

GLOBAL ENVIRONMENT FACILITY

Regional

Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika

Project Document

*This Project Document has been edited to facilitate public dissemination.
The original is on file in the GEF Office at UNDP Headquarters in New York.*



ABBREVIATIONS

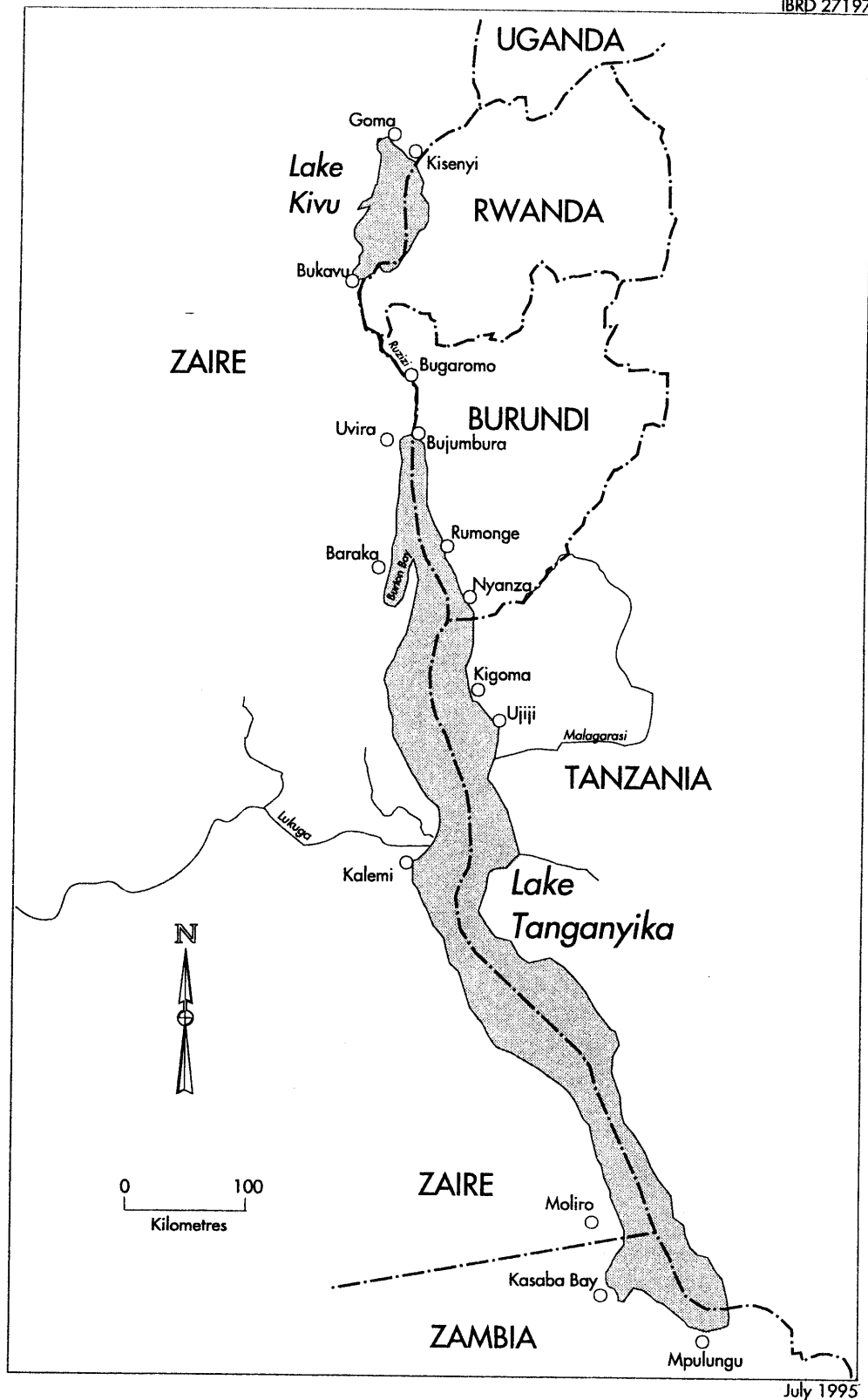
CEPGL	Economic Commission for the Great Lakes
CIFA	Committee for the Inland Fisheries of Africa
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environment Facility
INECN	National Institute for Environment and Conservation of Nature
NGO	Non-governmental organization
PPER	Project Performance Evaluation Report
PTA	Preferential Trade Area
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WWF	Worldwide Fund for Nature

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LAKE TANGANYIKA

IBRD 27197



July 1995

UNITED NATIONS DEVELOPMENT PROGRAMME

GLOBAL ENVIRONMENT FACILITY

Regional Project

Title: Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika

Number: RAF/92/G32

Duration: Five years

Project Site: Lake Tanganyika

UNDP Sector: Environment

Subsector: Environmental enhancement and management

Government Counterpart Agencies: The Governments of Burundi, Tanzania, Zaire and Zambia

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GEF/UNDP Inputs: US \$10 million

Brief Description:

Lake Tanganyika, one of the world's great lakes, possesses perhaps the highest biodiversity of any lake on earth. It plays an important role in the economies of the countries that surround it—Burundi, Tanzania, Zaire and Zambia. Despite its vulnerability to pollution because of its natural characteristics, few efforts have been made to conserve its biodiversity. The most immediate threats to the lake's environment and biota are pollution from excessive loads of sediment and nutrients caused by erosion in the watershed, industrial and urban pollution including boat discharges, and intensive fishing using inappropriate methods. These problems are increasing, and others such as oil exploration and transportation on the lake pose another cause of concern. Immediate attention is required to assess and control pollution and protect biodiversity.

This five-year project aims to: improve understanding of the ecosystem function of Lake Tanganyika and the effects of stresses on its lake system; take action to maintain the health and biodiversity of the ecosystem; and coordinate the efforts of the four countries to control pollution and prevent the loss of the exceptional diversity of Lake Tanganyika.

These goals will be achieved by:

- Establishing a regional framework for cooperation, including endeavors to harmonize legislation
- Investigating pollution, including sources, effects and control
- Investigating conservation measures leading to the creation of protected areas as underwater parks.

Activities will closely involve government environmental ministries, agencies and sectoral departments. A major objective of the project is to strengthen national capabilities and community participation. The project will be supported by international and local staff and contractors. Non-governmental organizations (NGOs) will be involved, particularly through community education and conservation, and the private sector will be included through the promotion of tourism and the control of industrial pollution. Provision will be made to continue the work of the project after its life through a regionally cooperating organization.

A. CONTEXT

1. Description of subsector

Lake Tanganyika, the largest water reservoir in Africa (18,800 cubic kilometres (km³)), is shared by four countries: Zaire (45 percent), Tanzania (41 percent), Burundi (8 percent), and Zambia (6 percent). Being a vital water resource, it plays a pivotal role in the economic activity of the region. Fish from the lake (85,000 tons/year) are a primary source of protein; a valuable ornamental fish export industry is also supported by the lake. Lake Tanganyika provides a transportation link for the countries around it—a link which will be increasingly important in their development.

The remarkable biodiversity of the lake is of worldwide interest and importance. Over 1,300 species of fish, invertebrates, and plants have been recorded, some 500 of which do not occur anywhere else. Many of these have no close relatives outside the lake basin and are the result of a very long evolutionary history.

Of the many serious environmental threats currently facing the lake, the most immediate come from excessive amounts of suspended sediment entering the lake as a result of deforestation and agricultural practices. Chemical pollution from urban and industrial sources is also increasing. Both these types of pollution alter the nutrient balance in the lake, leading to eutrophication. Adding to these pollution sources, intensive oil exploration in the past decade has led to petroleum resources

in the basin and the lake sediment. This finding raises the possibility of oil spills in the future; leaks and losses of oil incidental to lake transportation have already occurred.

Another serious problem is the long-term decline in the fish catch in areas where improved mechanized methods of fishing have been developed. The diversity of these fishery stocks has already diminished. Inshore, the uniquely diverse assemblages of cichlid fishes are being affected by destructive fishing practices.

Unfortunately, the lake is singularly vulnerable to pollution. It is a virtually closed basin with only one small river outlet; almost all water loss is by evaporation. As a result, its flushing time, which is related to the renewal of water in the lake, is as long as 7,000 years—far longer than in any other great lake. Moreover, most of the deep water is already naturally permanently deoxygenated, in a proportion greater than in any comparable lake. As this proportion worsens through further exploitation and pollution, the health of the ecosystem, its biodiversity, and its ability to sustain human populations will be imperilled. These effects are long-term; in effect, pollution would be permanent in relation to human lifetimes.

These threats are potentially grave because of the great dependence of people in the basin on the lake (some 7 to 10 million people including the Lake Kivu catchment). There is a growing awareness in the region of these problems, as well as a growing appreciation of the value of the lake and its resources. These resources and the environmental threats to them are common to the four countries because of their interactions within a single ecosystem. Consequently, these countries recognize the need for an integrated regional approach to the conservation and management of the lake environment.

There are large gaps in our knowledge about the lake resources and environmental dangers, and strategies for pollution control and biodiversity conservation have yet to be developed. Enough is known, however, to identify key questions where research and inquiry are necessary. This investigation will have to be performed in the context of poor communication between the lake countries in technical and logistical matters. Moreover, there is a shortage of skilled personnel in fields related to conservation management and pollution control. There is also a need for greater community awareness and education about environmental problems and solutions.

On the positive side, enough is known to identify key environmental problems and develop approaches to their solution. There is evidence of a strong desire in the region to undertake this work, and it will be facilitated by the recent far-reaching restructuring of legislation and institutional responsibilities for environmental matters within the countries. This project presents an opportunity both to investigate urgent problems, and to initiate regional cooperation in establishing a facility for pollution control and good management of an exceptional natural environment.

2. Host country strategy

There is as yet no legal framework among the four countries for the joint management of the lake. The countries participate in the Committee for the Inland Fisheries of Africa (CIFA) of the Food and Agriculture Organization of the United Nations (FAO). CIFA meets every year and shares experiences specifically on fisheries. Burundi, Tanzania, and Zambia are members of the

Preferential Trade Area for Eastern and Southern Africa (PTA), and Zaire has applied to join, while Burundi and Zaire are also members of the Economic Commission for the Great Lakes (CEPGL). PTA is an organization with a very broad range of interests, and CEPGL does not include Tanzania and Zambia. Under these circumstances, the sectoral policies of the four countries have primarily been concerned with national interests.

Chief among these has been the development of fisheries. There are about 36,000 fishermen on the lake, operating some 10,000 coastal canoe fishing units, and 2,000 improved artisanal units. Industrial (purse seine) units number about 60; these operate from the main ports: Bujumbura, Kigoma, Kalemie and Mpulungu. The export of ornamental fish to destinations around the world is a growing business.

The entire lakeshore population depends on the lake for drinking water and other domestic purposes. In urban areas, notably the city of Bujumbura, water supply arrangements with treatment on municipal scales are to be found. Plans exist in these places to develop lake water resources, which for the future have huge potential value in view of the size and location of this reservoir in a generally arid part of the continent with growing populations.

A shipping transport system links the main ports. This system has long been established, but there are strong indications, notably at the north and south ends, that lake transportation is growing, and will become an important part of a transportation network linking countries of East, Central and Southern Africa. Oil is already transported (oil imports to Burundi are routed by the lake), and this will increasingly be the case, especially if oil is produced in the basin.

At present, the countries have no formal policies to conserve biodiversity in the lake. No areas of the lake are set aside for conservation as parks or reserves, other than the nearshore waters of four land parks. Tourism is not developed, though huge potential for this enterprise exists.

Lake Tanganyika has received considerable attention from the international scientific community for many years, first for its highly diverse endemic biota, and more recently for its geology and sedimentology. There is no doubt that the riches of the lake and basin represent large potential natural resources for each country.

The project will take account of the various sectoral strategies and reflect a multisectoral approach. Certain technical programmes will differ between the four countries, but they will be designed to complement each other to achieve the required regional objectives.

3. Prior and ongoing assistance

There has been relatively important support for the fisheries of the lake. Three FAO projects, each about five years in duration, were partly (Zambia) or entirely (Burundi, Tanzania) concerned with Lake Tanganyika, and a regional FAO fisheries planning project which included Lake Tanganyika has just been completed. Most recently, in 1992, FAO and the Finnish Department of International Development Cooperation (FINNIDA) launched a regional fisheries research project to investigate the biological basis of fish production. Though these projects have concerned lake biota, none have covered the conservation of biodiversity in general. It is important that biodiversity

- Lake Tanganyika (Tanzania) Fisheries Project; Governments of Netherlands and Tanzania; fisheries.
- Ornamental Fish Export Production; CBI-Netherlands/Tanzania; sustainability of ornamental fish exploitation.
- Land Degradation in Western Tanzania; DANIDA/Government of Tanzania; remote sensing of land degradation.
- Integrated Regional Development; Norwegian Agency for International Development (NORAD)/Government of Tanzania; afforestation and water supply.
- Hydrothermal Activity in Lake Tanganyika (TANHYDRO); French and German National Science Foundations; Zaire, Burundi and Tanzania; limnology.
- Creation and Management of a Research Centre in Ichthyology and Hydro-biology; AGCD (Belgium)/CEPGL-IRAZ; Burundi, Rwanda and Zaire; pollution monitoring in northern bay of the lake, limnology and training.
- Fish and limnological investigations; Kyoto University (Japan)/national governments; Zaire, Tanzania and Zambia; behavioral ecology, fish biology and limnology.
- Regional Fisheries Project for Lake Tanganyika; FINNIDA/FAO; Burundi, Tanzania, Zaire and Zambia; improved fishing practices, limnology and training.
- International Decade of East African Lakes (IDEAL), regional project with fifteen participating countries; National Science Foundation (NSF) (USA) and others to be identified; limnology (in development phase).
- Ecology and sedimentology projects organized between various lakeshore countries and the University of Arizona (USA), the Royal Museum of Natural Sciences, Belgium, and the University of East Brittany, France. Cooperation has been ongoing for twelve to fifteen years.
- Ongoing community development, land management and fisheries project conducted by CADIC and HAAC at Uvira (Zaire).

Most of these projects are quite small and narrowly focused, and deal with specific problems. Most involve only one lake country. While there are areas of complementarity, there is little, if any, overlap with this project. None of them serve the need for biodiversity conservation and pollution control in the lake as a whole, even though a regional approach is clearly a prerequisite for any action to be effective.

4. Institutional framework for subsector

In the absence of a formal regional institutional framework for coordinated management of the resources of the lake, interchange between the four countries has been taking place primarily

conservation be addressed now, since fish catches in the lake have been declining, both in numbers and diversity.

Other projects concerned with the lake or watershed, either underway or in an advanced stage of preparation, that will have bearing on this project are listed below. The Project Coordinator will initiate contacts with all these projects, with a view to enhancing cooperation and the exchange of information. Moreover, where projects relating to the environment are operational on the neighboring Lakes Malawi and Victoria, this project will be cognizant of progress and results that may be useful. In the following list, each project title is followed by the donor agency, the implementing agency, the country or countries involved, and the foreseeable areas of cooperation with this project.

- Role of Ecotones in Lake Tanganyika; Danish International Development Agency (DANIDA)/United Nations Educational, Scientific and Cultural Organization (UNESCO); Burundi; lake margin wetland research (Rusizi delta), and development of the Lake Tanganyika museum.
- Bujumbura Municipal Water Quality; German Agency for Technical Cooperation (GTZ); BWB; Burundi; pollution monitoring in the Bujumbura area.
- Biodiversity Support Project; National Institute for Environment and Conservation of Nature (INECN); United States Agency for International Development (USAID)/Peace Corps; Burundi; on-land conservation.
- Ntihakwa River Basin Project; FAC (France)/ISABU; Burundi; natural forest/park protection and environmental education.
- Project Memwere & Muhuta; Swiss Aid/Travaux Publiques; Burundi; watershed management.
- Project d'aménagement d'haute terre; Italian Foreign Aid/ISABU; Burundi; watershed management.
- Sewage Treatment Facility for Bujumbura; KFW (Germany)/SETEMU; Burundi; pollution control for Bujumbura area.
- Administrative Management Design (ADMAGE) project for national parks and wildlife services; Worldwide Fund for Nature (WWF), USAID and Government of Zambia; community involvement in reserve design and management.
- Zambian Environment Educational Programme (ZEEP); WWF and Government of Zambia; community, primary and secondary education.
- Fisheries Loan & Capital Equipment; IBR/Government of Zambia; improvements in fishing gear, strengthening of institutions (project in suspension).

through ad hoc inter-country consultations. Fortunately, similar institutions exist for the management of natural resources at the national level, and lead agencies for environmental matters have been designated. In Burundi, there is a Ministry of Land Management, Tourism and Environment which includes a National Institute for Environment and Conservation of Nature (INECN). In Zambia, a National Environment Council (NEC) has been set up with units handling water pollution control, solid waste management, air pollution and noise abatement, pesticides and toxic substances, and natural resources management. At the ministry level, there is the Ministry of Environment and Natural Resources. In Tanzania, a Ministry of Tourism, Natural Resources and Environment exists to complement the National Environment Management Council (NEMC). In Zaire, there is a Ministry of Environment, Conservation of Nature and Tourism.

All these environmental agencies are relatively new and have inadequate staff, with little resources or financing. While their responsibilities are broad, their operational capacities have yet to be well established.

There are also national universities that cater to the research needs of their societies. The University of Burundi has now developed some research capacity on ecological and pollution aspects of the lake. The Biology Department of the University of Zambia is also interested in working on the lake at some point. The staff of the Department of Biology at the University of Dar-es-Salaam in Tanzania has undertaken research on lake fisheries. Several NGOs which are oriented towards providing direct support to communities in the field of environmental awareness also exist in the countries.

The project therefore has the challenging task of establishing working relationships with all of these organizations, and increasing their respective capacities to help manage the lake environment. The Ministry of Environment in Burundi, the Ministry of Tourism, Natural Resources and Environment in Tanzania, and the Ministry of Environment and Natural Resources in Zambia will take part in the lead responsibilities for the project in their countries. All the institutions identified, however, must be involved in a concerted effort to ensure that the hydrological, soil, and biotic regimes of the lake basin can be sustained, and the deleterious activities controlled.

B. PROJECT JUSTIFICATION

1. Problem to be addressed and the present situation

Present situation

Burundi

The entire coastline of Burundi is inhabited, most of it densely. Nearly complete deforestation has occurred in the Burundi watershed, with protected areas restricted to three places (Rusizi Delta, Rumonge Forest and Kibwesa Forest). None of these areas is large enough to avoid significant impacts from the outside. Soil erosion resulting from deforestation and intensive agriculture is considered by most authorities to be a critical environmental problem facing Burundi. The effect on the lake is excessive sediment pollution and severe siltation. In 1992 it was observed that great quantities of anoxic muds were accumulating in places as shallow as 70 metres in depth

(above the usual maximum depth of oxygenation there), apparently as a result of the rapid accumulation of organic matter. Although deforestation is potentially causing this problem elsewhere in the lake, it is undoubtedly most acute here.

Rock and sand coastlines are the richest aquatic habitats in terms of species diversity in Lake Tanganyika. In northern Burundi such habitats are already severely degraded, resulting in reduced biodiversity. The very steep slopes of the lake bottom imply that siltation affects the entire nearshore biota of the lake in Burundi. Another aspect of sediment pollution is its potential, but as yet unknown, impact on the traditional and commercial fisheries, as all the important fishery species have a juvenile phase of life inshore.

The offshore and inshore fisheries in Burundi are, or were, the most intensive in the lake. A formerly prosperous commercial fishery, supported by a large local market and good road communications, is now in severe decline. This situation has serious economic and nutritional implications. The causes of the evident depletion of fish stocks are not well understood.

Industrialization and population numbers in Bujumbura are believed likely to expand rapidly, possibly doubling in the next decade or so. No sewage treatment exists in the city, and the water supply comes from the lake. Numerous industries discharge their wastes with little or no treatment into canals which enter the lake. It is quite possible that intake water quality will be threatened if the pollution discharge continues to increase. Chemical pollution, if uncontrolled, is also likely to become a serious problem in the northern bay of Lake Tanganyika.

Zambia

Environmental conditions in the Zambia sector are mostly very good. About one-third of the coastline receives considerable protection within the Nsumbu National Park boundaries, which extend a mile offshore. Another third of the coast is very lightly inhabited. These areas support extremely rich species diversity, especially nearshore (0 to 40 metres in depth). There is also a remarkable deep water fauna offshore down to 200 metres, which is more abundant in the Zambian area than elsewhere.

The remaining third of the coast, around the southeastern arm, contains areas heavily influenced by human settlements, such as the environs of Mpulungu where there is a harbor, several industrial fisheries installations, and a large population in satellite villages. Mpulungu is growing very quickly. Beach seining is commonly practiced around most of this area, and this fishing method is known to be destructive to nearshore biota, especially those with low reproductive rates and limited distribution, as is the case in many of the cichlid fish species. Large changes in the pelagic and bottom fish stocks have also occurred following sustained purse-seining and gill-netting. While these trends have been documented, the magnitude of the total impact of human activities in the area, including chemical enrichment around the harbor, has not been estimated.

Tourism facilities are more developed in Zambia than elsewhere, and there is considerable potential for the establishment of underwater parks. These parks would help preserve biodiversity and augment tourism, and also assist the commercial fishery outside the park by protecting inshore

nursery grounds of fish. The other commercial enterprises in the area are ornamental fish export and crocodile farming.

Tanzania

The Tanzanian sector includes most of the eastern coast of the lake, and is one of the most remote and least developed parts of that country. Few roads reach the lake, and none run parallel to the lakeshore. There is a considerable population of fishermen-farmers in villages along the coast, however, and fairly large population centres around the port and railhead of Kigoma, and at Kipili. Increasing deforestation and erosion are occurring, in particular along the northern Tanzanian coast. Seine nets are widely used, but their effects are not quantified. Industrial vessels fish sporadically from Kigoma, with apparent impacts on local fish stocks. Some chemical pollution has been noted at Kigoma, and as the port and shore installations grow, precautions against pollution in the area are required.

There are two land parks adjoining the lake: the small Gombe Reserve known internationally for its chimpanzees, and the mountainous Mahali Reserve. The former is under considerable pressure from adjacent highly populated areas. Extension of these parks to include sectors of the lake, as envisaged in the project, should considerably enhance the value of these parks, both from the point of view of tourism and ecology. The Tanzanian coast in general is highly variable in habitat types and appears to contain a very rich aquatic fauna.

Zaire

A similar description applies to the Zairian part of the lake, which comprises virtually all the west coast. There is one main railhead port, Kalemie, from which lake transport ships and industrial fishing boats operate. Villages are scattered along the lakeshore with poor communications with the interior. There is evidence from satellite photographs that significant deforestation is occurring along certain steep escarpments near the lake. The northern 75 kilometres of the coast is densely populated with a large local fishery. Catches in the area have diminished drastically in the past decade, apparently due to intense fishing. Considerable aquatic biodiversity exists, as indicated by a long series of underwater studies based at Uvira. There is a great need to establish reserves in parts of the Zairian coast to help in the conservation of the watershed and lake, but none have yet been proposed.

In short, there are clearly considerable disparities between the four countries in resource exploitation and environmental problems, actual and potential. Corresponding differences exist in the ways that special problems and their priorities of importance are perceived. The project must reflect these differences, and will do so through locating and emphasizing particular project activities in the different countries. Despite the different situations, however, the control of pollution and protection of biodiversity are closely related to environmental issues that are common throughout the basin. Certain problems of common interest stand out clearly.

Problems to be addressed

In general, poor management of resources at a time of rapid demographic expansion has characterized activities in the region. Inappropriate land use and deforestation are increasing the load

of sediments and nutrients flowing into the lake, and threats of industrial pollution are increasing. There is inadequate capacity within the countries to stem these processes, and to integrate conservation measures with development efforts. Moreover, a concerted regional approach to manage the ecosystem is needed. Specifically, the project will assist the four countries to address these problems in the following ways.

Ensuring a regional focus within the basin

The project will help develop a coordinated administrative mechanism for the environmental management of the lake and its basin. It will cooperate with national sectoral departments and institutes, and with other international and bilateral projects operating in the region in related fields. It will foster public awareness, education, and community involvement on lake environment matters, as well as support for environmental policy.

Obtaining vital data on the lake and watershed

A major strategy of the project will be to obtain a better understanding of particular aspects of the lake system, and changes which are threatening the lake. To accomplish this goal, an intensive programme will be implemented to collect and assess essential data. For example, the project will investigate biodiversity in the lake and measures to conserve it, and identify and attempt to quantify pollution and recommend measures to control it.

Formulating a cooperative mechanism for environmental management

This project aims to establish a cooperative permanent mechanism to adequately control pollution and conserve biodiversity. This approach must include provision for well-articulated, basin-wide monitoring and follow-up action based on the project's findings. It must also take account of the desire for sustainable rational development of lake resources, and the different national priorities of the lakeshore countries.

Strengthening national capabilities

Since trained personnel in the various fields of expertise involved in the project is largely inadequate in all four countries, the project will develop and strengthen national capability in research, monitoring, and management of biodiversity and pollution control.

2. Expected end-of-project situation

A regional framework for the coordination of activities for the management of biodiversity and pollution problems in the lake watershed will have been well established. Communication and cooperation between the lake countries on environmental matters of common concern will be much improved. The numbers of skilled and experienced scientific, management, and technical staff will be increased, and government agencies will be strengthened in their capability to deal with biodiversity and conservation issues.

The scale of the negative impacts from sediment loads and urban or agricultural pollution at present, and in the future, will have been limited, and a harmonized system of pollution control regulations will have been adapted by the four partner countries. The actual damage caused by fishing upon the natural communities will have been documented, and improved fishing practices will be encouraged by government departments and NGOs. Existing environmental laws will have been reviewed, with recommendations for coordination of laws and standards of allowable limits for pollutants. A pollution monitoring programme by the partner states will be in operation. The lake will have been zoned for conservation and utilization, and appropriate management regimes will have been outlined. Specific reserves or national parks will have been designated.

A regional environmental management plan, the Lake Tanganyika Strategic Plan, with a time horizon of at least ten years, will have been adopted and made operational. This will have integrated a consideration of all positive and negative impacts within the catchment area into a management framework for the lake basin. It will represent the objectives of the four partner countries. The economic benefits at the national and local levels will have been assessed, along with the most probable distribution of those benefits.

Awareness of lake and catchment area environmental problems will be increased at the level of the local communities, whose perceptions and expectations will also have been addressed in the plan. Their participation in the planning and conservation procedures will have been ensured. Measures will have been taken to create local income generation in lake shore communities, with activities which promote rather than inhibit environmental protection.

The most suitable form of a permanent organization for lakewide cooperation in pollution control, conservation, and lake basin management (for example, a lake basin commission) will be agreed upon, and the appropriate preparations made. This organization should be ready to take over and be operational by the end of the present project. A mechanism for the sustainability of the structure will also be established.

Much more essential knowledge about lake biodiversity and pollution will be available. Existing practices causing deterioration in the lake environment will be identified, their effects demonstrated, and recommendations and plans for remedial follow-up action made. Existing environmental laws will have been reviewed, with recommendations for the harmonization of laws, and standards for mitigation of international pollution problems in the lake agreed upon, including pollution monitoring and plans for emergency situations (for example, oil spills). The impacts of certain fishing methods will be ascertained. At least three underwater reserves with trained management will be established, and other potential reserve areas located.

3. Target beneficiaries

The direct beneficiaries of the project will be:

- The lakeshore communities, especially those in the larger population centres, which will benefit from the steps taken to avoid pollution of the lake on which they all depend (drinking water and domestic purposes). Development of new sustainable methods of income generation and local resource management should replace

environmentally destructive ones currently in use, and benefit many rural communities.

- People depending on fisheries, agriculture, forestry, and other natural resource uses will benefit from better resource management, as well as from increases in local income generation from tourism.
- Government agencies responsible for national development at the planning and implementation levels will benefit from an improved capability to develop, monitor, and manage the lake and catchment resources with the aim of achieving sustainable goals.

More indirectly, the worldwide community will benefit through the conservation of one of the most diversity-rich lakes on earth, comparable to others which have gained international recognition as "heritages of mankind."

4. Project strategy and implementation arrangements

The general strategy is to move toward a broader understanding of the lake and its natural resources while ensuring that their use and protection will be governed by a long-term planning framework. The strategy addresses biodiversity in all its aspects, and aims to protect it from the increasing effects of waste disposal and agricultural management practices within the basin as a whole. It is particularly important that a broadly-based and cooperative lake management mechanism be put into place which can continue to influence and extend the Strategic Plan beyond the lifetime of the present project. A phased sequence of activities required to pursue this strategy is shown in the bar chart in Annex 1.

At present there are broad perceptions of the processes which might threaten the existence and biodiversity of natural communities in the lake. These processes include increased domestic and industrial waste discharge, increased fishing pressure, and greater sediment inflows resulting from deteriorating agricultural and forestry management within the basin. Each of these actions, however, is symptomatic of the general increased pressure on resources caused by increasing populations around the lake. Having identified some of the qualitative threats to biodiversity in the lake, the first points to be addressed must be:

- The relative scale of these processes
- Where they might be having their effects
- How much worse they might become over a specified time.

There is, therefore, an initial need for quantification of the processes involved, combined with a comparison with plans in other sectors such as industry, agriculture, fisheries, and forestry to gain an indication of both the magnitude and time scale of any deleterious effects in the lake. Only then can specific points of intervention be identified to augment the broad management measures, such as those related to sewage treatment, which might be sought from the start of the project.

The first step is to assemble all existing quantitative data on pollution and other processes through a series of cross-sectoral reviews. Any projection of future developments from plans in other sectors will need to be taken into account. These reviews can provide the first tier of information in a lake-wide database compilation. Gaps in information can provide guidance for specific studies related to the direction and magnitude of potentially deleterious processes. Since international collaboration is a crucial element in the strategy, the review should also include the relevant legislation and regulations of all four countries, with a view to eventually developing a coherent legal framework for the integrated management of the lake.

There is no doubt, from the information collected already on the number and nature of the species existing in Lake Tanganyika, that it is a site of primary international significance and a spectacular evolutionary laboratory. While the conservation of biodiversity is a pre-eminent objective of the present project, it cannot be seen in isolation. National interests and economies will expect to gain from the natural resources just as local communities will not readily forgo their traditional activities and sources of income. As pressure on resources increases, sustainable conservation can only operate through consensus, which can usually only be achieved where there is no conflict of interest, or where there are incentives for people to restrict their activities in some way. Around Lake Tanganyika communications are poor, so central influence and control of lakeside communities is difficult. It is all the more important, therefore, that these lakeside communities are included in the consensus since their attitudes will play a major part in the success or failure of the project.

It is likely, therefore, that Lake Tanganyika will be used to an increasing degree for a number of different purposes in the foreseeable future. Just as the number of uses are varied, so the conservation requirements within the lake may not be uniform. In terms of habitat, the lake is rather heterogenous. A review of the biological information available will be used to identify centres of biodiversity, and to identify zones which should be kept pristine, those of national or local significance, areas of potential for tourism and education through their accessibility, those in need of rehabilitation, or those where exploitation can be carried out, with perhaps intermediate buffer zones in sensitive cases.

The preliminary zoning, or classification of the lake from the physical and biological reviews, can be combined with management outlines for each category. This will lead to the drafting of a preliminary Strategic Plan. This process should also take into account what has been deduced about the severity of the trends over time, and contain some initial impression of the opinion of local communities of the lake and its problems. The first six months will be a major planning exercise where all existing data is brought together, and the major strands of project-driven research, institutional development, and education are finalized. This data will be organized into a database which will be copied to all national centres. The major information gaps in the quantification of potential negative trends, such as sediment transport and water quality, will require specific surveys and research. Ultimately, if properly designed, such surveys could provide the basis of long-term monitoring of the lake.

The primary objective of the project research, however, is to determine exactly what is going into the lake, what and how much is coming out of the lake, and the extent to which these inputs and outputs are likely to change with time.

With regard to fisheries, patterns of fish catches over time are known to some degree. Nominally only 6 out of over 300 fish species are involved, but the extent to which some techniques (such as beach seines and gill nets) damage wider sections of the fish community is unknown. There is also no indication of the potential knock-on effect through the food chain of destabilizing influences created by the over-exploitation of the six species principally involved. The position of the ornamental fish trade is also unclear. Although the numbers involved are relatively low, and while it may also be a potential income generator for national interests and lakeside communities, the nature of the trade often puts a premium on rarity. Rarer species may, therefore, require specific protection, and the trade may require some regulation. An understanding of its present operation, scale and outlets, as well as potential, will therefore be needed.

The Strategic Plan should also include surveys which will establish the baseline condition of the lake and its normal processes. Target areas for more complete biological inventories will be identified from the gaps evident in the reviews, and the assessment of need for conservation areas. Relatively little is currently known about the hydrology of the lake, and it is important to know where sediment inflows and chemical inputs are likely to end up. Studies required to complete a basic understanding of the hydrodynamics and mixing processes in the lake will lead to the formation of a simple model which would indicate the most likely fates for increased inputs. In a similar way, there are simple community models (for example, ECOPATH) which take fisheries and fish community data, and can predict the knock-on effects of changing exploitation through the fish community as a whole. This model has, in fact, already been applied in some portion of Lake Tanganyika and Lake Victoria.

For a wider view of the baseline conditions over the basin as a whole, Geographic Information System (GIS) surveys will be employed. These surveys will enable the tracking of the progress of such features as erosion and deforestation to be followed on land, as well as the extent of sediment plumes and phytoplankton productivity in the water.

Ultimately, no conservation plan can succeed without the cooperation of the local people. The Strategic Plan will, therefore, develop studies to ascertain the expectations of local people from the development of the lake. Identifying areas of conflict between these expectations and the need for conservation will entail small representative socioeconomic studies around the lake. These studies will look at the significance of watershed use, fish, patterns of fishing, and fishing activity in those communities, with a view to determining if any changes in activities are necessary and, if so, that they are acceptable to the people.

In tandem with the studies, additional ways of generating income should be explored. For example, tourism is a potential means of income generation, and a survey of existing and future needs for organization and infrastructure in each of the four countries is required. It must be clear, however, that the local people should share in the benefits of tourism and not just bear its impact, and the assessment of tourism potential will consider the distribution of existing benefits. Other alternative sources of income or revenue, which essentially may be needed to sustain conservation planning in the future, would also need to be investigated, such as differential license fees for commercial fisheries, or tourism transport taxation.

To include the local communities, it will be essential to work through the local power groups and councils. A further study within the Strategic Plan will ascertain the most appropriate channels of information through local government and community organizations. Enquiries into conditions and attitudes, and dissemination of information on the use of local flora will be of paramount importance.

It is critical that a linkage be established between project-sponsored community outreach programmes, and rural women and children in lakeside villages. Because women and children are responsible for the majority of agricultural work, they bear much of the responsibility for implementing effective soil conservation and anti-erosion measures. NGOs which are supported by the project will need to develop innovative ways of reaching this target audience, since the "normal" channels of power and information between outside or government agencies and village audiences are dominated by contacts between men. For this reason, the NGOs will need to recruit women activists or technical liaisons who may be better able to make direct interpersonal contacts at the village level with local women. Similarly, the project bears a responsibility to train women conservation technicians and scientists, not only for the purpose of equity, but also to serve as role models in outreach to communities around the lake.

For the future, the most influential target group will be the teachers and their schools. The rapid production of information materials on the lake and the project within the four countries will therefore be essential. Just as appropriate NGOs may help in liaison with local communities, they could also help in organizing teachers' groups during the early phase of the Strategic Plan. When Protected Areas or reserves become designated, classrooms and dormitory blocks for the use of schools should also be included in any infrastructure.

These special studies, identified within the Lake Tanganyika Strategic Plan, following the initial Reviews and Inception Report, will proceed over a two-year period. They will operate from four national centres established by the project: Uvira in Zaire, Bujumbura in Burundi, Kigoma in Tanzania, and Nsumbu in Zambia. The studies, and subsequent implementation and management of the Strategic Plan, will make demands upon the personnel and institutional resources of all four countries, as the project will work through national experts to the extent possible. The review phase, therefore, will include a review of national staffing levels and institutional facilities. From this review, the immediate ability to contribute to the project will be factored into the plan, while future training needs and training programmes will be characterized.

As the project studies near completion, a second planning phase will begin. Since the magnitude and direction of the major threats will now be known, measures of intervention or mitigation will be recommended for incorporation into the final version of the Strategic Management Plan, taking into account the most likely prognoses from other sectoral management plans. The various categories of conservation zones will be drawn up and their selection finalized. For each of the identified zones, management options will be determined, and specific long-term objectives defined.

The formulation of such a well-documented plan for ministerial approval will provide a unifying influence for multilateral cooperation in lake management. It will also provide a clear pattern of objectives, and ways and means, thereby giving the environmental sector a voice in

discussions with other sectors (principally industry, agriculture, fisheries and forestry) in the integrated management of the whole lake basin.

Once the Strategic Plan is finalized, the legal framework within each country will need to be scrutinized, and changes suggested if necessary. Information on allowable limits for pollutants will also be available to assist in refining the newly framed pollution regulations in each country. Management regulations governing conservation zones and other areas of the lake could also be formulated at this point.

Consultation at the community level is an integral part of the project process. At the finalization of the planning stage, all elements of the plan and its management components will have been discussed with local groups in order to identify workable options.

Further studies will have been identified as part of the final plan, but some of the earlier studies will be used as the basis of an ongoing monitoring programme incorporating physical, chemical, and biological features which can be added to the project database and GIS system. An international manual for the monitoring programme could be produced.

One further element in the final Strategic Plan will be an economic appraisal at both the macro and micro levels. The overall conservation and management needs to be costed, and the financial constraints on management options will be assessed. The amount of income which could potentially be generated by such activities as tourism, ornamental fish, licenses, and taxes should be set against the amount required to come from each of the national budgets on an annual basis over ten years, or from outside sources. Any potential changes in local economies could also be investigated, particularly the potential distribution of any benefits at the community level, since these may be of the greatest incentive in obtaining the cooperation and participation of the people in management and conservation.

It is anticipated that the organizational structure of the project outlined in Section B7 will foster multilateral cooperation in lake management, as well as a flow of information at all levels. This will provide the basis for future management of the programme.

An important aspect of implementing the technical and research programme is the use of a contractual approach. Specific tasks in different fields will be accomplished by subcontractors rather than by engaging a number of resident, less specialist project staff. The experience of previous projects on the lake indicates that the contractual approach has produced better results and greater local benefits than the more traditional arrangement involving a group of resident experts. In any case, it would not be possible to assemble in a permanent staff the range of expertise and background required. Nor are the skills and experience needed likely to be found in any one body or institute elsewhere. The project will therefore proceed by engaging an implementing agency with the necessary worldwide contacts and professional organization to employ suitable subcontractors. Project staff will administer, work with, and provide necessary services and basic facilities needed by the subcontractors, who will in fact be the principal technical implementing agents.

Project staff will also be responsible for collating results of the research undertaken by the subcontractors and providing a preliminary compilation of policy options emerging from this

research. General direction and support of contractors will be maintained by project staff under the Project Coordinator, advised and monitored by a Technical Committee. Overall strategy will be directed by a project Steering Committee (see Section B7).

It is expected that the efficiency of contractors directly responsible for the supply and execution of their own contracts will result in lower real costs for what they do, and also in a reduction of the otherwise invisible costs that might be incurred through delays and other common administrative difficulties. A particular benefit of this approach is the educational and training advantage that should come from the involvement of a number of outside institutes and training centres. A significant criterion to be used in the selection of contractors will be the extent to which they will make use of local expertise (national professionals) and supplies, the amount of training they will offer in-country and abroad, and the improvements they will leave behind. Potential subcontractors will be evaluated in part on the basis of their proposals for training counterparts, and further use of those subcontractors will be decided on their performance in doing so.

The institutional framework for this international project is complex, and the project management and implementation strategy will need to fit within this framework. Within the context of building a partnership among the countries, the project proposes to operate from four national centres, one in each country, whose activities will of course extend to the other countries. These centres are proposed as follows.

Pollution Studies Centre, Bujumbura, Burundi

Efforts will concentrate on excess sediment pollution and chemical pollution. The most serious of these problems around the lake probably occur in Burundi. Land erosion projects are being mounted by other agencies in the same general area and should be complementary. As part of the same studies, observations will be made in nearby Zaire and Tanzania. Industrial and urban sources of pollution would be studied mainly near Bujumbura, as well as at other ports and population centres. Project administration will also be located in Bujumbura for reasons of logistical advantages.

Limnological Centre, Kigoma, Tanzania

Tanzania has a long coastline and, from a consideration of probable circulation patterns, it is proposed to place two of the four lake stations for limnology in the Tanzanian sector. In addition to focusing the limnological investigations here, the study of the impacts of fishing methods on biodiversity would also be based in the centre. The project would coordinate its activities with the recently renovated laboratory in Kigoma.

Education and Training Centre, Uvira, Zaire

As one of the most densely populated parts of the lakeshore, it is proposed to make Uvira the centre for environmental education. Moreover, acute environmental problems related to population pressure (for example, decline in fish catches, and erosion) are occurring in this general northern area of the lake, and NGOs concerned with environmental education and extension are already in place in Uvira.

Biodiversity Studies Centre, Nsumbu, Zambia

The rich variety of aquatic habitats in this part of the lake, including extensive oxygenated deep areas, make it a most suitable place to initiate the studies on biodiversity. The initial work to establish an underwater reserve will be carried out at Nsumbu, later extending to locations in the other countries.

A major element of the project's strategy will concern cooperation with other projects that are carrying out activities related to the lake environment, conservation, or environmental education (see Section A3). Decisions as to the means and extent of cooperation with current projects will be made at an early stage and periodically reviewed by the Steering and Technical Committees.

Finally, project activities will be continually reviewed and implemented with flexibility. Based on an evaluation of progress achieved, more plans will be examined and revised, and budgets will be modified in support of those activities where progress is most apparent. The aim of the project is to contribute maximally to the protection of the lake, and shifts in the allocation of funding per activity and per country can occur to support the most effective and committed actions.

5. Reasons for GEF assistance

Government resources are generally channelled towards development and poverty alleviation goals which preclude much investment in the environment. Many of the activities proposed for this project, while being of significance in terms of natural resources and the global environment, would nevertheless be difficult for individual governments to undertake on the basis of short-term economics. Stimulating regional cooperation in solving common water resource management problems, and protecting biodiversity on a lakewide basis, are only likely to be achieved at the present time by the provision of significant technical and financial support by an entity such as the Global Environment Facility (GEF). Biodiversity and international waters form two of the four focal areas of the Facility (the others are climate change and ozone layer protection).

Experience in large lakes elsewhere has shown that they are vulnerable to uncontrolled exploitation and pollution, particularly when they are shared by more than one country. Lake Tanganyika is especially vulnerable because of its slow renewal or flushing rate, and its large proportion of already deoxygenated deep water. However, the pollution problems in Tanganyika have not yet reached the point where they would draw sustained government attention, particularly not on a regionally cooperative basis. GEF can help to prevent a critical, and perhaps irreversible, situation from arising by addressing the environmental problems of the lake before more costly intervention is necessary. The GEF can also assist by promoting regional cooperation to ensure the long-term viability of the lake as a biotic and economic resource.

6. Special considerations

Two outstanding special considerations are the related problems of communication within the lake basin, and coordination of lake management. Travel between localities around the lake is difficult and slow. This problem is largely due to the fact that the sides of the basin are steep with rugged shorelines, and most roads and the two rail links lead directly to or from the lake. There are

few places where land transport along the lakeshore is possible. The capital cities of the four countries are, with the exception of Bujumbura, remote from the lake. There are also numerous linguistic barriers. There are no long-standing traditions of cooperation or mobility around the lake; the lake has in fact served more as a barrier in the past than as a means of communication. Physical scale must also be borne in mind: the lake measures 650 kilometres in length, with a shoreline of over 1,500 kilometres.

Passenger and freight transportation services are provided by several ships, which ply regularly between the major lake communities. Local transportation is by various kinds of small wooden boats. These services are very basic, however, and rather limited in relation to the size of the basin populations, given their dependence in some way or other on lake resources and transported materials.

Against this background, an absolutely essential element for the implementation of the project will be an efficient communication system. For project operations, good radio links between the project centres, and with project vessels, will be a minimal requirement, with possibly telephone-satellite links for voice and data transmission to be established wherever feasible. However, satellite link systems are expensive to use and will therefore be impossible to sustain after the project. Good, high frequency (HF) radio equipment which can operate between land stations and ship-to-shore may be preferable. Project vessels (main vessel, four utility boats, and minor craft) will also be in constant use in the work programme to ensure the mobility of staff. Committee meetings, workshops, training activities, and a newsletter will all be used to increase communication.

Coordination of project activities is intended to lead to a regionally organized structure for the environmental management of the lake. These arrangements are illustrated in the following chart.

7. Coordination arrangements

Regional level

A Lake Tanganyika Conservation Steering Committee will be set up, consisting of senior civil servants representing the four governments. Membership will also include project National Coordinators and representatives of UNDP/GEF and the implementing agency. The overall management/organization structure and lines of communication are shown in the accompanying organogram.

A project Coordination Unit will be set up consisting of a Project Coordinator, a Scientific Liaison Officer and a Training Officer, together with their administrative support personnel. They will be responsible for the overall management and implementation of the project. Since training and education will play a major role in the institutional development within the project, the Training Officer should lead a Training and Education Committee to decide upon education and training needs following the review phase, and arrange and implement the programme. One further important aspect is procurement of equipment and materials, which is also a specialized task for new institutions. A procurement cell—headed by the Project Coordinator with representatives of some or all of the participating institutions and a Technical Officer experienced in procurement—should

be established during the first eighteen months of the programme, when procurement will be a major activity. This cell may need to be reconvened when new infrastructure is proposed later.

National level

Each participating country will designate a National Coordinator, who will facilitate effective coordination of project activities within that country. The National Coordinator will effectively make available the information and experience gained by the project to relevant national institutions and departments through National Working Groups. These groups will be formed early in the project, and will contain representatives of participating institutions and NGOs. They will be led by the National Coordinators.

Regular contact must be made with local communities. This activity could be the responsibility of some of the government officers who are part of the National Working Group. It might, however, be more appropriate for this task to be accomplished through NGOs. They could assist in forming consultative groups at the district or village level through existing community structures. Ultimately these consultative groups could form the nuclei of local management groups.

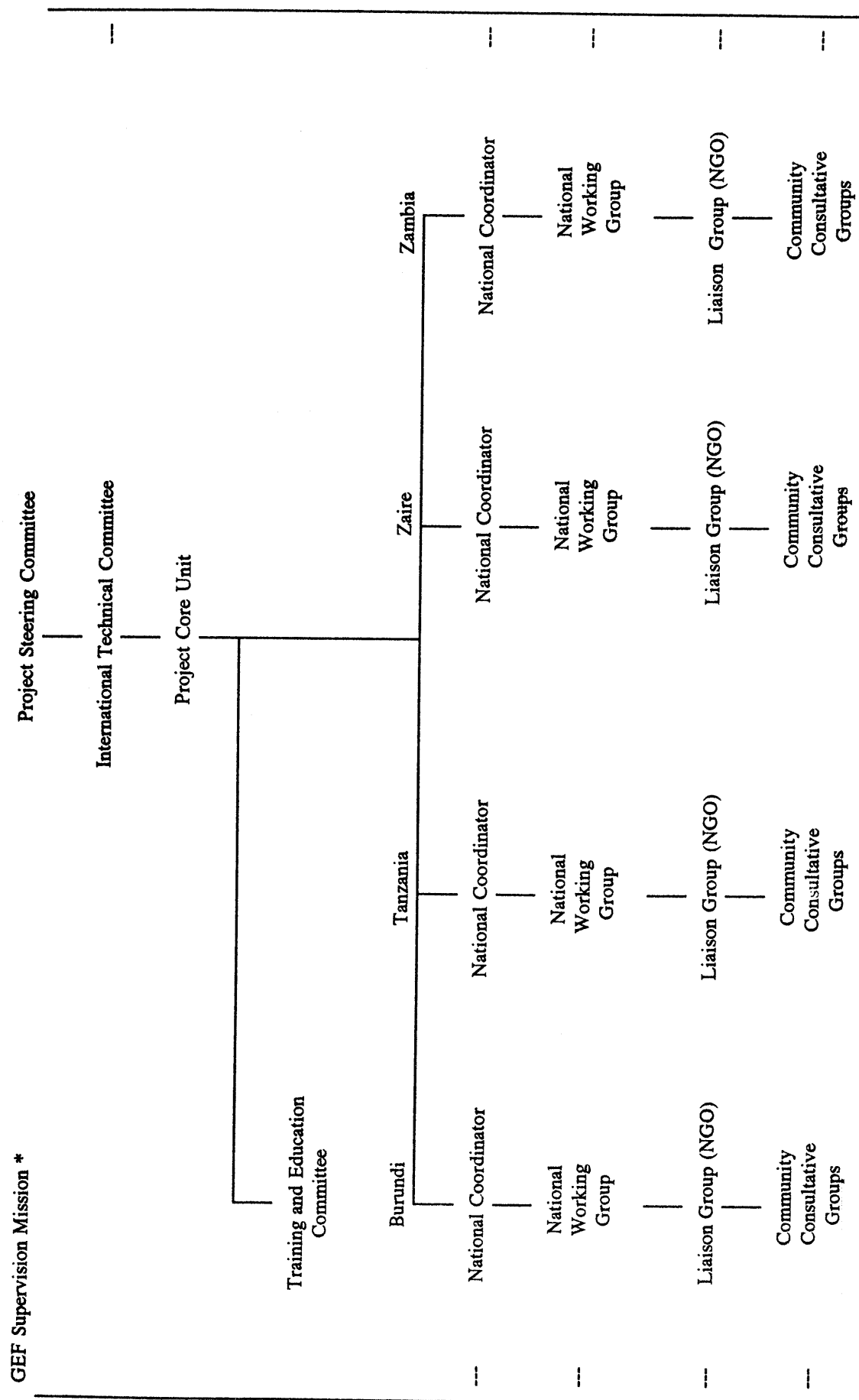
Overall coordination

The Project Coordinator will be the executive secretary for the Steering Committee, and will report annually to the committee. He or she will chair the Technical Committee and maintain coordination between the various project activities in each country, regularly visiting each project centre. The coordinator will also keep in close contact with other projects working on the lake, sharing progress reports, and arranging for them to contribute to project conferences and committees, as appropriate. Other international project staff will have a coordinating role for their respective activities; for example, the scientific liaison officer will monitor and facilitate the work of the technical subcontractors, providing basic logistic support and ensuring that in the field their work not only conforms to technical requirements, but is integrated with the national centres.

A Conservation Technical Committee will have oversight of the Project Technical Programme, monitoring and reviewing the progress of its activities. Membership will include national and international technical experts involved with or experienced in Lake Tanganyika.

To coordinate and monitor the overall management and progress of the project, a six-monthly supervision mission should be convened by the GEF. This mission can run in tandem with the Conservation Technical Committee, but should be equally concerned with management as well as technical issues. It should consist of the Task Manager of the GEF or its executing agency, plus the team leader of the Technical Committee and one other co-opted member who should have considerable project management as well as technical experience. It should not, however, include the Project Coordinator. The Technical Committee will operate concurrently with the supervision mission on a six-month basis. It will interpret technical progress for the supervision mission, but the supervision mission will prepare the final Aide Memoir on overall management and technical progress of the project for the donor agencies and the Steering Committee.

GEF Lake Tanganyika Project Management Organization



* GEF Supervision Mission will confer with all levels of project operations.

During their six-monthly meetings, the GEF Supervision Mission and the Technical Committee should have contact with each level of project organization as indicated in the accompanying organogram. These contacts should be made on a regular basis by the Project Coordination Unit and be the subject of a report to the two reviewing bodies.

Operation and management

The activities required to manage and coordinate the project are summarized in the bar chart below. The staff for this Project Coordination Unit should be recruited for the start of the project, and the National Coordinators should be appointed immediately afterwards. There may be a start-of-project meeting between a GEF Supervision Mission, the Project Coordination Unit, and the National Coordinators to plan the initial programme and the review phase. The review phase can be conducted by contractors who will conduct the special studies required by the Strategic Plan. The Technical Committee should be recruited as soon as possible. The Technical Committee and the GEF supervision mission will convene in the fourth month after the reviews are complete. In addition to contributing to the formulation of the initial Strategic Plan, they will agree upon criteria to incorporate into a logical framework or into a sequence of milestones against which future missions will assess progress. The GEF Supervision Mission and the Technical Committee will meet with the Steering Committee at the end of the first year, after having reviewed and evaluated the progress made during that year. Further details on monitoring and evaluation procedures are given in Section H. These tripartite meetings should continue on an annual basis.

The first meeting at the end of the review phase should also provide personnel and training requirements, as well as the objectives for community information and education. The Training and Education Committee can also, therefore, establish their programme at this point.

At some point in the first year, preferably shortly after the Lake Tanganyika Strategic Plan has been formulated, a ministerial meeting of all four countries should be convened to establish a collective political commitment to the project, and generally to facilitate international cooperation.

A major meeting of the GEF Supervision Mission, the Technical Committee and the Steering Committee should take place at the finalization of the Strategic Plan, following the results of the special studies.

GEF Lake Tanganyika Operation and Management Activities

	Year 1	Year 2	Year 3	Year 4	Year 5	Summary
Project Co-ordination Unit						To Year 5
4 - Partite Ministerial Meeting						
4 National Co-ordinators						To Year 5
GEF Supervision mission (Management and Technical)						Every 6 months
Evaluation (midterm, final)						
Tripartite review						
International Technical Committee						Every 6 months
Steering Committee						Every Year
Training and Education Committee						As needed
Procurement Cell						As needed over 18 months
National Working Groups						To Year 5
Community Liaison						Continuous
Community Consultative Groups						Every 3 months

8. Counterpart support capacity

The availability of adequate numbers of counterpart staff and certain contributions in kind are essential both to initiate the project and to continue its work. Training and education to strengthen national capacities are large components of this project. Sites for the project centres and various facilities, which will be improved to the extent necessary for operations, are also basic requirements. National inputs are described in Section E.

C. DEVELOPMENT OBJECTIVE

The ultimate objective of the project is to demonstrate an effective regional approach to control pollution and prevent the loss of the exceptional diversity of Lake Tanganyika. For this purpose, the development objective to be met is the creation of the capacity in the four participating countries to manage the lake together in a sound and sustainable manner.

D. IMMEDIATE OBJECTIVES, OUTPUTS AND ACTIVITIES

IMMEDIATE OBJECTIVE 1

Establish a regional long-term management programme for pollution control, conservation, and maintenance of biodiversity in Lake Tanganyika.

Output 1.1

Review all existing relevant data on Lake Tanganyika and its basin to provide a platform for initial formulation of the Strategic Plan for management of the lake.

Activities for Output 1.1

- 1.1.1 Review biological, hydrological, and water quality information to establish known patterns of biodiversity in the lake, and to determine the current level of degradation in the lake.
- 1.1.2 Review demographic trends from census data and examine all sectoral plans, past and present, in agriculture, forestry, industry, urbanization and fisheries. Ascertain the current status of each of these sectors in as much as they impinge on the lake, and the likely extent and timing of future developments.
- 1.1.3 Review the present capability of host country institutions to identify gaps in equipment and facilities which need to be filled during the project. Similarly, assess the present staffing strengths of these institutions, as well as NGOs, in order to compare with probable staffing requirements. This assessment will lay the foundation for the training programme. The plans of other related development projects will also be scrutinized to ascertain the prospects for shared facilities.
- 1.1.4 Review all legislative aspects, including present environmental policies in the four host countries, and any existing or prospective regulations on pollution control and allowable

limits. This review will contribute to the eventual formulation of the legislative framework needed in all four countries to underpin the proper implementation of the programme and its conservation areas, as outlined in Immediate Objective 2 below.

- 1.1.5 Establish early contact with representative lakeside communities as part of a continuing process of dialogue and consultation. This process could mean the early involvement of NGOs, as initial attitudes of the communities to the present state of activities on the lake and their perceptions of the future must be solicited through interviews.

Output 1.2

An Inception Report based on all review data which will provide baseline data for the planning of the management programme.

Activities for Output 1.2

- 1.2.1 From all the data assembled, the negative trends among processes influencing the lake will be characterized and identified.
- 1.2.2 From all the data assembled, the major gaps in information will be identified. This activity will aid the formulation of special studies which can be directed to filling these gaps (see Immediate Objective 5). Once these studies have been conducted for a sufficient time, the Lake Tanganyika Strategic Plan can be finalized on a firmer planning basis (see Output 1.1).
- 1.2.3 Compile the review data in the Inception Report into a computerized database which is compatible between countries, and which can be shared between project centres and updated as new information becomes available. The Inception Report should be available three to five months after the start of the project.
- 1.2.4 The database will be continually updated by results from the special studies, and will be the basis of a GIS system for Lake Tanganyika. The most appropriate hardware and software for the GIS system which is compatible between the participating countries will be determined.

Output 1.3

A preliminary Lake Basin Strategic Plan will be drawn up from information compiled in reviews and combined into the Inception Report. This plan will be used as a tool to identify the basic elements of the management programme, and the activities needed to finalize and implement it. This plan should be complete within five months of the start of the project.

Activities for Output 1.3

- 1.3.1 The lake will be divided into zones based on use or known conservation value, taking into account the multiple uses of the lake and its pattern of biodiversity. Some initial prioritization of conservation areas will be attempted, based on known biodiversity, habitat distinctiveness, and accessibility.

- 1.3.2 Finalize work programmes for special studies which will contribute to a long-term understanding of the functioning of the lake (see Immediate Objective 5), and help fill gaps identified in reviews.
- 1.3.3 Prepare and initiate four project centres, one each from the host countries around the lake, where various elements of the programme will be carried out. Once the direct study requirements have been identified, they can be shared among the centres, and a work programme for each can be created.
- 1.3.4 Finalize a list of equipment and services for procurement. This list will be acted on over the next eighteen months by the procurement cell (see Section B7).
- 1.3.5 The future staff needs, in terms of number, discipline, and level for trained personnel will be itemized from the institutional and manpower review. A training programme to address these needs will be drawn up by the training officer, and the necessary arrangements and progress review will be carried out by the training committee (see Section B7).
- 1.3.6 Community consultations to determine their reactions and suggestions to the proposed plan will be carried out by NGOs.

Output 1.4

Finalization of the long-term Lake Tanganyika Strategic Plan will take place when all the requisite information has been collected and sufficient data has become available from the special studies. As data become available from the special studies (see Output 1.5), their results will be incorporated into the preliminary plan (see Output 1.3)

Activities for Output 1.4

- 1.4.1 From the biological, tourism and education data, conservation areas will be selected to be given National Park or other status as conservation areas, to add to the previously identified areas at Nsumbu and Mahali. The criteria for determining such areas and their potential status will be established, for example, biodiversity, accessibility, or educational value.
- 1.4.2 Initiate specific remedial actions to combat pollution problems, and identify those particularly requiring international cooperation.
- 1.4.3 Harmonization of measures aimed at mitigating and regulating pollution, including the convening of a workshop to recommend environmental standards for the lake, and remedial actions to control international pollution problems.
- 1.4.4 Draw up management measures for zones identified on the lake.
- 1.4.5 A legislative framework enabling these measures to be implemented in the four countries will be drawn up (see Immediate Objective 2), once regulations and the various zones, including national parks, within the lake have been finalized.

- 1.4.6 The tourism and pollution control considerations may propose new infrastructure requirements. These requirements will be itemized and costed.
- 1.4.7 The major long-term impacts on the lake, and the most likely points at which those impacts will have their effects, will be identified and quantified from the reviews and special studies.
- 1.4.8 As proposals for final elements in the plan become available, they will be discussed with local communities to assess which are acceptable, meaningful, and practical in the local context.
- 1.4.9 Economic evaluation of costs and benefits of all potential elements of the plan with indications of annual budgetary requirements from government and non-government sources will be conducted, and plans refined accordingly. This process includes investigating financing mechanisms to fund the continuation of relevant project activities after the end of the project (financing options include trust funds, tariffs, fees, or internal funding from governments).
- 1.4.10 Produce the final document of the Lake Tanganyika Strategic Plan for environmental management, following approval by the Steering Committee and appropriate ministries.

IMMEDIATE OBJECTIVE 2

Formulation of a regional legal framework for cooperative management of the lake environment.

Output 2.1

Analysis of existing laws and recommendations for harmonizing legislation, and/or new legislation placed in an international legislative framework. This work will be done with the assistance of an expert in environmental legislation, particularly with expertise in legislation relating to internationally shared lakes, and an expert in environmental negotiation and conflict resolution.

Activities for Output 2.1

- 2.1.1. Existing laws for the protection of the lake environment and other existing laws and regulations which impact the lake in the four countries will be reviewed.
- 2.1.2 Shortcomings in the implementation and enforcement of existing legislation will be identified.
- 2.1.3 A comparative analysis for discussion between the four countries with a view to defining compatible legislation and the means to harmonize realistic legislation will be prepared.
- 2.1.4. A basic framework of lake environmental legislation for consideration by the four countries will be recommended.

IMMEDIATE OBJECTIVE 3

Establish a programme of environmental education and training for Lake Tanganyika and its basin.

Output 3.1

Increased environmental awareness and sensitivity among lakeside communities concerning the fragility of Lake Tanganyika, the international nature of its problems, and the inter-dependence of people with the lake.

Activities for Output 3.1

- 3.1.1 The regular contacts between the National Working Groups, intermediary NGOs, and lakeside communities (see Section B7) will provide regular channels for the two-way dissemination of information. In addition to explanatory meetings, these regular contacts can be augmented with extension-style techniques, for example, simple posters, radio broadcasts, and possibly mobile videos.
- 3.1.2 The National Working Groups and NGOs will organize teachers groups among local schools where appropriate ideas and material can be disseminated.
- 3.1.3 Specific printed materials for use in communities and schools will be produced early on in the project, and refined as the planning process proceeds.

Output 3.2

A cadre of trained environmental scientists and technicians to provide a core of expertise for managing the biodiversity of the lake and protecting its watershed in the future.

Activities for Output 3.2

- 3.2.1 Establish an in-service training programme for technical staff to learn skills relating to lake environmental management.
- 3.2.2 Provide library and teaching support to national universities to help them upgrade their programmes in aquatic conservation biology and limnology.
- 3.2.3 Provide fellowship support to undergraduate, graduate, and post-graduate students working on projects relating to the Lake Tanganyika environment, and train African women scientists in aquatic sciences.
- 3.2.4 Provide on-the-job training for present and new parks managers on the management of the protected areas.

IMMEDIATE OBJECTIVE 4

Establish tested mechanisms for regional coordination in conservation management of the Lake Tanganyika basin.

Output 4.1

Mechanisms for regional coordination will be introduced and developed.

Activities for Output 4.1

- 4.1.1 Install an effective communication system using radio and telephone/fax technology as appropriate to link the four national project centres, coordinators, and project vessels.
- 4.1.2 Organize regular meetings of the international Steering Committee and the project Technical Committee, and make them an integral part of the planning and management process (see Section B7).
- 4.1.3 Prepare for approval by the Steering Committee recommendations on steps to create a system for coordinated management of the lake environment, and arrange for this system to continue as an effective organization after the project.
- 4.1.4 Prepare and distribute to all concerned a newsletter in French, English, Kiswahili, and any other appropriate local language.
- 4.1.5 Carry out such other tasks within the approved budget, timeframe, and capacity of the project as may be authorized from time to time by the Steering Committee.

IMMEDIATE OBJECTIVE 5

Certain specific studies need to be undertaken in order to produce a full Strategic Plan for long-term application. These studies will also add to the understanding of the lake as a whole and, in some cases, provide the baseline and framework for long-term research and monitoring programmes.

Output 5.1

Determination of the biological consequences of sediment discharge into Lake Tanganyika caused by watershed deforestation and erosion.

Activities for Output 5.1

- 5.1.1 Regular determination of the quantities of sediment brought into the lake by the major rivers.
- 5.1.2 Satellite monitoring of lake-wide deforestation to establish the trends of deforestation and sediment discharge over time, and seasonal peaks in discharge into the lake.

- 5.1.3 Detailed analysis of the fate of transported sediment particles discharged into the lake.
- 5.1.4 Detailed analysis of the impact of suspended and deposited sediment in the lake ecosystem.
- 5.1.5 Output to be added to Lake Tanganyika database/GIS system (see Activity 1.2.4).

Output 5.2

Determination and prediction of consequences of chemical pollution discharged from land or boats.

Activities for Output 5.2

- 5.2.1 Identification and quantification of existing sources of pollutants.
- 5.2.2 Detailed analysis and modelling of lake circulation to determine the fate of pollutant and sediment discharges, and the identification of high risk portions of the lake.
- 5.2.3 Output to be added to Lake Tanganyika database/GIS system (see Activity 1.2.4).

Output 5.3

Determination of patterns and structure of biodiversity in Lake Tanganyika, with emphasis on proposed national parks and other conservation areas.

Activities for Output 5.3

- 5.3.1 Prepare inventories of species by geographic distribution and habitat, and estimate their relative abundances.
- 5.3.2 Determine various criteria for assessing diversity in each study area and habitat.
- 5.3.3 Study the underlying causes of the extraordinary biodiversity in Lake Tanganyika and their implications for conservation of the fauna.
- 5.3.4 Determine criteria for selecting protected areas, identify critical areas for inclusion in future reserves based on extraordinary biodiversity, and delineate priority areas.
- 5.3.5 Output to be added to Lake Tanganyika database/GIS system where appropriate (see Activity 1.2.4).

Output 5.4

The damaging effects of exploitation on the fish of Lake Tanganyika will be investigated, and recommendations made for their mitigation.

Activities for Output 5.4

- 5.4.1 Estimate actual and potential impacts of commercial (purse seining) and traditional (gill-netting and beach seining) fishing methods on the biodiversity and stability of fish stocks.
- 5.4.2 Examine the numbers and species of fish taken by the ornamental fish trade. Estimate the present and potential markets.
- 5.4.3 Investigate the usefulness and possibility of using computer-based models to evaluate the ecological impact on fishing and other sources of exploitation throughout the natural community.
- 5.4.4 Identify and make recommendations on alternative fishing methods and management strategies which would be less harmful to biodiversity than those presently used, and encourage their trial investigation by international projects, fisheries departments, and directly by lakeside communities.

Output 5.5

Developments in other sectors within the lake basin intimately affect the lake. A detailed examination of present and future plans in these sectors needs to be carried out so they can be taken into account in the Lake Tanganyika Strategic Plan.

Activities for Output 5.5

- 5.5.1 Collect all available sectoral plans and contact all ministries concerned with agriculture, fisheries, forestry, urbanization, industrialization, and planning in general in each of the four partner countries. Synthesize the present and future potential impacts on the lake from the various sectors.

Output 5.6

Prospects for future management of the lake may depend upon any additional benefits generated. The nature and direction of those benefits will be investigated and recommendations made for their distribution.

Activities for Output 5.6

- 5.6.1 A study on tourism potential around the lake should be carried out looking at infrastructural and organizational requirements for the future in the context of existing tourism networks within each country.
- 5.6.2 The precise economic role of fishing for men and women at village level will be examined, along with the traditional patterns of these activities.

5.6.3 Enquiries into the awareness and expectations of the villagers from the lake, and from the project itself, should be made. The community power structure should also be described since any changes or exchange of information should be effected through existing systems.

5.6.4 The possibility of other income-generating activities, whether from tourism, fishing skills, or other sources, should be examined.

IMMEDIATE OBJECTIVE 6

The implementation and sustainability of the Lake Tanganyika Strategic Plan and incorporated environmental management proposals.

Output 6.1

Creation of long-term research and monitoring programmes.

Activities for Output 6.1

6.1.1 From the results of the special studies, identify those areas in need of further work to contribute to a better understanding of the lake and its processes. Identify low-cost means for monitoring significant pollution threats following completion of the project.

6.1.2 From the special studies and the final decisions on pollution regulations, those elements which will give a continuing picture of the impact of pollution in the lake should be consolidated into an international monitoring programme which can be operated by the four partner countries.

Output 6.2

Management plans will be drawn up for the development of four underwater reserves in Lake Tanganyika for the protection of biodiversity, the conservation of commercial fish nursery grounds, and the enhancement of tourism.

Activities for Output 6.2

6.2.1 Make ecological surveys of the proposed reserve areas.

6.2.2 Define and reconcile local socioeconomic interests relating to the establishment of the reserves.

6.2.3 Prepare recommendations for specific reserve boundaries, access by user type, and nature of concessions.

6.2.4 Produce first phase management plans for the underwater reserves.

Output 6.3

Establish and manage new underwater components of reserves with trained management. Both the terrestrial and underwater components of the reserves will be managed as one interdependent unit. In the existing protected areas that are presently managed as parks, the project will work with the park managers to determine the best options to achieve effective management of the parks, and will provide additional training.

Activities for Output 6.3

- 6.3.1 Have an experienced manager set up and manage a new underwater component of the reserve at Nsumbu (Zambia) during years 1 to 3 of the project, together with an additional trainee manager.
- 6.3.2 Have an experienced manager set up and manage a new underwater component of the reserve at Mahali (Tanzania) during project years 2 to 4, together with an additional trainee manager.
- 6.3.3 From the experience of Nsumbu and Mahali, and the zoning and conservation area recommendations of the Lake Tanganyika Strategic Plan, at least one further reserve will be selected, set up and managed within the project, during years 3 to 5.
- 6.3.4 Develop community participation programmes to ensure local benefits from reserves, and encourage the acceptance of these reserves.
- 6.3.5 Develop user facilities, such as underwater trails and interpretive displays.
- 6.3.6 Produce underwater guidebooks for the reserves.
- 6.3.7 Convene a workshop of technical experts on tourism to discuss the potential of Lake Tanganyika underwater reserves for stimulating ecotourism in the area.
- 6.3.8 Prepare detailed recommendations with budgeting for sustainable operation of the underwater reserves. UNDP should also sponsor a donor round table to assist countries in obtaining the necessary funding.
- 6.3.9 Provide specialized advice and support for management of the reserves.

Output 6.4

Mechanisms for ensuring the involvement and cooperation of local people.

Activities for Output 6.4

- 6.4.1 Local consultative groups and teachers' groups formed during the project will be incorporated into local or national management groups for parks, conservation areas, or other zones.

- 6.4.2 Full support in terms of materials, visits, and time should be given to teachers and schools since the attitudes of future generations are the only true hope for a sustainable future.
- 6.4.3 An analysis of the scale and distribution of any benefits will be carried out to determine if the benefits are likely to reach the target group, and to see if any trade-offs are possible.

E. INPUTS

1. Governments

Each of the participating countries will designate an official representative to the project Steering Committee who will be a senior official associated with environmental policy. National Coordinators for project activities will also be provided, who will attend Steering Committee meetings. One graduate should be present as a full-time counterpart research officer in the corresponding field in each country during the project, as well as six or more support staff. It is expected that at least three graduates and four technicians will be provided by each country for in-service and/or academic training during the project period. Selection of trainees will be made in consultation with the implementor.

Contributions will also be made in kind at the four proposed national lake centres at Bujumbura, Uvira, Kigoma and Nsumbu. These will consist of office/laboratory buildings, workshops, stores, and harbour facilities. Housing will be made available, where such exists, on a temporary basis for project staff and contractors.

2. Global Environment Facility

	<u>p/m</u>	<u>\$US</u>
<u>International staff</u>	120	1,826,000
Project Coordinator	60	802,700
Scientific Liaison Officer	60	694,430
Short-term consultants		201,160
Project Preparation		127,710
<u>Monitoring missions</u>		50,000
		20,000
<u>Evaluation (Mid-term, final)</u>		
<u>National staff</u>	805	482,740
Secretary	60	20,400
Document editor	60	20,400

Reserve manager trainees	108	22,680
Mechanic trainees	120	25,200
Boat trainees	120	25,200
Drivers	85	26,350
Training officer	60	95,570
Administrative officer	60	45,000
Reserves managers	72	134,940
Senior technical officer	60	27,000
National consultants		40,000
<u>Duty travel</u>		250,000
<u>Subcontracts</u>		3,396,370
Preliminary Strategic Plan		198,000
Legal framework		140,000
Special studies		2,551,370
Final Lake Tanganyika Strategic Plan		125,000
Implementation and sustainability		382,000
<u>Equipment</u>		1,157,800
<u>Meetings and workshops</u>		100,000
Quadri-partite ministerial meeting, regular meetings of Steering and Technical Committees, international workshop "State of the Lake"		
<u>Training programmes</u>		1,470,000
Community environmental education		500,000
In-service training activities		270,000
Assistance to national universities and fellowships		700,000

<u>General operating costs</u>	597,828
Operation and maintenance	360,000
Sundries	100,000
Contingencies	110,828
Reporting	27,000
 <u>Premises</u>	 110,000
 <u>UNDP Office for Project Services (OPS) support cost</u>	 539,262
 Total	 10,000,000

Improvement of premises

The four lakeshore national centres will be established or improved to the extent necessary to implement the project work programme, and to provide a material basis for continuing activities.

Most of the equipment inputs provide for highly specialized scientific research and monitoring equipment, and research vessels to carry out the scientific and technical work programme of the project. The collection of this scientific information, which is a necessary prerequisite for long-term management and conservation of Lake Tanganyika, and the accompanying equipment requirement, is eligible for funding under the GEF.

F. RISKS

This is an unusual project since it involves four countries and many traditional sectors working around a very large lake, without adequate communications facilities. These factors have been taken into account in the preparation of this Project Document.

Social instability or lack of security is the major risk to the success of the project. It is reasonable to hope that the security situation will improve all around the lake, but there is some risk that periods of insecurity will occur and impede implementation of the project. Many of the activities have been designed to be implemented by nationals in their own country, but some activities go across boundaries or are lakewide. Insecurity in distant capitals may have only limited effect at the lake, but insecurity in project centres could have a major impact on the progress of the project.

The achievements of the project would be diminished if the legislatures of the Lake Tanganyika basin countries fail to harmonize their natural resources legislation regarding the lake,

or if they fail to continue cooperation on the lake after the project. The likelihood of these risks materializing will depend upon the extent to which the countries perceive the interdependency of their interests in the basin's land and water resources. The vulnerability of the lake to pollution, and the value of its highly diverse and unique fauna has become much better known. The activities of the project should make these factors even clearer, and increase the likelihood of harmonization and continued cooperation.

An additional risk is the effect of the low priority that the project may have in individual national priorities at a time of budget restraint and cut-backs. This prospect could affect counterpart funds and availability. Additional problems may be caused by changes in foreign exchange regimes and/or import restrictions. The need for special accounts has been foreseen, but other changes could occur which might affect the speed of implementation. In order to assure a high level of commitment, it is recommended that the inaugural meeting of the Steering Committee be attended by ministry heads so as to consolidate the international consensus on this project. There will still be a risk, nevertheless, because this GEF project addresses issues that are not, or are unlikely to be, addressed through normal project prioritization processes in each country.

A further risk is that pressure from donors for work in the field of environment is increasing to such an extent that governments may be tempted to undertake more in the way of commitments than they are likely to be able to maintain in the form of counterpart contributions of staff and facilities. An important criterion for GEF projects is that there should be no duplication of effort with projects that are ongoing or can be otherwise funded. This situation may also lead to a lower priority being placed on the GEF activities, resulting in shortfalls of necessary contributions for this project.

G. PRIOR OBLIGATIONS AND PREREQUISITES

No actions or inputs from governments or NGOs involved in this project are considered necessary as prerequisites. The signatures of the governments to this document indicate their agreement to provide the counterpart support (specified in Sections B and E above) required for project implementation.

H. PROJECT REVIEWS, REPORTING AND EVALUATION

The project will be subject to periodic review in accordance with the policies and procedures established by UNDP for monitoring project implementation.

The project will be subject to tripartite review (joint review by representatives of the government, executing agency and UNDP) at least once every twelve months, with the first such meeting to be held within the first twelve months of the start of full implementation. The National Project Coordinator and/or senior project officer of the United Nations executing agency shall prepare and submit to each tripartite review meeting a Project Performance Evaluation Report (PPER). The PPER will also serve as input for the Steering Committee meetings, and should be finalized in a timely manner prior to the relevant Steering Committee meetings. Additional PPERs may be requested, if necessary, during the project.

A project terminal report will be prepared for consideration at the terminal tripartite review meeting. It shall be prepared in draft sufficiently in advance to allow review and technical clearance by the executing agency at least four months prior to the terminal tripartite review.

The project Technical Committee will review technical progress on the project with the National Working Group every six months. At the same time, an independent GEF/UNDP Supervision Mission will be organized, led by the UNDP Project Officer or representative of the executing agency. They will review overall management progress and the achievement of targets. The Technical Committee will advise the Supervision Mission on progress on technical issues. Based on progress achieved, the workplan for the next six-month period will be re-examined and budgets modified in support of those activities where progress is most apparent. The Supervision Mission will prepare an Aide Memoir identifying new actions needed, actions pending, and actions completed on each occasion.

During the first year, the Technical Committee and the Supervision Mission should be convened three times, once at project inception, once to consider the preliminary Lake Tanganyika Strategic Plan at mid-year, and once at the end of year 1 to report to the Steering Committee. The Mission and the Technical Committee should be convened six-monthly thereafter. The two groups should also consult with NGOs and local consultative groups. The NGOs themselves should be represented in the Technical and Steering Committees. These structures are summarized in the management bar chart and organogram given in Section B7. There will be a major review of the project at least once every twelve months in which the Supervision Mission and Technical Committee will report to the Steering Committee.

The project shall be subject to evaluation approximately twenty-six months after the start of full implementation, and four months prior to the scheduled termination. The organization, terms of reference, and timing will be decided after consultation between the parties to the Project Document, plus any associated United Nations agency.

The project will prepare an Inception Report after three months, a draft preliminary Strategic Plan after six months, a finalized Strategic Plan after two years and six months, and a Final Report at the end of five years. These stages are summarized in the bar chart in Annex 1.

I. LEGAL CONTEXT

This Project Document shall be the instrument referred to as such in Article 1 of the Standard Basic Assistance Agreement between UNDP and the governments of the four participating countries, signed by the parties on the following dates:

- Burundi (20 November 1975)
- Tanzania (30 May 1978)
- Zaire (26 May 1976)
- Zambia (14 October 1983).

The host country implementing agencies shall, for the purpose of the Standard Basic Assistance Agreement, refer to the government cooperating agency described in that agreement.

J. BUDGETS

The overall project budget covering the UNDP contribution, the subcontract budget, and government in-kind contributions are attached. The project budget is not adjustable for inflation or increases in fixed costs, and if there are such unavoidable increases in certain project components, they will have to be offset through decreases in other components. The Steering Committee will provide guidance on such changes.

The project will draw up administrative sub-budgets which will be maintained by the Project Coordinator to monitor activities and performance within sectors of the project. Sub-budgets will be maintained according to the UNDP accounting system.

**PROJECT BUDGET
(IN US\$)**

COUNTRY: REGIONAL - AFRICA
PROJECT NUMBER: RAF/92/G32/C/1G/31
PROJECT TITLE: POLLUTION CONTROL & OTHER MEASURES TO PROTECT BIODIVERSITY OF LAKE TANGANYIKA

C/MIL	DESCRIPTION	1993		1994		1995		1996		1997		1998	
		PM	TOTAL \$	PM	TOTAL \$	PM	TOTAL \$	PM	TOTAL \$	PM	TOTAL \$	PM	TOTAL \$
10	PERSONNEL												
11-51	PROJECT PREPARATION		127,710		117,590								
11-97	SHORT-TERM CONSULTANTS	0	201,160	0	28,160	0	20,000	0	63,000	0	20,000	0	70,000
11-99	SUBTOTAL	0	328,870	0	145,750	0	20,000	0	63,000	0	20,000	0	70,000
16-01	MONITORING MISSIONS		50,000		10,000		10,000		10,000		10,000		10,000
16-02	EVALUATION (MID-TERM, FINAL)		20,000						10,000		0		10,000
19	COMPONENT TOTAL		398,870	0	155,750	0	30,000	0	83,000	0	30,000	0	90,000
20	SUBCONTRACTS												
21-01	FAO I/A AGREEMENT		609,000		107,300		159,700		159,700		112,300		70,000
21-02	SUBCONTRACT		7,901,040		1,977,130		1,934,030		1,638,910		1,367,800		983,170
29	COMPONENT TOTAL		8,510,040	0	2,084,430		2,093,730		1,798,610		1,480,100		1,053,170
40	EQUIPMENT												
46-01	UTILITY BOATS X 3 (PURCHASE FITTING, TRANSPORT)		100,000		50,000		50,000						
47-02	PLANK BOATS X 12		18,000		9,000		9,000						
47-03	OUTBOARD ENGINES X 15		37,000		18,500		18,500						
47-04	LIFT NET BOAT UNIT		3,000		3,000		3,000						
47-05	PICK-UPS/UTILITY X 4		115,000		57,500		57,500						
47-06	MINIBUS		30,000		30,000		30,000						
47-07	4-WHEEL DRIVE		15,000		15,000		15,000						
47-08	EQUIPMENT/FURNITURE		50,000		40,000		40,000						
47-09	COMPUTERS & PRINTERS X 7		30,000		30,000		30,000						
47-10	PHOTOCOPIERS X 8		16,000		16,000		16,000						
49	COMPONENT TOTAL		414,000	0	269,000		145,000		0		0		0
50	MISCELLANEOUS												
51-01	CONTINGENCIES		110,828		20,500		21,580		22,916		22,916		22,916
53-01	REPORTING		27,000		2,000		2,000		10,000		3,000		10,000
59	COMPONENT TOTAL		137,828	0	22,500		23,580		32,916		25,916		32,916
90	PROJECT TOTAL	0	9,460,738	0	2,531,680	0	2,292,310	0	1,914,526	0	1,536,016	0	1,176,086
93-01	SUPPORT COST (5.7%)		539,262	577	144,306		130,662		109,128		87,553		67,037
999	GRAND TOTAL		10,000,000	10,657	2,675,986		2,422,972		2,023,654		1,623,569		1,243,123

BREAKDOWN OF SUBCONTRACT BUDGET

PROJECT NUMBER:

PAF/92/G32/C/IG/31

PROJECT TITLE:

POLLUTION CONTROL & OTHER MEASURES TO PROTECT BIODIVERSITY OF LAKE TANGANYIKA

CMBL	DESCRIPTION	TOTAL		1994		1995		1996		1997		1998	
		PM	\$	PM	\$	PM	\$	PM	\$	PM	\$	PM	\$
10													
11-01	PROJECT COORDINATOR (P5)	60.00	802,700	12.00	151,200	12.00	155,740	12.00	160,400	12.00	165,200	12.00	170,160
11-02	SCIENTIFIC LIAISON OFFICER(P4)	60.00	694,430	12.00	130,800	12.00	134,720	12.00	138,760	12.00	142,930	12.00	147,220
11-99	SUB-TOTAL	120.00	1,497,130	24.00	282,000	24.00	290,460	24.00	299,160	24.00	308,130	24.00	317,380
	ADMINISTRATIVE SUPPORT												
13-30	SECRETARY	60.00	20,400	12.00	4,080	12.00	4,080	12.00	4,080	12.00	4,080	12.00	4,080
13-40	DOCUMENT EDITOR	60.00	20,400	12.00	4,080	12.00	4,080	12.00	4,080	12.00	4,080	12.00	4,080
13-50	RESERVE MANAGER TRAINEES	108.00	22,680	0	0	36.00	7,560	36.00	7,560	36.00	7,560	36.00	7,560
13-60	MECHANIC TRAINEES	120.00	25,200	24.00	5,040	24.00	5,040	24.00	5,040	24.00	5,040	24.00	5,040
13-70	BOAT TRAINEES	120.00	25,200	24.00	5,040	24.00	5,040	24.00	5,040	24.00	5,040	24.00	5,040
13-80	DIVERS	85.00	26,350	17.00	5,270	17.00	5,270	17.00	5,270	17.00	5,270	17.00	5,270
13-99	SUB-TOTAL	553.00	140,230	89.00	23,510	125.00	31,070	125.00	31,070	125.00	31,070	89.00	23,510
15-00	DUTY TRAVEL		250,000		55,000		60,000		60,000		50,000		25,000
17-00	NATIONAL PROFESSIONALS												
17-01	TRAINING OFFICER	60.00	95,570	12.00	18,000	12.00	18,540	12.00	19,100	12.00	19,870	12.00	20,260
17-02	ADMINISTRATIVE OFFICER	60.00	45,000	12.00	9,000	12.00	9,000	12.00	9,000	12.00	9,000	12.00	9,000
17-03	RESERVES MANAGERS	72.00	134,940	6.00	11,220	18.00	33,960	24.00	44,880	18.00	33,660	6.00	11,220
17-04	SENIOR TECHNICAL OFFICER	60.00	27,000	12.00	5,400	12.00	5,400	12.00	5,400	12.00	5,400	12.00	5,400
17-61	NATIONAL CONSULTANTS	0.00	40,000		8,000		8,000		8,000		8,000		8,000
17-99	SUBTOTAL	252.00	342,510	42.00	51,820	54.00	74,900	60.00	86,380	54.00	75,730	42.00	53,880
19	COMPONENT TOTAL	925.00	2,229,870	155.00	412,130	820	456,430	310	478,610	155	484,930	155	419,770

BREAKDOWN OF SUBCONTRACT BUDGET

PROJECT NUMBER: RAF/92/G32/C/1G/31
PROJECT TITLE: POLLUTION CONTROL & OTHER MEASURES TO PROTECT BIODIVERSITY OF LAKE TANGANYIKA

CMBL	DESCRIPTION	TOTAL		1994		1995		1996		1997		1998	
		PM	\$	PM	\$	PM	\$	PM	\$	PM	\$	PM	\$
20	SUBCONTRACTS												
2101	BASILINE REVIEW		110,000		110,000								
2102	INCEPTION REPORT/DATABASE		55,000		55,000								
2103	DRAFT ACTION PLAN		33,000		33,000								
2104	LEGAL FRAMEWORK		52,000					52,000					
2105	CONFLICT RESOLUTION		88,000					44,000					
2106	DEFORSTATION & SEDIMENT SURVEY		126,000		31,500	83,000		31,500					
2107	SEDIMENTATION & SEDIMENT IMPACT		661,000		161,000	339,000		161,000					
2108	POLLUTION OF INTERNATIONAL WATERS		358,370		38,300	139,950		139,850					
2109	FINAL SEDIMENT ANALYSIS		36,000										
2110	BIODIVERSITY INVENTORIES		613,000		98,800	171,400		171,400					36,000
2111	TAXANOMIC BASIS		100,000			25,000		25,000					25,000
2112	FINAL BIODIVERSITY ANALYSIS		25,000										25,000
2113	FISHING PRACTICES		120,000		60,000	60,000							
2114	ORNAMENTAL FISH TRADE		33,000		33,000								
2115	COMMUNITY MODELLING		33,000			33,000							
2116	TOURISM		66,000		66,000								
2117	INCOME STUDIES		66,000		66,000								
2118	SECTORAL STUDIES		55,000		55,000								
2119	STRATEGIC PLAN (SPECIALISED INPUTS)		99,000			99,000							
2120	ECONOMIC APPRAISAL		26,000			26,000							
2121	FUTURE BASIN ORGANISATION		55,000							30,000			25,000
2122	POLLUTION MONITORING PROGRAMME		65,000							65,000			
2123	ECONOMIC APPRAISAL		26,000							26,000			
2124	CREATION OF SECTORAL FORUM		22,000							22,000			
2125	RESERVE MANAGEMENT		204,000		17,000	51,000		68,000		50,700			17,300
2126	FINAL IMPLEMENTATION ANALYSIS		10,000										10,000
29	COMPONENT TOTAL		3,137,370		824,600	1,007,250		692,750		474,470			138,300
30-00	TRAINING												
31-00	UNIVERSITY ASSISTANCE & FELLOWSHIPS		700,000		140,000	140,000		140,000		140,000			140,000
33-00	IN SERVICE INC WORKSHOPS & GROUPS		270,000		54,000	54,000		54,000		54,000			54,000
34-00	COMMUNITY ENVIRONMENTAL EDUCATION		500,000		50,000	125,000		125,000		100,000			100,000
35-00	CONFERENCE AND WORKSHOPS		100,000			40,000		20,000		20,000			20,000
39-00	COMPONENT TOTAL		1,570,000		244,000	359,000		339,000		314,000			314,000

BREAKDOWN OF SUBCONTRACT BUDGET

PROJECT NUMBER: RAF/92/G32/C/1G/31
PROJECT TITLE: POLLUTION CONTROL & OTHER MEASURES TO PROTECT BIODIVERSITY OF LAKE TANGANYIKA

CMBL	DESCRIPTION	TOTAL		1994		1995		1996		1997		1998	
		PM	\$	PM	\$	PM	\$	PM	\$	PM	\$	PM	\$
40-00	EQUIPMENT												
43-00	PREMISES		110,000										
42-01	4 SHORE-BASED & 1 MARINE HF RADIO SYS		124,000										
42-02	4 FAX MACHINES		4,000										
42-03	GIS: 1 BASE STATION, 4 PORT. GPS RECEIVERS		40,800										
42-04	DATA MANAGEMENT & VALID. SOFTWARE		6,000										
42-05	ADCP INCL. COMPUTER & RECORDER		120,000										
42-06	CTD PROBES X 2		34,000										
42-07	TRANSMISSOMETERS X 2		10,000										
42-08	METEOROLOGICAL EQUIPMENT		18,000										
42-09	SCUBA EQUIPMENT		22,000										
42-10	SPECTRO-PHOTOMETERS, PH, OXYGEN METERS		10,000										
42-11	MISC. GRAB/DREDGE SAMPLERS		5,000										
49-00	COMPONENT TOTAL		503,800		403,800		22,000		24,000		26,000		28,000
50-00	MISCELLANEOUS												
51-00	OPERATION AND MAINTENANCE EQUIPMENT		360,000										
53-00	SUNDRIES		100,000										
59-00	COMPONENT TOTAL		460,000		92,000		92,000		92,000		92,000		92,000
99-00	GRAND TOTAL		7,901,040		1,976,530		1,938,880		1,824,360		1,371,400		982,070

**PROJECT BUDGET COVERING GOVERNMENT OF BURUNDI'S CONTRIBUTION
IN KIND**

PROJECT REFERENCE: RAF/92/G32
PROJECT TITLE: POLLUTION CONTROL AND OTHER MEASURES TO PROTECT BIODIVERSITY
IN LAKE TANGANYIKA

Annual Inputs ('000 \$US)

Input	Total	1994	1995	1996	1997	1998
Professional staff (15)	450	90	90	90	90	90
Support Staff	180	36	36	36	36	36
Offices, etc.	700	140	140	140	140	140
Administrative support	140	28	28	28	28	28
Grand Total	1,470	294	294	294	294	294

PROJECT BUDGET COVERING GOVERNMENT CONTRIBUTION (IN KIND) IN TANZANIAN SHILLING

PROJECT REFERENCE: RAF/92/G32

PROJECT TITLE: POLLUTION CONTROL AND OTHER MEASURES TO PROTECT BIODIVERSITY IN LAKE TANGANYIKA

DESCRIPTION		TOTAL			1994		1995		1996		1997		1998	
		MM	Amount TShs '000	MM	TShs '000	MM	TShs '000	MM	TShs '000	MM	TShs '000	MM	TShs '000	
A. PERSONNEL														
National Coordinator	1	60	900	12	180	12	180	12	180	12	180	12	180	
Research Officer	1	60	900	12	180	12	180	12	180	12	180	12	180	
Technical Officers	3	180	2700	36	540	36	540	36	540	36	540	36	540	
Technicians	3	180	1440	36	288	36	288	36	288	36	288	36	288	
Secretaries	2	120	720	24	144	24	144	24	144	24	144	24	144	
Library Assistant	1	60	360	12	72	12	72	12	72	12	72	12	72	
Workshop Staff	10	600	3600	120	720	120	720	120	720	120	720	120	720	
Drivers	3	180	900	36	180	36	180	36	180	36	180	36	180	
Watchmen/Cleaners	4	240	960	48	192	48	192	48	192	48	192	48	192	
Casual Labourers	*15	900	3150	180	630	180	630	180	630	180	630	180	630	
SUB-TOTAL		2580	15630	516	3126	516	3126	516	3126	516	3126	516	3126	
Travel Allowances			60000		12000		12000		12000		12000		12000	
SUB-TOTAL A		2580	75630	516	15126	516	15126	516	15126	516	15126	516	15126	
B. SUPPLIES & FACILITIES														
Staff Housing (Rental)		300	1800	60	360	60	360	60	360	60	360	60	360	
Office/Laboratory, Buildings, Workshop Stores			5000		1000		1000		1000		1000		1000	
Use of Harbour facilities			2500		500		500		500		500		500	
SUB-TOTAL B			9300		1500		1500		1500		1500		1500	
C. CONTINGENCIES														
			5000		1000		1000		1000		1000		1000	
GRAND TOTAL		2880	97430	576	19486	576	19486	576	19486	576	19486	576	19486	

PROJECT BUDGET COVERING GOVERNMENT OF THE REPUBLIC OF ZAMBIA CONTRIBUTIONS IN KIND

PROJECT REFERENCE:

RAF/92/G32

PROJECT TITLE:

POLLUTION CONTROL AND OTHER MEASURES TO PROTECT BIODIVERSITY IN LAKE TANGANYIKA

ALL COSTS IN 1993 ZK'000 (EXCHANGE RATE US\$ = ZK435)

DESCRIPTION	1994	1995	1996	1997	1998	TOTAL
PERSONNEL						
Project steering committee representative	310	310	310	310	310	1,550
National Project Coordinator	1,000	1,000	1,000	1,000	1,000	5,000
Graduate Research Officer	400	400	400	400	400	2,000
Support Staff	2,200	2,200	2,200	2,200	2,200	11,000
National Working Group	1,500	1,500	1,500	1,500	1,500	7,500
OFFICE AND ACCOMMODATION						
Houses for Project Staff *	800	800	800	800	800	4,000
House Maintenance	200	200	200	200	200	1,000
Office Space	600	600	600	600	600	3,000
Office Maintenance	100	100	100	100	100	500
Office Supplies	200	200	200	200	200	1,000
Telephone, Telex	400	400	400	400	400	2,000
TOTAL	7,710	7,710	7,710	7,710	7,710	38,550

* / Subject to availability for purchase or renting

Annex 1

WORKPLAN

The major components of the workplan and preliminary estimates of staff, equipment, and time scale are given below. Operation of the plan will be monitored by the Technical Committee, and any substantial changes that may become necessary will be authorized at the discretion of the Steering Committee. The parts of the workplan that will be implemented in the field by consultants will be closely coordinated and integrated by the project Scientific Liaison Officer.

I. Regional strategic plan

A. Baseline reviews

National experts and/or consultants will be appointed to compile and review all existing information on biological aspects, water quality, lake hydrology, sectoral plans, institutional capability, and manpower availability over a three-month inception period (ten consultant months over the first three months of project).

B. Inception Report

- All reviews will be compiled into a report by the Project Coordination Unit, assisted by an environmental planner and an environmental scientist (two consultancy months during month four).
- All compiled information will be entered into a flexible database which is compatible between the riparian countries. This database can be extended with time by a data management specialist, and can be made the basis of a Lake Tanganyika GIS (three consultancy months during the first year).

C. Draft preliminary Lake Tanganyika Strategic Plan

From the review data in the Inception Report, the negative trends affecting the lake over time can be characterized, and the condition of the lake assessed to the extent that these trends are known. The major qualitative and quantitative gaps in the understanding of the lake and the negative impacts can be identified and vectored into special studies. Major zones in the lake can be categorized and the staffing, training, and procurement requirements for the future identified. The planning can be carried out by the Project Coordination Unit and the National Coordinators, with assistance from an environmental planning consultant and an environmental scientist (three consultant months within months four to six).

II. Legal framework

A consultant will be recruited to carry out the review of existing laws pertaining to the lake environment and other existing laws and regulations which impact the lake. This consultant will also

make recommendations for a regional framework for consideration by the four countries in the Final Plan (four consultant months in year 3).

III. Special studies

These special studies will be finalized when the preliminary Lake Tanganyika Strategic Plan for the environmental management plan is compiled by month 6. They will commence soon afterwards, and the results will contribute to the final Strategic Plan.

A. Sediment discharge and its consequences

Sediment discharge

- Lakewide deforestation and sediment plume survey, using remote sensing (satellite imagery, GIS). Every effort will be made to involve institutes in Africa in this work. Historical analysis of deforestation to start near the beginning of the project (one to two years in duration, entailing eight scientist months, with continuation of work by an MSc student).
- Quantification of volumes of sediment currently entering the lake through major inflows.
- Detailed sedimentation and sediment impact studies. The main rationale for this study is that sediment pollution is diminishing biodiversity in faunal communities and may also be affecting fish important for food production.
- Tracing fate of particles discharged into the lake (vertical and horizontal transport), using as a case study discharges along the coast of Burundi. Lake monitoring sites measuring quantity of sediment discharged are to be established. The project will concentrate on sediment entering the water column around particular drainages; several other agronomy-oriented projects (see Section A3) will supply useful complementary data in this area. Several monitoring sites will also be located in rivers and river mouths. Additional studies for comparative purposes will be undertaken at relatively undisturbed areas similar in geology and climate in the northern parts of Tanzania and Zaire waters (eighteen scientist months, plus twenty-seven technician months).

Effect of sediment on biota

Water column impacts (implications for commercial fishery)

- Comparative analyses of phytoplankton, zooplankton, and fish communities showing various degrees of impacts at different times of year, including the effects of turbidity on phytoplankton and zooplankton community structure and feeding, effects of turbidity on zooplankton-feeding fish, and exclusion effects (fifty scientist months for plankton studies and twenty-four scientist months for fish studies).

Benthos impacts (implications for biodiversity)

- Faunal census and inventory along transects at selected high- and low-impact areas. Short cores to be taken from sediment polluted areas to establish historical timing, background fluctuation, and rates of reductions in biodiversity (twenty-five scientist months, plus twenty-seven technician months).
- Several MSc and PhD students may work with this project section. Diving equipment, elutriation tables, Van Veen dredge and cabling, gravity corer, Pb-210 dating. Main project vessel (five months), and one utility boat, a plank boat, and a lift-net unit for the duration of work (shared between physical and biological study groups).

B. Pollution of international waters

1. Identify existing and potential pollution sources, including sediments, and where possible, quantify the types and levels of pollutants. Lakewide investigation will include urban, industrial and shipping sources, as well as an enquiry into the implications of exploration and exploitation of oil in the basin. To start in first year of project (after other sediment pollution results completed, entailing forty-three scientist months). Main project vessel (four months) plus one year and six months of utility boat time. This study will also utilize water and sediment analytical equipment.
2. Circulation of lake waters will be studied. Lakewide investigation to model transport and dispersal of pollutants, and identify areas of special risk. Creation of simple computer model. Thermistor monitoring chains and current metres at stations; supplementary limnological measurements on synoptic cruises; meteorological data at shore and on lake stations. The study is to continue over a three-year period (thirty-four scientist months, including calibration, operation and analysis time, plus twenty-eight technician months). Main project vessel (eight months) plus two years and six months of utility boat time. The study will also utilize major limnological equipment—thermistor chains, currents meters and CTD probes.

Data from programmes A and B will be utilized to review conclusions in terms of "state of the lake," and to identify major existing and potential pollution processes requiring specific remedial and precautionary measures. This "state of the lake" environmental audit will be reviewed at an international workshop which will recommend water quality and pollution control standards, and remedial actions for the lake.

C. Biodiversity studies

Because of the great size and complexity of the ecosystem, it is not possible within the scope of this project to evaluate biodiversity over the entire lake. A number of representative study areas will therefore be chosen. The criteria for these areas are accessibility, variety of habitats, and potential for continuing long-term observations so that the areas studied can be thoroughly understood. Reconnaissance inventories of the aquatic animals and plants will be made to provide

information necessary for the planning and management of identified reserves. In a second phase, after finalization of the Strategic Plan, additional areas of exceptional biodiversity will be identified and studied.

Inventory of species

Inventories will be made by geographic distribution and habitat type, monitoring changes in both over time. (Exploratory investigations will continue at selected sites throughout the project.) Procedures will include the following:

- Analysis of existing fisheries data from a biodiversity viewpoint
- Remote sampling with nets, grabs, and dredges over various bottom types (0 to 250 metres)
- Diving (0 to 40 metres) transect censusing
- Video records from submersible vessel (ROV) in same areas as net
- Quantitative replicate sampling for relative abundances by habitat
- Long-term studies of movement and change in diversity patterns.

Indicators of diversity

Various indicators will be determined, such as species richness, gradients in diversity, and diversity with habitat (ecological). Their significance will be explored and compared with other lakes. The study will be based on the results from Section A.

These two studies (inventory of species and indicators of diversity) will require ninety scientist months, as well as the main project vessel as available, plus one utility boat and two plank boats on a full-time basis. The studies will also require supplies, a computer and curation.

Taxonomic basis of diversity

Coordinated morphometric, anatomical, and molecular genetic studies will be conducted of key hyper-variable taxa, to understand the extent of diversification for management decisions on conserving biodiversity. The investigation will include analysis of phylogenetic relationships of endemic taxa, and mechanisms of speciation and evolution, and be partly based on samples and data from the two previous studies. This study will entail six scientist months during years 2 to 5 of the project.

D. Fishing practices and biodiversity

Certain modern fishing methods, notably purse seining and gill-netting using powered vessels, have drastically altered the fish stocks in certain areas of the lake and reduced diversity. Some traditional methods such as beach seines, and the use of very small mesh nets for catching young sardines, are probably also destructive. The pelagic, benthic, and littoral fish communities are closely linked ecologically, so bad fishing practices in one of these communities affects the others. The effects of the ornamental fish industry and sport fishing on the ecosystem are unknown.

Fishing practices

Alternative fishing methods, and management strategies which would be less harmful to biodiversity than those presently used, will be identified and recommended. The project will evaluate the impacts of these fishing methods on biodiversity, and propose conservation strategies. Proving of alternative fishing methods involving experiment and training will not be addressed, but the findings and recommendations should guide and facilitate such work by fisheries projects. The number of species valuable to each year should be determined (twelve months fisheries biologist plus twenty-four months technician time during years 1 to 2 of the project; main vessel (one month) and one utility vessel (six months)).

Ornamental fish trade

The preferred target species and quantities of fish taken presently should be determined, and the present and future market outlets examined. Potential threats to particular species should be identified for legislative action (two consultancy months in year 1).

Community modelling

The usefulness of setting up a simple community model (such as ECOPATH), using the available fisheries and community data, to assess the knock-on effects of fishing through the system will be investigated (three consultancy months in year 1).

E. Socioeconomic and sectoral studies

Tourism

A survey of all existing tourism facilities and networks related to Lake Tanganyika in each country, with recommendations on the needs for infrastructure, and organization required to encourage tourism in the area (six consultancy months in year 1).

Socioeconomic appraisals

Socioeconomic studies in representative lakeside communities to ascertain the role of fishing in the local economy, the pattern of fishing, and the organization of lakeside communities and their decision-making structures. Public awareness of the project will also be assessed (four consultancy months in years 1 to 2).

Income generating studies

Investigation of the possibility of other income generating activities along the lakeside (two consultancy months in years 1 to 2).

Sectoral appraisals

Since much of what happens to the lake depends upon what happens in other sectors, a close study of all other sectors in each of the four countries needs to be made. This study should ascertain

the most likely developments in those sectors with respect to actions which will affect the lake. All development plans should be evaluated, planning ministries contacted, and a liaison established with sectoral ministries (five consultancy months in years 1 and 2).

IV. Finalization of Lake Tanganyika Strategic Plan

From the reviews and special studies, a definitive Strategic Plan for the integrated environmental management plan of the lake can be formulated in year 3 to guide management actions for the lake. As additional data becomes available from the project's activities, the plan can be refined as necessary. The classification of conservation zones, pollution measures, and regulations can be decided upon. Management regimes for the lake zones can be outlined and proposed for tourism. Those areas of research and monitoring which need to be continued can be identified.

- **Draft of Plan:** This planning exercise will be conducted by the Project Coordination Unit with the National Coordinators, and the assistance of an environmental planner and an environmental scientist, plus any appropriate specialists required (ten consultancy months in year 3).
- **Economic appraisal of plan** which determines the costs of the various elements and translates them into annual budgeting requirements over a ten-year planning horizon. This activity will help to shape the final plan (two consultancy months in year 3).

V. Training and education programme

Training and education are essential elements in the project. All technical programmes carried out through contractors should have a built-in training component. Community education will be undertaken to increase awareness of lake environmental problems and solutions. Small workshops will be held. The Project Training Officer will supervise all aspects of this programme which will be carried out at four levels.

A. Environmental education at the community level

The NGOs should open up channels of communication with the local communities through their existing community structures. This process should also act as a channel for educational communication via regular meetings, and the dissemination of information through appropriate media. These channels may also be used for persuasion or extension if new practices are recommended. Budgetary provision is required for all NGO liaison, education, and extension activities. A particular target will be the schools and school teacher groups.

B. In-service training

This training will be effected primarily through the placement of employees of government departments and institutions in project related activities, where they will work closely with project staff and contractors. The aim will be to strengthen the capacity of these organizations. Small workshops will also be conducted primarily for such trainees for discussion and exchange of information, and to ensure their understanding of all aspects of the project.

C. Assistance to national universities

This assistance will be given according to the uniqueness of each university's needs. Assistance will take the form of library support (aquatic science books and journals), one-year aquatic biology courses with emphasis on pollution and conservation aspects (in English and French), and short courses at the level of university staff and associated project scientists as required.

D. Fellowships for post-graduate trainees

Train undergraduate, graduate, and post-graduate students over the life of the project through a fellowship programme, giving some preference to prior in-service trainees and encouraging the training of women in aquatic sciences. The project will determine the most appropriate and effective distribution of undergraduate, graduate, and post-graduate support in the fellowship programme.

VI. Implementation and sustainability of project

A. Future basin organization

In the final year of the project, arrangements will be put in place to continue its activities without break or delay. A permanent organization to represent the four lake countries in all matters concerning pollution control and conservation of biodiversity will be planned. The Steering Committee will have special responsibility for this planning, and will work out details and launch the necessary initiatives with the help of project staff. Seven months consultant time is dedicated to this activity.

B. Pollution monitoring programme

From the special studies and the decisions on pollution regulation, the most appropriate monitoring programme will be given in the Strategic Plan. The implementation of this programme which follows from the special studies can be initially assisted by GEF, but ultimately transferred to the national institutions (six consultancy months in year 4).

C. Economic appraisal

The economic implications of the project at both the village and national level need to be ascertained. A study in benefits, their distribution, and beneficiaries will need to be conducted, together with the overall economic implications of the plan. In particular, the scale of benefits likely to reach those target groups which bear the main impact of the plan needs to be ascertained (two consultancy months in year 4).

D. Ensuring cooperation of local communities

The NGOs will have organized local consultative groups, and teachers' groups and their schools. These groups can be incorporated into local management groups related to their local conservation areas or management zones. They should have regular communication with the National Working Group and the National Coordinator.

E. Creating a cross-sectoral planning forum

As the lake management will interact with several sectors in each of the four partner countries, an appropriate planning forum for the action of the Lake Tanganyika Strategic Plan for environmental

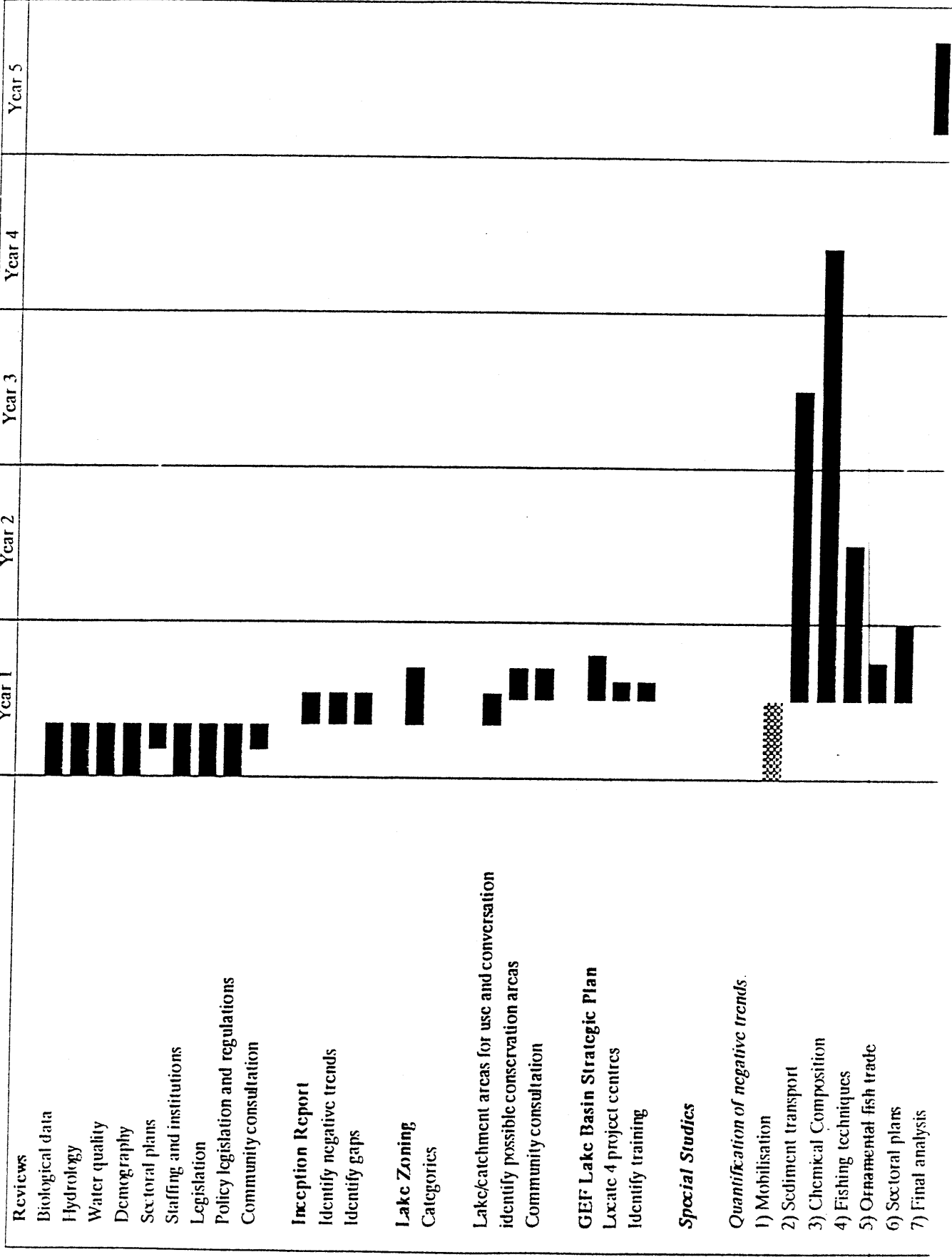
management should be located or created where possible. The most likely access points are the planning ministries (two consultancy months in year 4).

F. Conservation activities

Nsumbu and Mahali have already been identified and proposed as good and important sites for new reserves. Other conservation areas will have been designated within the Strategic Plan, and will eventually be necessary for adequate conservation of the life of the lake. Not all underwater reserves will be accessible to visitors because of safety considerations (presence of crocodiles, hippopotamuses), water depth, and conservation of breeding and nursery grounds. Establishment of subsidiary lake and land-use management areas bordering the reserves may be desirable from considerations such as ecotone interfaces (buffer zones), extension of carefully managed areas, and increase of tourist facilities. Recommendations will be made concerning these aspects. In the reserves, there must be integration of various user interests (for example, traditional, commercial and sport fishing), along with conservation and the operation of adjacent terrestrial portions of the parks. Both the terrestrial and underwater component of the reserves will be managed as one interdependent unit. Development of the underwater parks should involve the participation of local people for their benefit (income-generating). The project will provide the main expertise and equipment, as well as training, while the riparian governments have counterpart obligations.

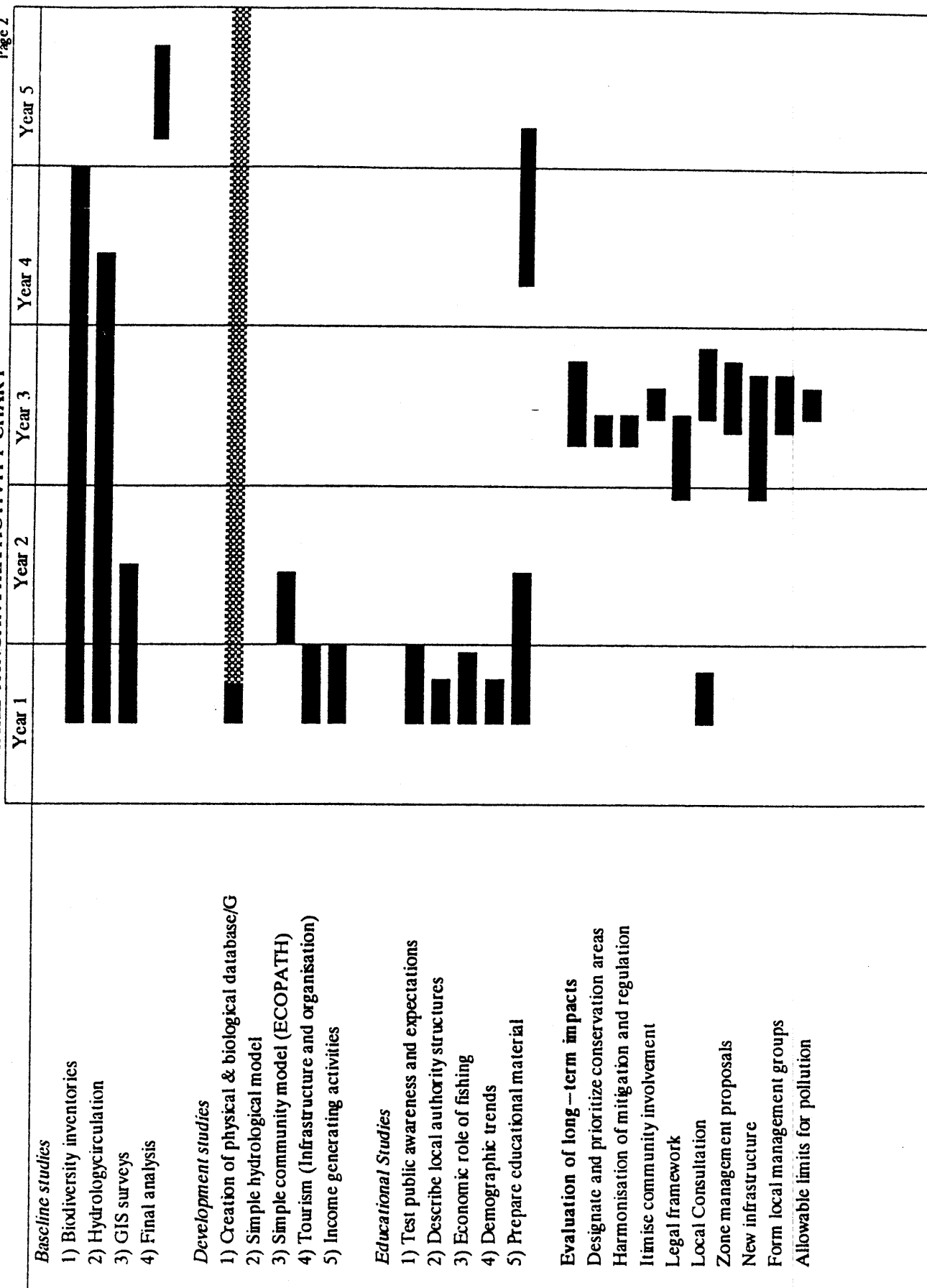
The objectives of the project are to help establish these underwater reserves, assist in their initial management (including training of personnel) and promote the establishment of further reserves by surveys and the biodiversity studies. Some informational material such as guidebooks can also be prepared. In the existing protected areas that are presently managed as parks, the project will work with the park managers to determine the best options to achieve effective management of the parks, and will provide additional training.

- An experienced reserves manager will set up and manage the reserve, together with a trainee manager (starting in year 1 in Nsumbu, with support for two years).
- An experienced reserves manager will set up and manage a reserve, along with trainee manager (starting in year 2 in Mahali, with support for two years).
- At least one further reserve will be established during the project from the analysis which leads to the production of the Strategic Plan.
- The preliminary ecological surveys of reserve areas will entail nine scientist months, as well as diving equipment, small boats, and necessary land transport. The cooperation of land park personnel will also be required.
- Socioeconomic studies to define and reconcile different interests, in consultation with the local people, will require three months of consultancy time.
- Management recommendations in a first phase management plan, including proposals for reserve boundaries, access by user types, and nature of concessions will entail three months of consultancy time. Initiation of these reserves will involve completing this phase in years 3 to 5 of the project.



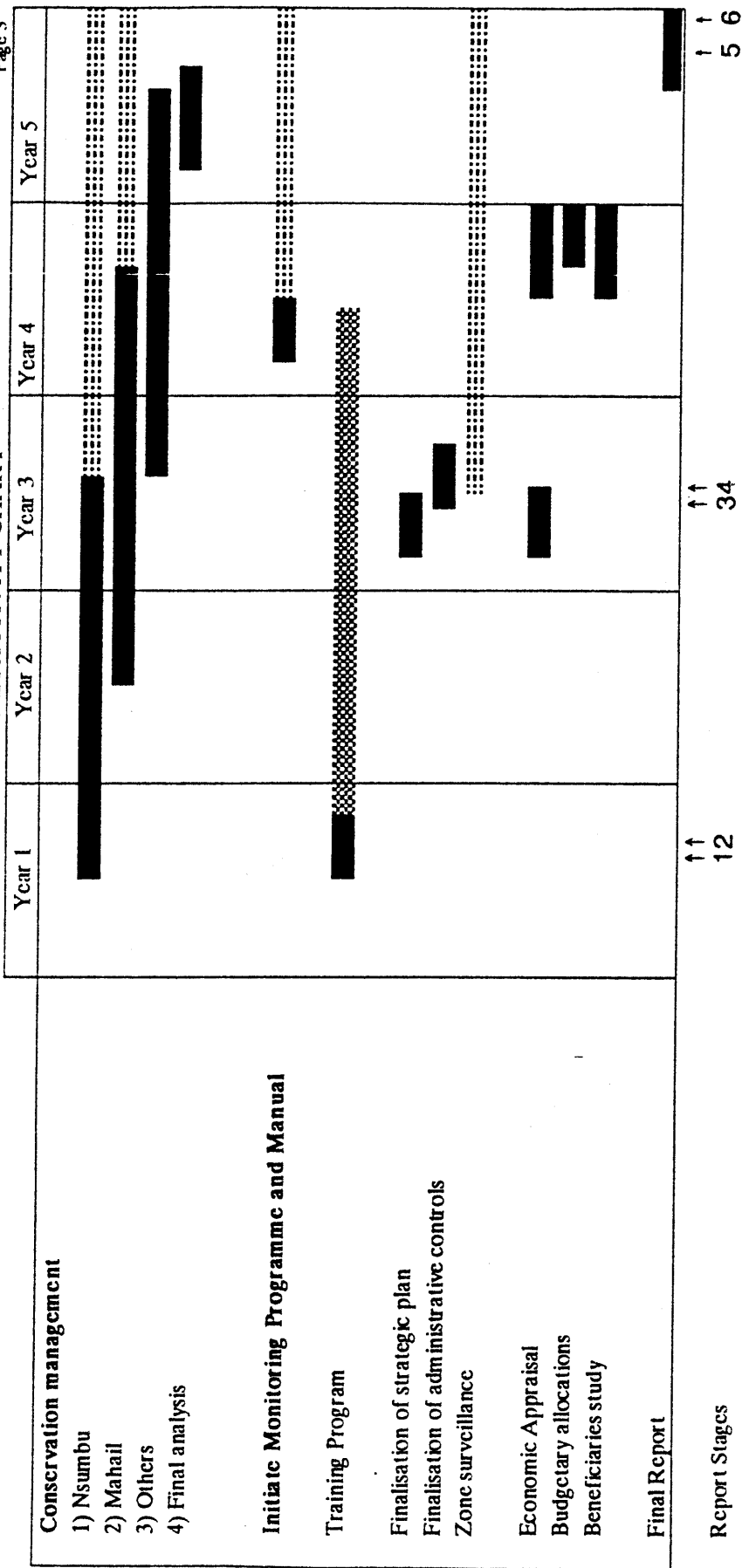
GEF LAKE TANGANYIKA ACTIVITY CHART

Page 2



GEF LAKE TANGANYIKA ACTIVITY CHART

Page 3



KEY

■ Specific Project Activities

■ Activity of Partner Countries

■ Continuous Unspecific Project Activity

Major Reporting Stages

- 1 Inception Report
- 2 Preliminary Lake Tanganyika Strategic Plan
- 3 Draft Final Strategic plan
- 4 Final Strategic Plan
- 5 Draft Final Report
- 6 Final Report

Annex 2

TECHNICAL PROGRAMME SUBCONTRACTS

Table 1 Technical programme subcontracts

Annual Inputs ('000 \$US)	1994	1995	1996	1997	1998	TOTAL
I Preliminary Action Plan						
Baseline Reviews	110.00					110.00
Inception Report/Database	55.00					55.00
Draft Action Plan	33.00					33.00
II Legal Framework						
A. Legal			52.00			52.00
B. Conflict resolution			44.00	44.00		88.00
III Special Studies						
A: Sediment Discharge						
Deforestation and sediment Survey	31.50	63.00	31.50			126.00
Sedimentation and sediment impact	161.00	339.00	161.00			661.00
B: Pollution						
Pollution of international Waters	38.30	139.85	139.85	40.37		358.37
Circulation of lake waters	37.30	89.70	89.70	42.30		259.00
Final analysis					36.00	36.00
C: Biodiversity						
Inventories/diversity indices	98.80	171.40	171.40	171.40		613.00
Taxonomic basis		25.00	25.00	25.00	25.00	100.00
Final Analysis					25.00	25.00
D: Fishing Practices & Biodiversity						
Fishing Practices	60.00	60.00				120.00
Ornamental Fish Trade	33.00					33.00
Community Modelling		33.00				33.00
E: Socio Economic Studies						
Tourism	66.00					66.00
Income Studies	66.00					66.00
Sectoral Studies	55.00					55.00
IV Final Strategic Plan						
A: Specialist inputs for draft			99.00			99.00
B: Economic Appraisal			26.00			26.00
V Implementation and Sustainability						
A: Future Basin Organisation				30.00	25.00	55.00
B: Pollution Monitoring Programme				65.00		65.00
C: Economic Appraisal				26.00		26.00
E: Creation of Sectoral Forum				22.00		22.00
F: Reserve Management	17.00	51.00	68.00	50.70	17.30	204.00
G: Final Analysis					10.00	10.00
	861.90	971.95	907.45	516.77	138.30	3396.37

Table 2 Summary of technical programme subcontracts

Work Head	Plan	US\$ ('000)
I	Preliminary Strategic Plan	
	A. Baseline reviews	110
	B. Inception Report and Database	55
	C. Draft of Preliminary Strategic Plan	33
II	Legal	
	A. Framework	52
	B. Conflict resolution	88
III	Special Studies	
	A. Sediment Discharge	
	Lakewide deforestation and sediment survey	126
	Sedimentation and sediment impact	661
	B. Pollution	
	Pollution of International Waters	358
	Circulation of lake waters	259
	Final analysis	36
	C. Biodiversity Studies	
	Inventory of biota : Indices of Diversity	613
	Taxonomic basis	100
	Final Analysis	25
	D. Fishing Practices and Biodiversity	
	Fishing practices	120
	Ornamental fish trade	33
	Community modelling	33
	E. Socio Economic Studies	
	Tourism	66
	Socio-economic and Income Studies	66
	Sectoral Studies	55
IV	Final Lake Tanganyika Strategic Plan	
	A. Specialist inputs for draft	99
	B. Economic appraisal	26
V	Implementation and Sustainability	
	A. Future Basin Organisation	55
	B. Pollution monitoring programme	65
	C. Economic appraisal	26
	E. Creation of Sectoral Forum	22
	F. Future management of reserves (surveys and recommendations)	204
	G. Final analysis	10
	<i>Total</i>	3,396

Annex 3

FRAMEWORK FOR EFFECTIVE PARTICIPATION OF NATIONAL AND INTERNATIONAL STAFF

A. Institutions

Each government has agencies responsible for fisheries which have local offices at or near the lake. The INECN in Burundi has a Department of Fisheries which works closely with several international fisheries projects on the lake. The Zambian Ministry of Agriculture has a Department of Fisheries which maintains a Provincial Fisheries Officer at Mbala, and offices at Mpulungu and Nsumbu. Tanzania's ministry includes the Tanzania Fisheries Research Institute which maintains a regional office at Kigoma. The Government of Zaire has a Natural Sciences Research Centre (CRSN) at Uvira, not far from Bujumbura, where the Hydrology Department is also represented.

Responsibilities for parks and wildlife are fairly well established by the governments, but some changes in environmental ministries are being made at present. In Burundi, the INECN is responsible for parks and "nature conservation." The "parks" area is well staffed, and the Rusizi National Park is established at the lake, but there is no staff yet for nature conservation. In Zambia, there is a Department of National Parks and Wildlife which is now being put under the Ministry of Tourism. A park exists at Nsumbu. In Tanzania, the National Parks Service is a parastatal (TANAPA) that comes under the Ministry of Tourism, Natural Resources and Environment; based in Arusha, it is well-established and already has two parks at Gombe and Mahali beside the lake.

Pollution control, on the other hand, tends to be a newly recognized responsibility of the governments. In Burundi, the INECN is responsible, but has as yet no staff or regulations. In Zambia, the Environmental Council has recently established units for Water Pollution Control, Solid Waste Management, Air Pollution and Noise Abatement, Pesticides and Toxic Substances, and Natural Resource Management. In Tanzania, the National Environmental Management Council has a division for Pollution Prevention and Control, but it is still short-staffed.

The prevention of pollution through the reduction of sedimentation from run-off and erosion of cleared or tilled lands is the indirect responsibility of several agricultural, land management, and natural resource agencies. These authorities have implicit responsibility to ensure sound agricultural and forestry practices to minimize run-off, erosion and soil loss. These agencies and activities, however, tend to be dispersed through various ministries, departments and councils.

The coordination of all externally financed development projects is the responsibility of other ministries, such as the Ministry of Planning in Burundi, the National Commission for Development Planning in Zambia, and the Ministry of Foreign Affairs in Tanzania. These ministries are the lead contacts for each government for all development projects.

A very positive factor at present is that the governments are in the process of working out a new approach to management of their environments. Established ministries are being changed and new ones created, legislation is being revised, and new acts and regulations are being considered.

Unfortunately, the resources available for new initiatives are minimal, and there is some uncertainty about how the new arrangements will evolve.

The legislative situation is complex. In each country there are numerous acts covering various activities that affect environment management. For example, in Zambia alone there are twenty-two acts dealing with the environment. Among the more important of these directives for the lake are:

- The Tsetse Control Act (1941)
- Water Act (1949)
- National Parks and Wildlife Act (1968)
- Natural Resources Control Act (1970)
- Forests Act (1973)
- Fisheries Act (1974)
- Lands (Conversion of Titles) Act (1975)
- The Environment Protection and Pollution Control Act (1990).

Other countries have a similar situation with many old acts, some dating from colonial times. All four countries have recently passed specific environmental legislation, and are in the process of planning and preparing regulations dealing specifically with various aspects of environmental management and coordination. There is an opportunity to facilitate the harmonization of objectives and standards for the lake basin, so that major inconsistencies can be avoided across borders.

The newly established environmental agencies are typically understaffed and have much to do. The testing period for them to undertake an effective role is just beginning. Their responsibilities are broad, but their resources and operational capacities have yet to be built up.

From a policy point of view, new strategies are only now being developed. Conservation has in the past been limited to certain agencies such as parks, fighting a sometimes losing battle against production-oriented agencies such as agriculture, forestry and fisheries. A new realization is taking root: maximum production may not be sustainable (fish catches at the lake are down, and soil in the basin is being lost at alarming rates). The concept of determining the sustainable limits of resources, and managing them accordingly, is gaining ground. It is also being shown that conservation can bring concrete local benefits, in addition to meeting what seem vague national conservation objectives. The new agencies are beginning to play lead roles in these changing perspectives.

Universities, laboratories, and research institutes also have an important part to play in the project. The University of Burundi has been primarily a teaching university, but is now developing a research capability, with particular interest in working on Lake Tanganyika. Other Burundi research agencies involved include the Department of Waters and Fish (fisheries and hydrobiology research), REGIDESO (potable water analysis), the Ministry of Health (waste water analysis, sanitation and waste disposal), and the Institute of Scientific Agronomy (ISABU) (studies of erosion and mitigation strategies in the lake). Staff shortages and the lack of adequate funding often make effective utilization of the facilities of these agencies difficult.

In Zambia, the university has been focusing its research efforts on priority areas established by the government, but is now entering a new phase under the "Third Republic," when it will be

able to review its own research priorities. More attention may be paid to the lake by the Biology Department in this case, and the university may play a role in the project. The National Council for Scientific Research outside Lusaka, that has certain laboratory facilities and a small staff, may also have a role.

In Tanzania, the University of Dar-es-Salaam has an active biology department with an interest in aquatic biology and experience on the lake in biology and pollution aspects. It is anticipated that this capability can be utilized and strengthened through the project.

Other laboratory facilities and institutional capabilities of relevance to Lake Tanganyika will also be utilized and strengthened where feasible and appropriate, including those in Zaire at Uvira. Existing laboratory and office facilities in each of the proposed four national project centres will be upgraded to sustain additional operations. Training will be provided for local staff in operations and procurement.

Although a large number of local and international NGOs exist in the four countries, not many are established at the lake shore. In Bujumbura there are a number of active NGOs, among which Catholic Relief Services is prominent. Some seventy NGOs are registered in Zambia, and in Tanzania a group of NGOs has been formed with sixty-six national and six international members. These NGOs are generally oriented towards direct support to people, but several are being established with environmental objectives, particularly in the field of education. Conservation of biodiversity is a fairly new concept, but a few NGOs are strong in this area, such as the East African Wildlife Association, the WWF, and the International Union for the Conservation of Nature and Natural Resources (IUCN) with offices in Dar-es-Salaam and Lusaka.

NGOs offer an opportunity for reaching out to the poorest and most isolated people in ways that are difficult for government agencies, at times of fiscal restraint, to achieve from often distant capitals. In particular, environmental education should be a fruitful area for the involvement of NGOs in the project. For example, a Zambian Environmental Education Programme (ZEEP) is just getting underway, and a similar programme is planned in Tanzania. Nearer the lake is the community-based World Vision International which has an office in Mbala. Other NGOs which are interested in working with the project include CADIC (Uvira/Bujumbura) and HAAC (Uvira/Bujumbura). The project will identify NGO partners for collaboration on the relevant project activities early in the project.

In summary, there are numerous ministries and agencies with responsibilities for the environment in the lake basin. Many of them are being actively reviewed at present in the light of an increased interest in environmental management and pollution control, so the timing is good for supporting the process.

B. Project management

Steering and Technical Committees

Within this complex institutional framework, the project must incorporate the interests of the senior development coordinating ministries, the environment ministries and councils, the various

natural resource sectoral agencies, and the local interests of other agencies representing people in the basin. To ensure compatibility of objectives and outputs, a project Steering Committee will be formed with the following terms of reference.

The Steering Committee will:

- Provide overall direction of the project
- Review the progress of the project and the various national activities, ensuring a regionally integrated approach
- Advise on policy matters, and monitor the utilization and availability of counterpart staff
- Approve future planning, and make recommendations to UNDP and the implementing and executing agencies as to changes in project timetables, inputs, and budgets which may be necessary from time to time
- Provide guidance and support to the Technical Committee and Project Coordinator.

The Steering Committee will consist of members appointed by each country, from the national environmental agency or ministry equivalent, preferably at Director General or Permanent Secretary level, as well as the designated National Coordinators from each country. Representatives of UNDP and the implementing agency will also be members. Arrangement for persons who can contribute special expertise to become members will be made on an ad hoc basis. UNDP will chair the Project Steering Committee, and the Project Coordinator will serve as Executive Secretary to the committee, which will meet at least once a year.

The mandate of the Project Technical Committee will include:

- General supervision of the implementation of the technical work programme, with periodic review and revision within the terms of the Project Document and budget
- Evaluation of the technical work carried out by the project, drawing conclusions and recommendations for appropriate further action, and reporting as required to the Steering Committee
- Technical support and advice to the project.

The committee will consist of the technical experts from the agencies actively involved in the project; these agencies are expected to be the fisheries, parks, wildlife, environment, and pollution control departments from each country. Project staff and representatives of contracting implementing agencies will be invited to meetings, as appropriate. The Project Coordinator will chair the committee, which will meet at least twice a year.