The key findings are summarised in Table 1 and discussed further below. Details of country findings are presented in section 4.

TABLE 1: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.	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.
Other comments	Fishing in open waters/at night was suspended for most of 1999 for security reasons, resulting in an increase in fishing in lagoons, irrigation channels, etc.	Little is known about current fishing activities along most of the Congolese lakeshore.	Conflict with NR managers over the no-fishing zone around MMNP, and over the enforcement of the nationwide beach seine ban in GSNP.	There is an industrial fishery 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 and rice.			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 by hippos.	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 practices, agroforestry, high yield hybrid oil palms, and vegetable growing.	Some problems with infertility or erosion; use of fallow periods and contour ridges. Problems of theft of crops in remote fields, and crop damage by monkeys. No extension service or access to inputs.
Livestock	Cattle owned by well off Bujumbura households 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 NRs	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 re/afforestation 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.

3.1 Fisheries livelihoods and practices

The most common fishing gears are lift nets used from catamarans, beach seines, gillnets, and various types of lines, although the FPSS reports over fifty gears in use, and every niche is exploited¹³.

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 in deep water, 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 lift net 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 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.

Beach seines are mainly used at night over sandy bottomed beaches with lamp boats to target sardines, but are also used during the day in inshore areas where they target all littoral fish¹⁴. 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 lift nets 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 not enforced and unenforceable, and the nets continue to be used illegally.

Different types of 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 (sun dry) the sardines before they spoil. **Gillnet** and **line** fishing occur throughout the year. Gillnets are used where there are extensive shallow waters, for example off deltas such as Malagarasi. Specific types of lines are used in almost every habitat. Both tend to 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.

¹³ See FPSS reports for technical information on the different types of gear.

¹⁴ 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.

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 areas¹⁵. 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 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.

¹⁵ *“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)

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 hillside fields and the lake. 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 secure¹⁶. In the wider catchment 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 households, 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.

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 also grown on commercial 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 the lakeshore villages as the terrain is not suitable and tsetse is widespread. Nevertheless, in Burundi, cattle owned by well-off Bujumbura households are kept in the peri-urban zones of the city, and in Rukwa Region, in the southern part of the Tanzanian coast, Sukuma agropastoralists from the Central Plateau have brought in significant numbers in recent years. In northern Congo, cattle keeping ended with the recent 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.

¹⁶ 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.

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 NRs 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 lake¹⁷. 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.

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 growing¹⁸. Many fishing communities have highly 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 around Uvira), and in Zambia, where the decline in mining has left many unemployed elsewhere in the country. Migration to the lake occurs because line fishing and small scale sardine processing and trading are livelihoods relatively easily and cheaply adopted¹⁹. Many fishermen are not particularly 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 NRs 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

¹⁷ 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.

¹⁸ 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.

¹⁹ Data from Nsumbu show in-migration for fish trading, although this was not the case in the rather more remote Chisanza.

migration occurs when people leave impoverished 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 leaving remote villages in search of permanent opportunities elsewhere²⁰. Remoteness is associated with greater poverty and fewer livelihood options²¹. As well as for security, movement is part of the livelihood strategies of many of the region's populous.

3.5 Livelihoods and assets

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.

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 inequitable²². 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 households 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

²⁰ 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.

²¹ 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.

²² 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.

fish and agricultural products and fuelwood between fishing and non-fishing households 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.

Large communities tend to support a greater diversity of livelihoods than smaller ones as there are more opportunities for specialisation²³. The SESS has encountered salaried employees such as government²⁴ and 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 communities²⁵. 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.

²³ 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.

²⁴ Teachers, clinic workers, policemen, immigration officers, tax collectors, etc.

²⁵ 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.

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 households 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 NRs 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 industry²⁶). 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 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 aquatic zones, in acting as fish refuges. However, the SESS has found that they do not relate well to neighbouring the communities that bear the short term opportunity costs without understanding the long term benefits, many of which accrue elsewhere.

²⁶ Both for political reasons, where governments rely on popular support in the short term.

4 THE NATIONAL SURVEYS

4.1 Introduction: knowledge sharing and capacity building

In each of the four countries a National Socio-Economics Co-ordinator (NSEC) was appointed. With support from the SESS Co-ordinator and field based Facilitator, the NSECs devised national strategies and workplans, selected and trained their teams, oversaw data collection in the field, and were responsible for data analysis and report writing. Differences in working conditions (ranging from access to communities to access to computer time and electric current), institutional relationships, and the personal interests and experiences (outlined below) of the different NSECs in each of the countries affected the scope and nature of the work undertaken and the reports produced. In some cases political conditions or even Project or donor sensibilities restricted the authors' freedom to express their views fully.

Preliminary fieldwork was carried out in conjunction with the FPSS in villages around Kigoma, Tanzania in 1996 and 1997, and in Zambia in 1997 where the aim was to link with the EE component. Following this, two Participatory Rural Appraisals were carried out 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 Tanzania²⁷. Fieldwork commenced in the Francophone countries in 1999, when a bilingual Co-ordinator and field based Facilitator were appointed and also increased in pace in Zambia. In July 1999 the SESS Co-ordinator held informal meetings with all the of the NSECs in Dar es Salaam and Bujumbura. These were followed in November 1999 by the first regional SESS Working Group Meeting in Kigoma, Tanzania²⁸.

The Burundian NSEC, Dr Oda Sindayizeruka is a senior academic and a member of the Centre Universitaire de Recherche pour le Développement Economique et Social (CURDES) at the Université du Burundi in Bujumbura. Towards the end of the study she was promoted from Dean of the Department of Rural Economics to Dean of Finance for the University, which restricted the amount of time she was able to spend on Project work. The research team was drawn entirely from CURDES, and many of the members were qualified to Masters level in social sciences subjects. Although the initial plan was to cover a range of communities along the entire Burundian coastline, security problems restricted the team to the area immediately around Bujumbura city. A detailed study of livelihoods in the peri-urban zone was undertaken, with particular focus on the diversity of household livelihood strategies and non traditional activities, threats to traditional/rural livelihoods as a result of urban expansion, and the recent phenomenon of cattle keeping in the peri-urban zone as a result of the insecurity in the interior of the country. During the course of the study the lake was closed to fishing for security reasons. This, coupled with the facts that a) fishing is only one of a large number of livelihood activities in the study area, and b) the team did not contain a fisheries specialist, resulted in fishing and fisheries livelihoods receiving less emphasis in the Burundian reports than in some of the others.

The Congolese NSEC, Gérard Kitungano, is a fisheries economist at the Centre de Recherche in Hydrobiologie (CRH) in Uvira. He had previously participated in a survey of attitudes of fishermen and fish processors and traders in Congo as part of the LTR project, as had many of the other team members, who were all drawn from CRH, and were all male. Initially the team drew heavily on their experiences with LTR, with a strong focus on fisheries livelihoods, but as the survey progressed the focus broadened in response to preliminary

²⁷ See Appendix C and SESS Report No. I for further details of a summary and critique of the work carried out between 1996-1998.

²⁸ See Appendix D and SESS Report No II for further details.

findings of the importance of agriculture and other economic activities. Quantitative methods, including informal censuses, were favoured over more qualitative approaches, and a large body of detailed information was collected. Fieldwork was restricted to the area around Uvira and was carried out under extremely difficult conditions due to ongoing conflict and insecurity; the results present a rare view of the livelihoods and characteristics of communities under this type of stress. Report writing was also hindered by difficulties in communication and access to computers and electricity.

The Tanzanian NSEC, Dr Claude Mung'ong'o is a senior academic and environmental sociologist at the Institute of Resource Assessment in Dar es Salaam with considerable experience in the northern part of the catchment in Kigoma Region. Although not based on the lakeshore, over the long period he worked with the Project (three years) he was able to make numerous visits. The Tanzanian team members were based on the lakeshore, primarily in Kigoma town, and included Fisheries Officers from the Tanzanian Fisheries Research Institute (TAFIRI), a Community Development Officer from the District Council, agricultural, forestry, and agroforestry extension workers from a local NGO, as well as other District officials and National Park staff as appropriate to the study location. The NGO extension workers were educated to degree level in their fields with subsequent in service technical training, but others were less qualified, and none had a background in SE survey work. The study area covered a range of both environmental and socio-cultural conditions which differed between the north and south of the coastline and the north and south of the wider catchment in the interior. It was sometimes difficult to synthesise results from all of these disparate areas succinctly. The inclusion of TAFIRI Fisheries Officers and close collaboration with the FPSS teams in the early part of the Project meant that information on fisheries may have been somewhat biased towards prevailing national attitudes at the time, particularly with respect to beach seines.

The Zambian NSEC is an agriculturist, with particular experience in large scale commercial projects, and was based at the Environment Council of Zambia in Lusaka. He was also the Assistant National Co-ordinator for Zambia, and thus had a good general overview of the Project from the perspectives of both the Special Studies and the strategic planning aspects (SAP, Legal Convention, etc.). He did not have specific experience of SE survey work, nor of the Lake, and was sometimes constrained by difficulties in reaching the lakeshore for fieldwork, and by general heavy workloads. The Zambian team was comprised of Department of Fisheries officers, particularly those involved in training and extension work, along with other District level officials from the Departments of Health, Agriculture, and Community Development, and a local Head Teacher who was active in a range of development activities in the area. They tended to be educated to Diploma level, or have had technical in-service training. Although they did not have formal experience of this type of SE survey work, most had been very active in the Project sponsored formation of Village Conservation and Development Committees, and were very familiar with the lakeshore communities all along the Zambian coast. Because the NSEC was not able to be present during all of the fieldwork there were sometimes difficulties in getting field notes to him in Lusaka. His other priorities, compounded with email/communication difficulties, resulted in problems with submission of detailed reports in a timely fashion, and a significant part of the analysis of the field data collected remains incomplete at the time of writing.

4.2 Burundi

4.2.1 Introduction

The Burundian coastline stretches from Gatumba on the border with Congo in the north to Kabanga on the border with Tanzania in the south-east, approximately 135km. It includes the most urbanised portion of the lakeshore, the city of Bujumbura, as well as rural areas in the south, and a range of communities intermediate in their characteristics in the peri-urban zone around the city. The work focussed on this peri-urban zone, in part because of its unique mix of urban and rural features, in part in response to security constraints. Since 1993, violent ethnic conflict has impacted on every aspect of daily life in Burundi, and resulted in internal and cross border displacement, death, damage and destruction of infrastructure, and loss of livelihoods; this last has been compounded by general economic decline, currency devaluation, and inflation, further reducing standards of living for many.

4.2.2 Population dynamics and movement

Historically, the lakeshore and floodplain of the Rusizi were feared by the peoples of the mountains of the interior, and strong cultural taboos deterred the more influential in society from descending the escarpment or even looking at the lake. However, in more recent times, high population densities in the interior have caused many to come looking for land to farm, while others have taken up fishing, or have been drawn to the economic opportunities of the city of Bujumbura. In fact, before the outbreak of the current conflict, population increase and the expansion of the city had caused sufficient land shortages in the peri-urban zone that farming households had even started to move *away* to less densely inhabited areas further south. However, due to insecurity, since 1993 these and many others have sought refuge in the relative safety of the area, and populations have swelled. These displaced rent or share houses, or build temporary accommodation wherever they can, resulting in problems of overcrowding and poor sanitation. In general, their livelihoods are based on activities requiring little or no capital, such as the sale of NRs, small scale trade, or daily paid labour. However, without access to land to supplement livelihoods with farming, survival is precarious, and many depend on aid from international humanitarian and religious organisations.

As well as displaced people from the interior of the country, communities in the peri-urban zone have also received those fleeing ethnic cleansing in certain sectors of Bujumbura city, particularly middle class merchant households, and from time to time, depending on the socio-political events there, refugees from the ongoing conflict in neighbouring Congo, resulting in populations that are up to 50% non native. Meanwhile, there have also been government sponsored campaigns to return home both refugees and internally displaced people, resulting in community composition that is extraordinarily complex, dynamic, and difficult to define²⁹.

²⁹ For example, in Gatumba, official population estimates vary from 15,100 in March 1994, to 18,000 in January 1999, to 13,600 in April 1999, a reduction of 25% in just three months.

In addition to movement related to insecurity, there is also significant economic migration into the peri-urban zone, with young people coming from the countryside seeking economic advancement in the city often ending up in more traditional occupations in the peri-urban zone, and city dwellers moving to the suburbs to take advantage of lower costs of living. Despite the insecurity, movement out also occurs in response to financial pressures, for example in Kibenga, where farming households have been driven out by property speculators buying up land in anticipation of urban expansion, or from the majority of fish landing sites which were closed for security reasons throughout 1999, forcing fishermen to base themselves temporarily in the few which remained open. Reliable statistics are few, but it is clear that as well as migration, there is also a high rate of natural population growth, and that the populace is a young one.

4.2.3 Infrastructure and access to social services

Communities in the peri-urban zone have in the past enjoyed relatively well developed infrastructure and social services, but most sectors have been negatively affected by the insecurity resulting from the current conflict, either through damage or destruction of buildings and equipment, or because services have become unaffordable to most as incomes drop and prices increase. For example, in Gatumba there is a government health clinic as well as numerous private ones, but the cost of medicine is beyond the reach of many. Some go into debt, or use less expensive traditional/herbal medicines, or resort to magic; others, particularly daily paid workers, simply go without.

Diseases of insanitation are common as a result of the cramped living conditions and poor hygiene. Potable water is piped to the homes of those who can afford it, but this is a minority of households. To the rest it is available from public standpipes, but only for a few hours a day, and it is necessary to start queuing very early in the morning. Some buy it from private homes which sell it on illegally, but others choose to avoid the inconvenience and/or expense by simply collecting it from the lake or nearby rivers; generally it is drunk untreated.

As with health services, communities in the peri-urban zone are relatively well provisioned with schools, but again, many of these have been damaged, or are not functioning well, or have become unaffordable. A large number of children drop out, particularly to take up fishing. This has been exacerbated in recent years by deteriorating economic conditions which make the fees even less affordable and the contribution of children to the household economy even more important. Furthermore, people in traditional rural occupations such as fishing and farming who tend to have little or no formal education themselves, place little value on it for their children. In contrast, people involved in trade or commerce tend to be better educated, and try to keep their children in school despite the difficulties.

4.2.4 Livelihoods and survival strategies

The dominant theme emerging from an analysis of livelihoods and survival strategies in the peri-urban zone around Bujumbura is that although many individuals are primarily concerned with just one economic activity, household livelihoods are predominantly dependent on a diverse range of activities, in part to reduce risk, in part because often no one activity provides adequate returns. Livelihoods are also dynamic, and many activities are undertaken on a seasonal basis. Despite this, living standards are declining, and most households survive only from day to day, with little asset acquiring capacity.

Agriculture and livestock

Most women farm, and in peak periods, everyone, including children, joins in to help. The flat land in the floodplain of the Rusizi and at the base of the rift escarpment is relatively good for farming, but subject to other pressures, particularly urban development. Thus the main constraints to farming are lack of land and insecurity of tenure; lack of land limits production within a household, while insecurity of tenure promotes short term outlooks, resulting in soil exhaustion and reduced yields, and thus households which depend on farming alone are among the poorest. In Kibenga, where land speculation has been most intense, farmers who have sold their land to investors with the intention of moving away are now constrained by insecurity and have to rent the fields they previously owned.

The main subsistence crops are cassava, beans, maize, and bananas, while the main cash crops are cotton, rice, and tomatoes. The city of Bujumbura is a good and easily accessible market, and there are state institutions which guarantee a market at a fixed price for cotton and rice, as well as providing credits for inputs.

Only a few households own small livestock (goats, sheep, pigs, etc.) or even fowl. A few households own castrated bulls which are used primarily to transport heavy goods, which is very lucrative, as well as for ploughing. However, as a result of the insecurity in the interior of the country, there is currently a substantial cattle population in the peri-urban zone around Bujumbura. They are owned by a small number of well off households, typically based in the city and headed by high level civil servants or army officers, as a means of supplementing the diminishing purchasing power of their fixed government salaries. The sale of milk, primarily to patisseries in the city, is extremely lucrative, but the capital investment required is high, and there are numerous difficulties to overcome. The main problem is access to land on which to keep the animals, let them graze, and grow fodder crops. Some have bought land, but others have arbitrarily seized it from less influential farmers and others, opening conflicts. Animals are kept under relatively intensive conditions, particularly the exotic breeds which have high milk yields, but there are problems with availability and cost of foodstuffs, particularly in the dry season, when the cattle are taken to whatever patches of green can be found throughout the city or in the Parc National de la Rusizi. They sometimes stray into cultivated fields, causing further conflict with farmers, or wander onto the roads and are killed or injured in traffic accidents, and even within the peri-urban zone, there is a risk of theft by armed bandits. Between five and 20 people are employed, depending on the size of the herd, but they are not well paid, and relations between cattlemen and owners become strained when animals are killed by vehicles or stolen. Because of the insecurity of their position the owners try to invest as little as possible in permanent structures. They feel that the state does not do enough to support them, and are lobbying for a Ministry of Livestock separate from the Ministry of Agriculture.

Fisheries livelihoods

Because of historical taboos about the lake, fishing in Burundi was originally developed by Congolese, but it is now a major part of the national economy, particularly lift net fishing. This is relatively lucrative, even for the hired fishermen, and many work full time, although there are seasonal variations, and during the past year (1999) much of the Burundian portion of the lake has been closed for security reasons. Usually, the households of lift net fishermen tend to be less diversified than others, with the women typically farming, and perhaps undertaking some small scale trade in the off season only. Lift net fishermen tend to be young men with little or no formal education, although there is a period of training and apprenticeship to become a crewmember. They tend to be based in their native village, but

move up and down the length of the coast and routinely enter Congolese waters in pursuit of fish. Security in the open waters is a problem, but the military offer some protection. The urban centre of Bujumbura is a good and easily accessible market. Catches are highest in the dry season, but prices tend to remain high as the fish can easily be processed (sun dried). Revenues in the rainy season are lower and less stable as high winds and heavy rain make catches more variable, and levels of catch and day to day weather conditions cause prices to fluctuate. Many gear owners are not involved in the actual fishing themselves, although they are responsible for obtaining the necessary permits, etc. Relations between them and crew are generally formalised with contracts of employment.

Line fishing is also common, either as a major livelihood strategy, or on an occasional basis to supplement the diet or generate income. Members of “non fishing” households also fish in ponds and irrigation ditches, both as a planned activity, and opportunistically. Such fish is free or very cheap to purchase locally, and consumed more often than lake fish by many “non fishing” households. Especially during periods when the lake is closed, it is also quite lucrative as an income generating activity, as a good day’s work can generate 15,000FBU (\$12.50). Many children skip or drop out of school to fish for food or money.

Other economic activities

The city of Bujumbura employs many in tertiary and secondary industries as well as in civil or military service. However, as a result of currency devaluation the purchasing power of fixed salaries have declined, and in order to maintain living standards many households have diversified into livestock or shopkeeping, or more traditional/seasonal activities in the informal sector. As a result of the insecurity there is some local underemployment of professionals, such as teachers, who have fled to the relative security of the city.

The economic activities which complement farming, fishing, and salaried employment are varied. Many women are involved in the processing and sale of agricultural and fish products, such as the production of palm oil or cassava flour, or the drying of fish. Others activities are the collection and sale of NRs such as fuelwood, thatching grass, or reeds for fencing or the construction of outbuildings. In Gatumba, these are collected from the National Park by men and sold along the road by women, particularly the recently displaced, as little capital is required. The degazettement of a portion of the southern sector of the park has caused concern among those whose source of livelihoods is likely to disappear (although current levels of extraction are probably not sustainable).

Certain individuals have particular skills or crafts and manufacture or repair household items, or radios or bicycles. Women from poor households, particularly the recently displaced, and children engage in petty trade (informal sector retail) along the main roads, selling small household necessities such as matches or soap, or cooked snack foods, such as grilled maize cobs, hard boiled eggs, donuts, or roast peanuts. Better off households invest in kiosks, or even shops, although currency devaluations and rising prices have made trade more precarious.

Some livelihoods are related specifically to the presence of the city of Bujumbura, for example, the extraction of sand to supply the municipal water filtration plant, a very hard and poorly paid job typically undertaken by men from households without access to sufficient land to survive on farming. The city also absorbs some of the underemployed during low periods in the farming year in casual labour, e.g. as construction workers. In Gatumba, others are related to the proximity of the border with Congo, such as bicycle taxi peddlers, who

carry passengers and goods across the no-man's land between the two border posts. Typically those who own their bicycles make approximately 800FBU (\$0.67) per day, while those who rent their bicycles from others must pay the owner half of this. However, some individuals have established relations of trust with Congolese traders who do not have the necessary papers to enter Burundi; the trader entrusts his wares for sale to the bicycle taxi peddler, who sells them in Burundi and returns with the proceeds or new purchases as directed, for a fee.

4.2.5 Development and constraints

Along the coast south of Bujumbura there are two major rural/agricultural development projects. The first is SRD Rumonge, established in 1983 to rehabilitate and develop the palm oil industry. The project reorganised lands and communities, planted 4,700ha of high yield hybrid oil palms (3,700ha under village control, and 1,000ha in commercial plantations), and installed a refining plant with capacity to process approximately half of the crop. The second is Project Nyanza-lac, established in 1977 to facilitate resettlement from more densely populated areas elsewhere in the country. It oversaw the distribution of land and promoted the cultivation of cotton and oil palms, although with less success than at Rumonge due to environmental factors.

In general, the lakeshore area has good transport infrastructure, with all weather roads and regular public transport linking all of the major centres. The flat land along the lakeshore makes bicycle transport feasible, and provides inexpensive means of travel and livelihoods for many. The city of Bujumbura is a major market for fish, agricultural produce, NRs, and labour.

However, despite these assets, there are many constraints to the development necessary to ensure sustainable use of NRs . These include:

- conflict and insecurity resulting in loss of life, injury, displacement, destruction of infrastructure, failure of services, and the inability to pursue livelihoods; for example through the closure of the lake to fishing, the displacement of cattle, and lack of access to sufficient land for farming;
- land shortages and insecurity of tenure, resulting in low household agricultural output and reluctance to invest where tenure is not secure, and conflicts of interests between farmers, cattle owners, speculators and urban developers, and displaced people;
- low educational levels and a lack of skills necessary to succeed in a modern service economy resulting in the livelihoods of those dependant on traditional/rural activities being threatened by urban expansion. The resultant poverty and underemployment, particularly of youth, leads to increased crime and prostitution; and
- inadequate access to clean drinking water and affordable health care, and poor sanitation as a result of overcrowding and insecurity, resulting in low productivity.

4.3 Congo

4.3.1 Introduction

The Congolese coastline stretches from Kavimvira on the border with Burundi in the north to Moliro on the border with Zambia in the south, approximately 673km. It includes 417 fish landing sites and fishing villages, as well as the urban areas of Uvira, Fizi, Kalemie, and Moba. Due to security constraints, this work focussed on three communities on the north of the lake in the Territoire d'Uvira: Kilomoni, a cosmopolitan community at the intersection of the roads to Uvira, Bujumbura, and Bukavu; Makobola, a rural centre on the border with the Territoire de Fizi; and Kigongo, located midway between the other two.

Political and ethnic conflict has been ongoing in the area since 1996. At the time of the study, the Territoire d'Uvira was controlled by rebel militias supported by the government of neighbouring Rwanda and was effectively cut off from much of the country, including the national capital, Kinshasa. Civilian populations were exposed to the effects of intermittent attacks by Congolese guerrilla fighters (Mayi-mayi) based in the hills on the Rwandan-backed militias, and their subsequent retaliations, which were often very violent. Government services were almost non-existent, and day to day survival the concern of most. The area suffered from massive damage and destruction of infrastructure, breakdown in civil society, displacement of people, and loss of livelihoods and lives.

4.3.2 Population dynamics and movement

The dominant ethnic groups in the study area are the Bavira and the Bafuliro, followed by the Babembe, with small numbers of others, including Rwandan and Burundian Bahutu fleeing ethnic conflict in their home countries. Results from household interviews indicate that even with high infant and childhood mortality, the population is a young one. However, over the past few years it has declined through elevated mortality resulting from both the collapse of health and other social services and the violence itself, and through movement to the relative security of cities such as Uvira or Bukavu, or to other countries, particularly Tanzania, and many abandoned houses stood testament to this decrease.

Less than half of the residents of any village were native to it, although those not native were usually from nearby villages. Typically they had come between 1979 and 1990 to take up fishing, or as a result of conflict in their home areas. During the study period there was movement on an almost daily basis in response to incidents throughout the area, and thus the results are a snapshot of conditions at a particular time, with village and household composition in states of constant flux. Many households sheltered various members of their extended families, and utilising social capital and kinship bonds has become an extremely important survival strategy. Kilomoni in particular, as a crossroads town, has a particularly complex, cosmopolitan, and dynamic composition.

4.3.3 Infrastructure and access to social services

Communities in the peri-urban zone between Uvira and Bujumbura have in the past enjoyed relatively well developed infrastructure and social services, but every sector has been negatively affected by the insecurity resulting from the current conflict. Buildings and equipment have been damaged, and staff fled or turned to other livelihoods when salaries were not paid. In general roads have fallen into disrepair, and where bridges have washed away, communication is by boat only, although this is risky in bad weather, and unpopular. Some services, such as piped water have been rehabilitated. Nevertheless these can only be afforded by a few. More rural communities, such as Makobola, have never been provisioned with such services. Most households collect drinking water from nearby rivers and streams, or the lake, but do not treat or boil it because they do not like the taste.

Although there are numerous schools in the area, many were not functioning at the time of the study, and only about a third of school age boys and a quarter of school age girls were enrolled in school. Of adult men, about a quarter have had some secondary education, half have had primary only, and a quarter have had none at all. For adult women, the situation is much worse, with between a half and three quarters with no formal education. Girls were only slightly better educated than their mother's generation, although this generation of boys had less primary and less secondary school than their fathers. Factors contributing to low education levels were insufficient finance for school fees, the need for children to contribute to the household economy either in fishing or farming, and the perception that there were no jobs for those with formal education, which was regarded as little use to fishers or farmers.

4.3.4 Livelihoods and survival strategies

The dominant theme emerging from an analysis of livelihoods and survival strategies is that although the communities studied are considered to be fishing villages, the majority of the population, despite its mobility, survives on agriculture. Some small scale trade or commerce supplements incomes. In these difficult times most struggle from day to day with no asset acquiring capacity.

Agriculture and livestock

Almost all women farm. The flat land in the floodplain of the Rusizi and at the base of the rift escarpment is relatively good for farming, and in Kigongo, the presence of perennial rivers allows for irrigation during the dry season. The main crop is cassava. Other crops include oil palms, particularly in Kigongo, maize, groundnuts, beans, particularly in Makobola, and rice, particularly in Kilomoni in the floodplain of the Rusizi. All are grown for consumption within the household and for sale.

Before 1996 there were a significant number of cattle in the area, but these have now been stolen or killed. A small number of households keep small numbers of small livestock such as goats and pigs, rabbits and guinea pigs, or fowl and pigeons. For the most part these are kept in the house at night for fear of thieves.

Fisheries livelihoods

Fishing underpins the economies of lakeshore villages, but does not involve every household; for example, in Kigongo and Makobola, individuals from only half of the households interviewed were involved. The dominant type of gear is the lift net, although many rigs have been stolen or were out of use at the time of the study. Other gears include beach seines, gillnets, and lines. The importance of line fishing has increased in this period of insecurity as lines are less likely to be stolen, and more easily replaced than other types of gear. Line fishing is undertaken either as a major livelihood strategy, or on an occasional basis to supplement the diet or generate income, often by young boys. In Kilomoni, fishing is also undertaken in the Nyangara pond using gillnets, lines, locally made fish traps, or even just by hand. This type of fishing also requires little capital. The urban areas of Uvira and Bukavu, which is reached by a good all weather road, are good markets, and fish is generally sold fresh, unless catches are very high. Security in the open waters is a problem, and fishermen are also subject to harassment by the Burundian military on the lake.

Other economic activities

Many women are involved in the processing and sale of agricultural products, such as the production of palm oil or cassava flour. Men and women are involved in small scale trade and the retail of household goods, either along the road, or from small kiosks or market stalls. Others are involved in the collection and sale of NRs such as fuelwood, charcoal (particularly in Makobola), thatching grass, reeds and papyrus (particularly from the swamps in the Rusizi floodplain around Kilomoni), or the production and sale of handicrafts such as mats or fish traps, or traditional herbal medicines. Widows in particular brew and sell traditional local beers for sale. Some individuals have special skills or crafts such as carpentry, masonry, or tailoring, or repair household items such as radios or bicycles. Others find paid work as bicycle taxi peddlers, fish porters, or market cleaners. As a result of massive currency devaluations and even extended periods of non payment of salaries, salaried employees, particularly government workers (teachers, tax collectors, etc.), have had to diversify to survive.

4.3.5 Development and constraints

There are a large number small local NGOs, many of them based in Uvira, but they tend to lack funding, and thus their activities are limited. The majority are concerned with re/afforestation or agriculture, although there is an adult literacy centre in Makobola. Through local implementing partners, UNHCR has funded the construction of public latrines in many villages, but in general, their concern is on short term relief as opposed to medium or long term development.

The major constraints to development to allow for the sustainable use of NRs are related to the ongoing conflict and insecurity. These result in loss of life, injury, displacement, destruction of infrastructure, failure of services, and the inability to pursue livelihoods. The theft of fishing gear or livestock, and harassment and arbitrary seizure of goods and produce by armed bandits or members of the various military groups makes survival, let alone sustainable development, difficult, and planning for the future nearly impossible. Furthermore, all but those concerned with humanitarian aid³⁰ are reluctant to become involved in the area.

Under these circumstances, there is a distinction between short term needs necessary for survival and long term needs for sustainable development. The immediate priority is political stability and the return of law and order. For short term survival there is a need to rehabilitate services, and to provide small credits, or even donate the basic tools needed to farm and fish (hoes, gillnets, etc.), so that people are able to support themselves from day to day. In the long term, there is a need for agricultural extension work to make farming more profitable as well as more sustainable, and some reinvestment in the catamaran fleet, as well as support to alternative livelihoods, such as fish farming in ponds and lagoons. Good governance, economic stability, and a just system of taxation, are necessary to achieve these objectives.

³⁰ For security reasons even humanitarian aid activities are restricted.

4.4 Tanzania

4.4.1 Introduction

The study area included both lakeshore communities along the length of the Tanzanian coastline, and those in the wider catchment, although the effects of human activities there on the lake are largely thought to be mitigated by the extensive wetlands and delta of the Malagarasi. As such, it covered a diverse range of environmental, socio-cultural, and economic conditions, with often contrasting results from different areas. The areas were selected according to peculiarities in environmental conditions, types of institutions and stakeholders, and economic activities. The studies document ecological contexts, social institutions, and processes of SE and political change. The aims were to elucidate the local level dynamics that have induced different individuals and social groups to behave in the ways they do in pursuit of improved livelihoods, and to improve the understanding of:

- livelihood strategies of local communities, as a basis for informed intervention;
- patterns of NR utilisation and the threats to the NR base and biodiversity;
- the SE make-up of lakeshore communities and the key stakeholder groups; and
- institutional mechanisms whereby improved resource management and local development initiatives might be introduced.

4.4.2 Population dynamics and movement

The dominant ethnic group in the north of the lakeshore is the Ha, while in the south of the lakeshore it is the Fipa. However, successive invasions by outsiders have introduced SE and cultural diversity, and resulted in very cosmopolitan communities. The coming of the Bembe from Goma marked the beginning of fishing and the cultivation of crops such as cassava, sorghum, and groundnuts. The coming of Arabs from the coast introduced Islamic culture and influenced the planting of tree crops such as coconuts, mangoes, and oil palms. The arrival of the pastoralist Tutsi from Burundi during the middle of the 18th Century introduced cattle keeping in Rukwa Region; this ended at the end of the 19th Century with the spread of rinderpest, but in the past two decades there has been a westward expansion of the agro-pastoralist Sukuma people and their herds from the drier parts of the Central Plateau.

Ethnic and political conflict throughout the Great Lakes region over the past 35 years has affected population distribution and land use patterns in Kigoma Region as waves of refugees have come and gone. During the study period refugees from Congo and Burundi moved in, at times in many thousands of people per month. The Region has eight official camps harbouring almost 96,000 Congolese and 184,000 Burundian refugees, with many more living unregistered in the wider community. Environmental problems created by the influx of refugees have included rapid deforestation and resource depletion in and around the camps as forest resources have been used for shelter and fuelwood. This issue has now become politically sensitive.

During the study period overall population growth was significant, but steady. However there were remarkable variations between wards and villages. many lakeshore communities experience pressure due to rural-rural migration. from the Ufipa Plateau, the eastern parts of DR Congo, and northern Zambia, who come in to fish, to grow rice, to conduct business, or to get married. However, these areas also experience some out-migration as well, usually men in search of work in the larger cities.

Migration and movement can result in conflict, for example in Sunuka, or in Kaliani, where many people have come from DRC to settle over the past thirty years. Lack of good governance has resulted in paralysis of the local government in Sunuka, such that there is none at all, and seemingly unresolvable conflicts with the neighbouring Mahale Mountains National Park in Kaliani.

4.4.3 Infrastructure and access to social services

Apart from malaria, most of the major health problems are related to poor sanitation. Health education is regularly provided to mothers at mother and baby clinics, and generally people are aware of the importance of good sanitation and the need to boil drinking water. However levels of action varied. Even where pit latrines were common, some preferred to defecate in the lake, and few boiled drinking water because of shortages of fuelwood and because they did not like the taste. Most lakeshore villages are served by a dispensary, and Ward headquarters typically have a health centre. However, they generally have too few staff, too little medicine, and no operating facilities.

The educational level of most of the inhabitants of lakeshore villages is low. Many have had some primary schooling, but a considerable number have not finished the required seven years of study because they have left school early, the boys to go fishing, the girls to farm and/or get married. However, educational levels of youth are generally higher than those of their parents, although those of women are generally lower than those of the men. Twenty percent of leadership positions in the village government structure are set aside for women, but the women elected are often not well educated enough to play an effective role.

The majority of rural households in Tanzania are male headed. In the Ha and Fipa tradition the man controls all resources, including land and income generated within the household, and is the main decision maker. In lakeshore villages, women undertake most of the reproductive labour, including cooking and cleaning, as well as agricultural work, informal sector business, and community development activities. In some villages the workload of women is increased by the out-migration of able-bodied males.

4.4.4 Livelihoods and survival strategies

Agriculture and livestock

Despite the importance of fishing to the overall economy of the region, for much of the population along the lakeshore agriculture is the most important activity. It is more important where fishing is perceived to have declined, or where conditions are particularly favourable, such as around the Malagarasi delta. In the main, even those households whose primary activity is fishing do some subsistence farming. Around the lake, livestock keeping is generally limited to a few goats, sheep, and fowl, except around Kirando, where Sukuma agropastoralists have brought in large numbers of cattle in recent times. The largest impacts of agriculture on the environment were seen to originate from general low intensity practices resulting in constant expansion into new areas, particularly where these are steep hillsides.

Inland in the wider catchment people are primarily farmers, with some cattle keeping in the north. Maize, beans, coffee, cotton, and to some extent, bananas comprise the main crops. Use of inorganic fertilisers is rare due to their high costs (especially now there are no government subsidies) and relative unavailability. There is some intercropping, and in the north up to a half of households use animal manure, but general poor management and lack of extension services results in decreasing land fertility, low productivity, and further expansion and clearing of the *miombo* woodlands.

Fisheries livelihoods

Fishing is the most important activity for the economy of the region, although the level of dependence on it varies from village to village and from household to household. In the north as many as 80% of households are involved as either fishermen or fish processors or traders, while in the south the relative importance of agriculture is greater. The main fishing gears are lift nets used from catamarans, beach seines, gillnets, and lines. Fishing involves all sections of society, from those who own the fishing gears to hired fishermen, nationals and foreigners. Particularly in the north of the lake, at times up to half of the catamaran fleet may be owned by non Tanzanians, particularly Burundians, fleeing conflict in their home country, following fish stocks, or both. Processed fish is sold to wholesale business men and women who transport it to markets in Kigoma and thence to Dar es Salaam and/or Rumonge in Burundi. Such varied sources of demand complicate attempts to regulating fishing at this level.

The use of beach seines has become a point of concern in recent years, as they are believed to destroy fish breeding grounds and habitats as they drag over the bottom of the lake. In 1998 they were banned nationwide in Tanzania. However, the ban has been difficult to implement in Lake Tanganyika, and the only place it is rigorously enforced is in Gombe Stream NP where TANAPA staff patrol the beaches. Interviews in neighbouring villages indicated that this local implementation of national law has had very adverse effects on local economies as jobs were lost almost overnight without compensation. However, it is difficult to separate the effects of the restrictions on beach seining with other changes taking place in the region at the same time as a result of changing circumstances in neighbouring Burundi and DRC; these include reduced opportunities for small or medium scale fish traders to access markets there, reduced opportunities for smuggling since sanctions on Burundi were lifted, and unpredictable capital flow as foreign gear owners come and go at short notice.

Other economic activities

Gold mining is undertaken in Mpanda District on a small scale, involving approximately 1,500 people. The main environmental threat is the use of mercury in gold binding, although this is currently more of a threat to Lake Rukwa than Lake Tanganyika. Other activities include the running of shops, kiosks, and market stalls, the sale of cooked food, snacks, and traditional beers, the sale of handcrafts, and the sale of NRs such as firewood. In the north of the lake many poorer women process palm oil. Typically they own neither the palm trees nor the oil press, and must first buy the fruits and then rent the press, usually in exchange for some of the finished product. With technological improvements to produce a higher quality product combined with trade promotion this could be a major economic activity. However, once cottage industries are improved they tend to change ownership with the poor losing to the rich.

4.4.5 Institutional appraisal

Institutions range from the family or household to the national government, and include a variety of formal and informal groups, such as NGOs and local community groups. There has been some continuity in the local institutions, arrangements, and beliefs that traditionally governed the utilisation of NRs, such as tenure regimes, but many of these have passed through several phases of development. Officially, they have been superseded by state institutions, and the state has also appropriated the legal ownership of NRs such as land and water. However, most government departments lack basic resources to fulfil their mandates. Recent retrenchments have reduced manpower drastically, and transport to the field is problematic due to lack of funds.

The villages governments visited showed a close adherence to the formal organisational structure of a 25 member Village Council (VC). There are, however, minor divergences in the numbers and types of sub-committees, which demonstrate that villagers are able to create new institutions under the umbrella of the VC to cater for specific local requirements, such as environmental management and/or conservation. Nevertheless, popular participation in socio-political life is generally low. Furthermore, lack of the experience and confidence necessary to play an effective representative role have been a setback to people's representation, particularly for women.

In any case, the formal institutions at village level are more instruments for enforcing regulations and orders from higher administrative levels than instruments of grassroots democratic representation, and there is little real decentralisation of power. The central government controls village life through a variety of operations and legal acts. It determines, for example, where villages and individual homesteads should be located, who should live in particular villages, and the nature of social reproductive activities to be conducted. In this respect it even regulates the types and quantities of crops to be grown, and the agricultural methods to be used. Such patronisation has deskilled the people and undermined their capacity and initiative to play a meaningful role in local politics.

There is a proliferation of NGOs and other institutions in the wider catchment, although fewer at the lakeshore. However, the majority of international NGOs and institutions in the catchment are concerned primarily with the Burundian and Congolese refugees in the eight official camps, although some have recently begun to expand their activities to include local development issues as well. For example, Africare Tanzania, which has begun financing and co-ordinating the establishment of small scale income generating activities/enterprises, and the World Food Programme (WFP), which disburses small loans to help with simple animal husbandry³¹. A few are primarily concerned with the indigenous population, such as the International Fund for Agricultural Development (IFAD), which has helped the Department of Agriculture with working tools, including transport facilities, and technical know-how, and GTZ, whose involvement is concentrated on issues of food and nutrition.

Many national or even local NGOs and institutions are also primarily concerned with the refugees, and operate as implementing partners of the UNHCR³², but some are concerned with local development. On a national level, the government supports a revolving Women's Development Fund. In the north of the catchment, the Diocese of Western Tanzania (DWT) offers extension services with an emphasis on re/afforestation, development of energy saving stoves, bio-gas, irrigation and the use of oxen in agriculture. In Kigoma Region, Exploit & Help Nature (EHENA) supports improved education and health services, and "environmental integrity". In the lakeshore areas of Kigoma Region the TACARE Project offers agricultural, forestry, and agroforestry extension services, and grants to girls to go to secondary school, as well as supporting a Savings and Credit programme for women's groups. In Uvinza there is a women's association which promotes the use of improved stoves and re/afforestation. In Rukwa Region there is an umbrella association, the Rukwa Association of Non-Governmental Organisations (RANGO), which offers small loans as seed money to various local groups, as well as attempting to co-ordinate NGO activities.

³¹ Other international NGOs serving the refugees include CARE International and Christian Outreach.

³² For example, the Rural Services Programme of Tanzania (RUSERP), which works in the camps in education, distribution of food, and training of trainers in improved stoves, re/afforestation, environmental education, small scale entrepreneurship, and general community development techniques.

However, most of the local NGOs conceptualise environmental conservation as equivalent to re/afforestation. Other conservation measures are not in vogue, possibly due to the dominance of foresters in these institutions. Management is a major problem, and many of them are run as one man shows, while others are groups of people with vested interests and ulterior motives. Other major problems are shortages of funds and lack of knowledgeable and effective leadership.

4.4.6 Development and constraints

The economies of many lakeshore villages are vulnerable to the effects of regional circumstances beyond their control, particularly conflict and insecurity in Burundi and Congo. These effects are complex and dynamic, and affect different individuals as well as communities differently. For example, small or medium scale traders in the northern part of the coast who traditionally exported fish to Burundi and Congo have seen their fortunes decline when these markets became difficult to access as a result of conflicts there. At the same time, however, there is informal evidence to suggest that some very large scale traders prepared to take the higher risks of trade in unstable conditions are involved in a very lucrative trade in fish, particularly to Burundi, where the lake was closed to fishing for much of 1999. Similar informal evidence indicates that while economic sanctions were imposed against Burundi smuggling may have been a profitable activity for some, and opportunity now no longer available. Finally, a significant portion of the capital and investment in fishing in Tanzanian waters is not from nationals, and fluctuates in response to the situation in other lakeshore countries.

The general level of environmental understanding varies among individuals and communities, and “perception gaps” influence an overall lack of commitment to effect change. For example, one study established that despite extensive gullying, villagers did not perceive it as a major problem, as many of them had grown up seeing degradation around them, and viewed it as a natural process - whilst soil erosion is recognised in lakeshore villages, it does not seem to have reached the point where people feel the need to do something about it, in part because they often still have access to other land if they need it. Women are often more sensitive to environmental degradation, but gender inequity further constrains commitment to action. Moreover, as a result of bad experiences with previous state interventions, many rural Tanzanians are suspicious of outsiders who come in with offers of help or new ways of doing things, particularly when these increase workloads,

In the wider catchment Forest Reserves are facing considerable pressures. Originally established by the colonial administration for sustainable production, they are now managed by District Authorities. However, these have recently become self-funding, and, in order to generate revenue in the short term, have been overharvesting the very resources they are supposed to manage sustainably. This is compounded by lack of resources to adequately protect them from illegal agricultural expansion and fuelwood collection, especially for the flue-cured tobacco grown in the southern part of the catchment.

4.5 Zambia

4.5.1 Introduction

The Zambian coastlines includes the Districts of Kaputa, Mpulungu, and Mbala Districts in Northern Province, as well as the Nsumbu National Park. The area exhibits characteristics typical of isolated areas of the country, with development constrained by distances from commercial centres and the lack of good access roads, lack of storage infrastructure, and limited telecommunications and banking facilities. The survey focussed on lakeshore communities along the length of the coastline; Chisanza, Kapoko, and Kabyolwe are relatively typical lakeshore communities depending on fishing and farming. Lupiri and Munshi suffer from land shortages – Lupiri because of its proximity to the NNP, and Munshi because of topographical features – and thus their economies are more dependant on fishing and trade, particularly because Lupiri is relatively well served by road, and Munshi is an important border post on the Congolese frontier. Although in decline now, Lupiri was formerly an important provincial centre, and is relatively built up. A study of a farming community in the upper reaches of the Lufubu in the wider catchment was planned, but had to be cancelled due to flooding.

4.5.2. Population dynamics and movement

The Mambwe, Lungu and Tabwa are the dominant ethnic groups, followed by the Bemba. The population of Northern Province is young, with 47% of the population under 14 years old, and a median age of 16.2 years. Movement along the lakeshore between districts is common, although in Zambia overall there is more migration to urban areas than to rural areas. Fipa from Tanzania and Tabwa from Congo have also settled along the lakeshore, and there have been occasional but sometimes significant influxes of refugees from Congo in recent years.

Population density in the lakeshore districts is low - 5.6 people/km² – but this includes the large unsettled area of the NNP. There are two major settlement patterns. The first is based on the local government structure under the guidance of the District Administrator. People live in compounds in council designated areas, which are usually well serviced with piped water and electricity, as well as education and health facilities. Only Mpulungu boma is located on the lake. The second is based on a traditional structure under the rule of a Chief. They are characterised by clusters of communities headed by a village headperson under the authority of the Chief. There are 110 such clusters along the lakeshore, and many more in the catchment.

4.5.3 Infrastructure and access to social services

People in the lakeshore villages tend to bring their sick to Mpulungu town. Health facilities were only recorded at the provincial centre of Lupiri, and these were felt to be inadequate, with too few staff. Many use traditional/herbal medicines. In general, health education is good, and people are aware of the importance of child immunisation and proper sanitation and disposal of domestic refuse. However, access to safe domestic water is a problem, and a major concern. Water is collected primarily from shallow hand dug wells, or in Lupiri, from boreholes. The wells are subject to contamination from domestic animals, and in the rainy season, from flooding. In the dry season they often dry up, and people are forced to turn to rivers and streams, or the lake. Most people drink the water untreated, although during cholera outbreaks medical personnel undertake treatment campaigns. Access to education services is very limited, and educational levels are low.

4.5.4 Livelihoods and survival strategies

Farming, fishing and trading are the major economic activities, and livelihoods are dependant on the NR base. The wealthiest households are those with productive assets, specifically those related to fishing, such as larger fishing gears, outboard engines, and transport boats. In Munshi and Lupiri, where trade is important, the households of businessmen are also among the wealthiest. In Kapoko and Kabyolwe, where farming is more important, some households involved in farming were also ranked amongst the most well off. Households headed by skilled personnel, along with those who own small pieces of fishing gear such as lamp boats, are placed in a second wealth group. Households headed by women, generally divorcees or widows, are generally among the poorest. Household expenditure priorities include food, school fees, healthcare and investment in income generating activities.

Agriculture and livestock

Farming is the most widely undertaken economic activity in lakeshore communities, and in Chisanza, Kapoko, and Kabyolwe involves almost every household. It is less important in Lupiri and Munshi where land is limited, but this constraint is of major concern to many there. The most important crop for both subsistence and sale is cassava. Other crops are maize, rice, millet, sweet potatoes, yams, bananas, beans, groundnuts, pumpkins, vegetables, and sugar cane. Fruit trees such as mangoes, oranges, papayas, and guavas are grown around houses, primarily for home consumption. Oil palms are also grown around houses on a small scale; most of oil the produced is also for home consumption. Produce is sold in Mpulungu, particularly from Kapoko, or traded for fish. However, road access from most villages is poor and water transport is risky, and there are no facilities for handling perishable products such as mangoes and tomatoes. Extension services are minimal, and there is a lack of both information and credit for inputs. Furthermore, crop destruction by wild animals is a problem, particularly around the NNP.

Livestock ownership is very limited, and there are no cattle due to veterinary restrictions to prevent the spread of disease from Tanzania.

Fisheries livelihoods

Although fishing underpins the economy in the lakeshore, not every household is involved and the level of dependence varies among villages - for example, in Kapoko, less than a third of households are involved. The main gears are beach seines, gillnets, lift nets, and lines, although the use of beach seines is being discouraged, as they are perceived to be destructive. Traditionally, fishing was a dry season activity, with people focussing on agriculture in the rainy season. However, much activity is now year round. All fishers are male. In some villages, fishing is an activity of the elderly, while in others it is perceived as an activity for the young. Different individuals are involved in different ways, from owners of large fishing gear, to owners of lamps and lamp boats, to hired labour.

Fishermen sell fresh fish to traders locally, or at markets in Mpulungu and Lupiri, or to commercial fishing companies with blast freezing facilities and refrigerated distribution systems. Fish sold locally is processed by women and children. Most is then taken to the main Ngwenya market in Mpulungu, which also handles fish from Tanzanian and Congolese waters, although from Lupiri some is transported by road to the urban areas of the Copperbelt and Lubumbashi, or even Lusaka. Constraints to the marketing of fish include poor road access and the risks of water transport and high charges at Ngwenya.

Throughout the Zambian portion of the lake people felt that catches have been declining despite increased effort. They attributed this decline to increased effort, particularly increases in the numbers of gear and improvements in their efficiency, the advent of year round fishing, and the activity of the commercial fleet. However, lack of access to capital or credit to buy more or better gear was often cited as a constraint.

Other economic activities

In addition to the sale of agricultural and fish products, there is trade in NRs such as firewood, poles, and thatching grass, and manufactured goods, such as household items, and shopkeeping and trade are particularly important in the provincial centre of Lupiri and the border town of Munshi. Many women also bake scones or brew traditional beers for sale in the village.

4.5.5 Development and constraints

Government development activities in the region include the District Water, Sanitation, Health & Education Project. Other initiatives are focussed on the NNP, where private sector investors are developing tourism, and on the lake, where the CIFA is proposing a fisheries management project to be financed by the African Development Bank as a follow-on from the LTR Project. Finally, LTBP Environmental Education activities resulted in the formation of 60 Village Conservation and Development Committees, most of which have been registered as legal entities (co-operative societies), and received leadership training.

However, there are numerous constraints to the development necessary to ensure sustainable use of the area's NRs. Although many people were found to be forward looking and progressive, some were seriously constrained in their efforts to improve their lives by deep-seated beliefs in witchcraft aimed at those who were seen to be successful. Such people saw no point in working to improve their situation, and this issue will need sensitive handling by those attempting to work with these communities. The region is also vulnerable to the effects of events in neighbouring Congo, and security and immigration control were a priority for some. Other constraints are related to general low levels of capital assets: poor social capital, in that communities have little access to institutions which affect them, such as Water Departments, or police and immigration officers; poor human capital, in low educational levels and lack of extension, and poor health; poor physical capital, where roads and access to markets are limited, and water, health, and education facilities are lacking; poor financial capital, in the lack of access to credit to invest in fishing or farming; and poor or diminishing natural capital, where land is limited, or fish stocks are declining.

5 SOCIO-ECONOMIC ISSUES AND RECOMMENDATIONS

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 world³³, and almost all depend upon the NR base to survive and prosper. The first formal SESS Working Group Meeting in November 1999 discussed preliminary findings and underscored that people *requested* development, and that until their needs are met, current patterns of NR based activities would continue. This was later reiterated in the national reports. Thus the SESS suggests types of development to be "encouraged" as opposed to "permitted", with more emphasis on finding and promoting sustainable livelihood strategies and diversification from primary exploitation of the NR base.

The links between poverty and environmental degradation are well known. It is generally the poor who are most dependant on NRs, and who also are most often unable to plan for the long term and to manage their NRs sustainably due to efforts to meet their short term needs. Even where there is good understanding of possible future benefits, the poor cannot afford to forgo any short term benefits. The environmental problems 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 NR base is then less able to support life, which perpetuates poverty. Therefore, the main finding and recommendation of the SESS is that **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**, within a context of security and institutional reform³⁴. For further findings important to consider when implementing such programmes see Box 1.

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 services³⁵.
- 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 works³⁶

³³ E.g., per capita income in Kigoma Region, in 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.

³⁴ 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.

³⁵ 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 lack of alternatives from acting on their knowledge.

Substitution possibilities for more sustainable practices must be identified, tested, introduced, and promoted, as this is a key factor in the diversification of livelihoods. 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 the lake. This needs 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 NRs base in general and the biodiversity of the lake in particular.

5.1 Alternative livelihoods, activities and practices

Activities that increase wealth or well being around the lake in an equitable way, but do not cause increased erosion/sedimentation or increased fishing pressure should be supported as they could alleviate the reliance on, and thus damage to, the NR 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. The SESS has evidence that the following ideas (Box 2) may be beneficial and enhance the financial and other assets of lakeshore communities³⁷.

³⁶ For example, 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.

³⁷ Participatory testing of such ideas was beyond the scope of this study, but will be the key activity of a next stage.

Box 2 – Ideas for modifications to existing livelihood activities 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 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.
- Reducing damage to smoked fish by beetles, which 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 the 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* catch³⁸.
- 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, which may increase pressure on NRs and thus impact negatively on biodiversity.
- Non-wood forest/woodland products, particularly from 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.

³⁸ 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. Possible constraint to profitability, however, might be the seasonality of the catches and the fact that there is no light fishing for seven out of every 28 nights during the period of the full moon.

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

Attempts to improve living standards and alleviate poverty, both through support of direct actions themselves, and through raising the profile of the lake region should be supported. *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 SE development, capacity to manage renewable NRs, and reduced population growth rate, itself an underlying threat to the biodiversity of the lake³⁹. Important within these topics are improving health and education and other interventions to enhance human and social capital. For suggestions from the SESS to develop such capital assets see Box 3.

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 5.6 below).

³⁹ However, there are problems associated with increased in-migration to areas with improved resources.

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 children⁴⁰. To facilitate this, livelihood activities that are accessible to women and are based close to the home need to be supported. Women also 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 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 activities⁴¹. Nevertheless, the SESS teams believe that overall the benefits of diversification 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.

5.3 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 seines⁴². 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, the SESS suggests that, where possible, it be phased out as alternatives are phased in, and that this is done in a participatory manner.

⁴⁰ It is well documented that income governed by women is spent more on family welfare than income controlled by men.

⁴¹ 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.

⁴² 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.

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 concern⁴³. However, the SESS argues that any problems in the offshore fishery will bear directly on the future of the biodiversity in the inshore zone. The offshore fishery is large, and worth tens of 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 farming for survival, possibly in a very 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 expanded⁴⁴. Thus the 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 inequality⁴⁵ - 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 is not going to be easily eradicated. As long as the current lawlessness in Congo continues, gear will continue to be stolen⁴⁶. 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.

⁴³ The gear used for offshore fishing (lift nets and catamarans) is the most expensive, and the SESS recorded numerous complaints about lack of credit and/or requests for credit to allow entry into this more profitable arena.

⁴⁴ “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)

⁴⁵ Development should be sustainable and equitable. The 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.

⁴⁶ The lake is only 50km wide, a short boat trip with a good engine, and the pirates are better armed than any marine police.

If there were to be a credit project aimed at fishermen, it should include a direct buyout (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 or sold, resulting in no decrease in effort in the inshore zone, and an overall increase in the total fleet. The buyout would reduce the amount of the 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 be important to ensure that all stakeholders understand the proposed 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, the 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 seines in Tanzania) is ineffective⁴⁷, except where extraordinary law enforcement efforts are made (for example, in Gombe Stream NP). The effect of such top-down prescriptive enforcement without support to alternatives results in widespread hardship and deteriorating relationships between state appointed NR 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.

5.4 Sustainable agriculture and soil conservation

Other SSs suggest 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 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 and general human, financial, and physical assets that the SESS has recorded around the lake. 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 region⁴⁸, leaving some room for expansion⁴⁹, 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

⁴⁷ 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.

⁴⁸ For example, in Rukwa Region population density is only on the order of 10 people/km²; in Zambia's Northern Province it is less than 6 people/km².

⁴⁹ 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.

removal of woody biomass for fuelwood⁵⁰ 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 attention⁵¹. For suggestions of interventions to reduce soil erosion from cleared agricultural land, see Box 5.

Box 5 – Reducing soil erosion from cleared agricultural land

Reduce erosion from existing fields

- Modify fields to reduce the gradient (contour ridges, terracing, etc.)⁵²
- Trap eroded material, for example in thick grassy borders
- Protect bare tilled soil with mulch
- Plant permanent/tree crops (agroforestry) which do not require tilling each growing season and bind soil with their permanent root systems⁵³

Make existing fields more productive so new fields do not need to be cleared at the same rate

- Increase yields of existing crops
 - Use improved varieties
 - Improve soil fertility⁵⁴
 - Green manure/composting
 - Animal manure
 - Intercropping with leguminous plants
- Introduce new crops of a higher value, either as food crops, or cash crops.

Extension services should be supported to promote intensification and improve 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 emphasise 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.

5.5 Sustainable woodland management

Lakeshore communities should be supported 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

⁵⁰ For domestic use, fish smoking, charcoal production, tobacco curing, etc.

⁵¹ 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.

⁵² 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.

⁵³ Furthermore, many tree crops do not require weeding after establishment which allows other plants ("weeds") to bind the soil as well.

⁵⁴ 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 materials. This is particularly true when considering potential damage to the lake from overuse of under-priced (subsidised) artificial fertilisers.

slopes and/or above rocky aquatic habitats of high diversity⁵⁵. 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 sustainability⁵⁶.

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 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.

5.6 Market liberalisation, good governance, and institutional factors

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, financial and other capital assets generally 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 NRs, 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 NR base, as well as other capital assets. Specifically, moves to support market liberalisation can improve diversification options for both farmers and fishers. For example, in Tanzania generally, increased options for non-farm income generation resulting from new economic policies introduced in the early 1990s are widely regarded as a significant positive change in the lives of rural people.

Nonetheless, fishing and agriculture are likely to continue to constitute the predominant component of the population's livelihoods. 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 (poor social capital). Much of village life was not controlled at village level, and participation in political life was low, 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 directed.

⁵⁵ Examples of village protected forests/woodlands were recorded by the SESS in Tanzania, set up by local bylaw.

⁵⁶ In Kigoma Region the TACARE Project currently has an active village nursery programme promoting local ownership, as well as promoting agroforestry.

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 as they have the best understanding of local conditions, 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 work is a priority for further action.

6 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 produced preliminary suggestions for activities to support change (see section 5 above). The next part of the process of sustainable development is participatory action research in pilot locations to test these suggestions, monitor and evaluate their acceptability, 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 important 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 strategies⁵⁷, 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;
- the incidence and impact of HIV/AIDS, particularly with reference to the high levels of population movement (fishermen and refugees). Although generally a well documented problem in sub-Saharan Africa, data on this were noticeably lacking for lakeshore communities⁵⁸.
- 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 participatory 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.

⁵⁷ Specifically, in the clearing of land for agriculture and in fishing.

⁵⁸ Generally, there are only informal indicators such as the incidence of HIV in blood donors in Kigoma town (approximately 30%).

7 CONCLUSION

The overarching conclusion of the SESS is that the unsustainable use of NRs around the lake is closely linked to poverty, underdevelopment, and lack of alternatives. Biodiversity conservation needs to be linked with short-term SE viability as well as long-term SE sustainability. Villagers are unlikely and unable to adopt more sustainable practices if these threaten their present livelihoods and do not offer better prospects than existing practices. NR 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)

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APPENDIX B: SCHEDULE OF KEY FIELD ACTIVITIES

1996	November	Bubango, Tanzania
1997	January	Mtanga, Tanzania
	February	Kaputa, Zambia
	August	Kirando Ward, Tanzania
	December	Buhingu Ward, Tanzania
1998	February	Kigoma Region catchment, Tanzania
	July	Rukwa Region catchment, Tanzania
1999	October	Chisanza (A), Zambia
		Kigongo, Congo
		Mwamgongo, Tanzania
	November	SESS Working Group Meeting
		Gatumba, Burundi
	December	Kilomoni, Congo
		Lupiri & Munshi, Zambia
2000	January	Kibenga, Burundi
		Sunuka, Tanzania
	February	Kabyolwe, Zambia
		Makobola, Congo
		Kinindo, Burundi
	March	Kapoko, Zambia

APPENDIX C: SUMMARY AND CRITIQUE OF THE SESS 1996 - 8

After the SESS Co-ordinator, Dr K Meadows (appointed on a part time basis in April 1999), had produced an assessment of the Special Study to date and plan of action and procedure for the 1999-2000 phase, the first combined task undertaken by the new Co-ordinator and Facilitator (K Zwick, appointed in June 1999 on a full time basis) was to review and critique the SESS fieldwork undertaken by the Project to date (1996 – 8).

This was largely limited to Tanzania but included both lakeshore villages and institutional appraisals in the wider catchment. The seven site reports give an indication of the main economic activities and environmental threats and problems in villages around the lake. However frequent changes in co-ordination and direction⁵⁹ meant that there was not a organised or thematic approach to the surveys.

The reports were summarised along with relevant FPSS documents, and from this, key results were extracted in the thematic areas of fisheries livelihoods and practices; agricultural land use and livestock; deforestation, energy needs, and woodland management; and population and movement. Results from these are included in Sections 3 and 4 of the this report.

However, there was little information on the heterogeneity of communities and how differences in SE status influenced livelihoods and behaviours, or on household composition and how different household members contributed to livelihoods, information important in moving from an understanding of existing environmental problems to possibilities for alleviating them. Recommendations were made to investigate these aspects in more detail, as well as to collect more quantitative information on both the social and economic aspects of the different livelihood activities identified, and to undertake work in all four of the riparian countries. It was further recommended that institutional linkages be developed and strengthened to build regional capacity and maximise resources.

⁵⁹ Two UK based Co-ordinators, two consultants sent out on short term training missions, and a field based researcher with a special interest in ethno-zoology.

APPENDIX D: THE FIRST SESS WORKING GROUP MEETING

In November 1999 the NSECs and a SESS team member from each of the four riparian nations met together with the SESS Co-ordinator and Facilitator in Kigoma, Tanzania. The aims of the meeting were to achieve a co-ordinated understanding of the SESS work programme across the four riparian nations and to facilitate the exchange of ideas and information of the four national SESS teams, some of which were relatively newly formed. Specific objectives were to:

- share knowledge gained to date on current livelihood strategies and SE practices around the lake and its catchment area;
- share knowledge to improve the survey work, particularly data collection, data analysis and report writing;
- produce national workplans for the remainder of the Special Study; and
- identify directions for action regarding the SESS contribution to the SAP.

Methods included formal individual and team presentations, group discussions, informal exchange of knowledge, experiences and views, formal constructive criticism and advice, and team/individual discussions with the SESS Co-ordinator and Facilitator.

The first presentation was made by the SESS Co-ordinator, who briefly covered the highlights of the SESS from July to November 1999 which included the formation of the Burundian and Congolese teams and the re-energising of the Tanzanian and Zambian teams. The SESS Facilitator then presented a summary review of the work done between 1996 and 1998, primarily by the Tanzanian team. The main part of the meeting was a presentation by each of the national teams on their progress to date including main findings of interest, and their plans for the coming months. These were then critiqued by the other teams, and revised accordingly. The final sessions dealt with the SESS input to the SAP, which was felt to be inadequate at that time, as well as the role of the SESS within the Project and the balance between environmental conservation and human development.

One of the greatest successes of the meeting was the building of regional transboundary capacity as the separate national teams generously shared their knowledge and experiences and developed a SESS team spirit with the common aim of ensuring 'the well being and advancement of people [in Burundi, Congo, Tanzania, and Zambia] and their access to resources'. A second meeting for a participatory approach to producing the SESS advice document for the SAP and finalising of National Reports was planned for March 2000. However, funding restrictions precluded planned actions and the first WGM unfortunately remained the only SESS WGM.