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The World Bank

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REPORT No 21556

IMPLEMENTATION COMPLETION REPORT

MALAWI

GEF/SADC LAKE MALAWI/NYASA BIODIVERSITY CONSERVATION PROJECT

GEF TF 28671-MAI (US$5.4 MILLION)
CIDA TF 22676-MAI (CDN$4.0 MILLION)

DECEMBER 29, 2000

Rural Development Operations
Eastern & Southern Africa

CURRENCY EQUIVALENTS

(Exchange Rate Effective As of October 2000)

Currency Unit - Malawi Kwacha (MWK)
At appraisal: US$1 = MWK 7.14
At completion: US$1 = MWK 58.0

WEIGHTS AND MEASURES

Metric System

FISCAL YEAR

July 1 - June 30

ABBREVIATIONS AND ACRONYMS

CEO	Community Education Officer
CEOS	Centre for Earth Studies
CIDA	Canadian International Development Agency
DFID	Department for International Development
DNPW	Department of National Parks and Wildlife
EEO	Environmental Education Officer
FDP	Fisheries Development Project
FWI	Freshwater Institute
GEF	Global Environment Facility
GOM	Government of Malawi
ICR	Implementation Completion Report
INC	Industrial Cooperation Programme
LMNP	Lake Malawi National Park
MNR&EA	Ministry of Natural Resources and Environmental Affairs
MOFFEA	Ministry of Forestry, Fisheries and Environmental Affairs
MTR	Mid-Term Review
PM	Project Manager
PS	Principal Secretary
QAG	Quality Assurance Group
RAG	Research Advisory Group
SC	Steering Committee
TFA	Theatre for Africa
TCP	Technical Cooperation Programme
UNDP	United Nations Development Programme
WSM	Wildlife Society of Malawi

Vice President:	Callisto Madavo
Country Manager/Director:	Darius Mans
Sector Manager/Director:	Sushma Ganguly
Task Team Leader/Task Manager:	Francisco Pichon

IMPLEMENTATION COMPLETION REPORT

MALAWI

SADC LAKE MALAWI/NYASA BIODIVERSITY CONSERVATION PROJECT

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1. Project Data

Name:	LAKE MALAWI/ NYASA BIODIVERSITY CONSERVATION PROJECT	*L/C/TF Number:*	GEF TF 28671-MAI & CIDA TF22676-MAI
Country/Department:	MALAWI	*Region:*	Africa Regional Office
Sector/sub sector:	AY - Other Agriculture		

KEY DATES

			Original	*Revised/Actual*
PCD:	02/10/92	*Effective:*	01/31/95	07/31/95
Appraisal:	02/22/93	*MTR:*	07/31/97	01/19/98
Approval:	12/30/94	*Closing:*	07/31/99	06/30/2000

Borrower/Implementing Agency:	The Government of Malawi (GOM): Ministry of Natural Resources and Environmental Affairs (MNR&EA) as SADC Sector Coordinator for Inland Fisheries/Implementing Agency was the Malawi Ministry of Natural Resources and Environmental Affairs through an appointed Steering Committee
Other Partners:	Global Environment Facility (GEF); Canadian International Development Agency (CIDA); and the Department for International Development (DFID)

STAFF	**Current**	**At Appraisal**
Vice President:	Callisto Madavo	E. Jaycox
Country Manager:	Darius Mans	K. Marshall
Sector Manager:	Sushma Ganguly	C. Helman
Team Leader at ICR:	Francisco Pichon	E. Asibey
ICR Primary Author:	Pietros Kidane (ICR Mission Team Leader-FAO/CP); T. Seymour (Consultant-Scientific Advisor); and R. Hall (Consultant-Institutional Development Specialist)	

2. Principal Performance Ratings

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HL=Highly Likely, L=Likely, UN=Unlikely, HUN=Highly Unlikely, HU=Highly Unsatisfactory, H=High, SU=Substantial, M=Modest, N=Negligible)

Outcome:	S
Sustainability:	L
Institutional Development Impact:	SU
Bank Performance:	S
Borrower Performance:	U

	QAG (if available)	**ICR**
Quality at Entry:		U
Project at Risk at Any Time:	No	

Note: Overall Bank Performance is being rated as satisfactory, but only marginally so, given the difficulties discussed in the institutional design of the project, as well as the noted weakness in the appraisal mission which had implications on aspects of project implementation despite the satisfactory outcome of the project. It is however recognized that the project objectives of establishing the scientific basis for conserving the Lake's biological resources were well served in the design of the three project components, i.e. research, capacity-building and environmental legislation. The call for the project to accumulate a large scientific data base, and at the same time, produce professional and technical staff that could undertake further scientific work on the Lake, were appropriate development objectives supported by the original project design. Although these or any other achievements cannot compensate for shortcomings at appraisal, it is recognized that the role of project supervision and overall implementation support was indeed instrumental in assisting the project to achieve its objectives successfully.

3. Assessment of Development Objective and Design, and of Quality at Entry

3.1 Original Objective:

The Project's main objective was to assist the riparian countries (i.e. Malawi, Tanzania and Mozambique) in creating the scientific, educational, and policy basis necessary for conserving the biological diversity of Lake Malawi/Nyasa (the Lake) and its unique ecosystem. Its concept centred on acquiring knowledge on the current status of biodiversity, with a particular focus on fish, and on catchment and limnological processes. The objective of acquiring additional knowledge of the Lake's biodiversity was justified by a serious dearth of hard data on the nature of the Lake's biodiversity and productive systems. For example, not enough was known about catchment functions, nutrient cycling or trophic relationships to enable reliable predictions of the impact of anthropogenic change on either biodiversity or production. Parallel to generating scientific information, the project rightly sought to build the institutional capacity of the riparian states through higher-level university education and on-the-job staff training. This was a far sighted decision as it provided the riparian countries with a cadre of scientific personnel that can now build upon the research undertaken by the project. The project was to be guided by a Steering Committee (SC) whose members would be senior officials from the three riparian countries under the chairmanship of a Principal Secretary (PS) from the Government of Malawi (GOM). A full-time Project Manager (PM) with his Team was to be entrusted with day-to-day management of the project, while a Research Advisory Group (RAG) was to provide scientific advice to the project. However, the organization and management design of the project became ambiguous, as the functions of the SC and the Project Administration were not spelled out clearly at appraisal. The SC was sometimes referred to as an advisory body, even though the PM was to be employed by the SC and to report to it. Project design also failed to provide a strong institutional base that took into full account the project's regional characteristics. For instance, there were no formal agreements to allow the project to operate in the territorial waters of all three countries, and the rehabilitation of research stations in Tanzania and Mozambique was to be implemented with the assistance of the respective UNDP offices and not by government institutions. Assigning the Chair of the SC permanently to Malawi unintentionally signaled a favorable bias to this country, and the Grant Agreement was signed by Malawi only in its capacity of SADC Sector Coordinator for Inland Fisheries, albeit in the name of the other two countries also. Such anomalies in project design had some negative effects on project implementation, as became apparent over time (para. 7.1).

There was also an oversight by the appraisal mission concerning the facilities at project headquarters in Senga Bay. Although it was generally stated that the site and equipment were adequate, this was not found to be the case once the project started, and valuable implementation time was spent in improving the facilities and procuring equipment. Some training activities, such as environment education, were also poorly designed, requiring extra preparation work during project implementation.

3.2 Revised Objective:

There was no modification of objectives, hence the project was implemented following the original goals. However, some clarification on the scope of one of the main project outputs, i.e. the Management Plan for the Lake, were made during the Mid-Term Review (MTR) in January 1998. This was required because the vague description of the scope of the Management Plan in the Project Documents implied that the Project was to prepare a full Lake-wide Management Plan, which was not the case. The MTR Team agreed with the riparian countries on the nature of the Plan to consist of a single output containing the following three elements:

(1) interim management recommendations and strategies for aspects of Lake resources that could be supported by hard data collection during the Project (for example, through statistically correlated relationships between habitat and resource, regressions showing statistically valid physical, chemical or biological trends, or other data sets that clearly predict a more sustainable utilization of an identified resource as a result of the proposed action or strategy);

(2) identification of critically needed follow-on scientific work that should be included in a presumed "second phase" project that might immediately follow this Project to advance development of a more detailed Lake Management Plan; and

(3) recommendations that would be used to develop terms of reference for preparation of a "second phase" project focused on developing a Management Plan for the Lake.

3.3 Original Components:

The project comprised four components: (a) **Research** consisting of biodiversity survey, studies on taxonomy, ecology and distribution of the cichlid species, limnology and water quality studies, and the rehabilitation of three research stations, i.e. Cape Maclear, Kyela and Metangula, respectively in Malawi, Tanzania and Mozambique; (b) **National Capacity-Building**, comprising the training of officials from the three riparian countries in ecology, taxonomy and limnology, as well as conservation awareness activities through formal and informal education of decision makers and Lake resource users; (c) **Environmental Legislation**, comprising the review and evaluation of the compatibility of existing laws in the riparian countries for the management of the Lake's biodiversity; and (d) **Protected Area Management,**entailing the preparation of a strategic plan for Nankumba Peninsula and Lake Malawi National Park (LMNP). While research, national capacity-building and environmental legislation can be considered as components relevant to the project's core objective of creating the basis for the conservation of the Lake's biodiversity, this is not the case with the protected area management component. As an area-specific development component, it contributed little to the main project objective, although it demanded a significant share of management time and attention.

3.4 Revised Components:

There were no substantive changes to the project components during implementation. Two changes worth mentioning concern the environmental legislation component and the establishment of a monitoring programme. During the first year of implementation, the responsibility for financing and implementing the environmental legislation component was transferred to FAO. Following this decision, FAO is implementing this component as an assistance to the three riparian countries within the framework of an international project, and with a broader scope than was originally envisaged. The project also enabled initiation of an environmental monitoring programme based on key parameters identified during the project as critical to the maintenance of the ecosystem in its current structure and functions. To strengthen riparian capacities for collaboration in the implementation of such a cooperative monitoring programme, the project closing date was extended from July 31, 1999 to June 30, 2000, with a further extension of the CIDA grant to December 31, 2000. The monitoring programme was developed and carried out by the

project-trained scientific counterparts and students in Malawi, Tanzania and Mozambique with modest funding, consisting of unallocated project funds and contributions from the three riparian countries. The program included the regular collection of water samples for nutrient, plankton and quality analysis and the monitoring of river water, meteorological data and artisanal fisheries.

3.5 Quality at Entry:

There was no performance rating by the Quality Assurance Group (QAG) of the World Bank. However, at project completion, it can be said that the quality at entry was less than satisfactory. In spite of the significant contribution to the formulation of such a highly relevant scientific programme for conserving the biodiversity of Lake Malawi, project design did not provide a workable institutional base supporting the regional nature of the operation. This situation later led to disagreement over the distribution of resources and benefits between the participating countries during project implementation. In addition, there was lack of clarity in describing the management functions of the SC and the Project Administration, with no clear-cut distinctions between the policy guidance role of the SC and the managerial role of the PM, which would have reduced some of the friction recorded during implementation between chairmen of the SC and the PM. It is however recognized that the Bank provided valuable inputs during the conceptualization and preparation of the project. The project objectives of establishing the scientific basis for conserving the Lake's biological diversity were well served by the three components, i.e. research, capacity-building and environmental legislation. The call for the project to accumulate a large scientific database, and at the same time, to produce professional and technical staff that could undertake further scientific work on the Lake, were appropriate development objectives. The harmonization of national legislations of the riparian countries was also a useful element, as this would ensure the attainment of a coherent approach to biodiversity conservation in the Lake.

4. Achievement of Objective and Outputs

4.1 Outcome/achievement of objective:

The overall outcome of the project is satisfactory as it has achieved its main objective of establishing a solid scientific information base as a foundation for conserving the biodiversity of the Lake. The nature of this information is such that it will facilitate the formulation of responsible management and development programmes in the Lake. The scientific products will be of value to planners and managers over many years to come. The training of 10 professionals from the three riparian countries in research disciplines through a postgraduate scholarship programme has made a significant contribution to the availability of regional capacity in research and resource management on the Lake. On-the-job training given to the regional counterpart staff throughout the entire project implementation period also represents an important contribution to institutional strengthening, complementing and supporting the skills of the research graduate students. Together, these research staff will be able to lay the foundation for a meaningful research and management programme for the Lake.

4.2 Outputs by components:

(a) Research. This component was the most important of all as it aimed at generating scientific information that is necessary for formulating sound policies as well as development and management programmes. It was divided into four sub-components: biodiversity surveys; ecological and taxonomic studies; limnology and water quality studies; and rehabilitation and construction of research stations.

The biodiversity survey activities commenced with considerable delay because of repeated breakdowns of the research vessel, the RV Usipa. The Appraisal mission under-estimated the repair needs of the vessel after a protracted time of inactivity. It was only thanks to the efforts of DFID, owner of the vessel, that the Usipa was made sea-worthy at the beginning of 1997. In total, nine Lake-wide sampling cruises were carried out under the project, in addition to several location-specific visits. The survey was carried out jointly by the two Teams engaged in systematics/taxonomy and ecology. A huge amount of information was collected during these survey cruises, and the outputs of the biodiversity survey are now assembled into a digital biodiversity atlas comprising vector and roster maps, relational databases and data tables, which are available on a single compact disk, and multi-media presentations of four videos and three disks. These are accompanied by a final report and user manual. This information is considered extremely useful to the understanding of biodiversity in the Lake. Unfortunately, a great deal of the information collected with regard to fish ecology was not fully analysed after the termination of the Senior Ecologist, Technical Assistance (TA) personnel, in January 1998 (see the Ecology Programme below). Therefore, there will be even more insight into the biodiversity make-up of the Lake once these data have been fully analysed.

Systematics and taxonomy studies were carried out by a Team consisting of a Senior Systematist/Taxonomist and an Assistant Systematist/Taxonomist, both TA personnel, two counterpart staff and the university students enrolled in systematics. This Team was involved not only in identifying new species, but also in confirming descriptions and revising and redefining genera and species groups. At project completion, the Team had succeeded in developing the most comprehensive collection of fish ever taken from the Lake. Three reference collections have been assembled, one for each of the riparian countries, with back-up specimens held in the Africa Museum, Tervuren, Belgium, and the JLB Smith Institute of Ichthyology in Grahamstown, South Africa. Besides the more than 300 fish species which had already been formally described, the Team noted literally hundreds of undescribed species, many of which were collected in sufficient numbers to allow formal description in the future. The Systematics Team accumulated an extensive library at Senga Bay, and databases developed under the project's systematic work are now assembled on CD. Counterpart staff acquired a high level of skill during this programme, and graduate students were supported in their research endeavors for their dissertations. A guide to the fishes of the Lake is currently being prepared. In addition to the work on fish, some work on the distribution of algae was carried out under the limnology and water quality programme.

The fish ecology programme was carried out in two distinct phases. During the first phase, June 1997-January 1998, a huge amount of data was collected during the Lake-wide survey. However, following the departure of the Senior Ecologist, reportedly following disagreement with the PM on research approach and priorities, a second phase was initiated from June 1998 to July 1999 with a new Ecologist. The second ecological study did not sufficiently build on the first programme, but largely developed a new one in line with the PM's directives. Given that the main mechanized fishery in the Lake was demersal trawling, it was decided that the new study should focus where trawl stocks were abundant, in the

Southern part of the Lake. This programme had three principal focal areas: (a) the ecology of demersal trawl stocks, including species composition, temporal trends, life history studies on 40 important species and dietary studies on 9 species; (b) the genetic and ecological differentiation of fish populations of two species at different locations; and (c) the impact of river-borne sediments on shallow water fish of sandy and rocky grounds.

Limnology and water quality studies were seen primarily in the context of potential pollution threats to the Lake's biodiversity. This programme, which was carried out by the Fresh Water Institute of the Department of Fisheries and Oceans (Winnipeg, Canada), had the biggest study Team of all. In addition to the main limnology Team, that consisted of a coordinator mostly residing in Canada, the Resident Limnologist, two counterpart staff and graduate students, a large number of visiting scientists from Canada and the United States contributed to the study. The results of the limnology and water quality study are presented in a Water Quality Report prepared at the end of the project. This study is very comprehensive and does not lend itself to a short summary. However, it suffices here to indicate that it has identified the major water-related threats to biodiversity in the Lake and has recommended appropriate monitoring and remedial interventions. Its investigations have shed light on the effects and process of river discharge; atmospheric nutrient deposition; deep water renewal; nutrient upwelling and recycling; factors controlling algal abundance and composition, and contaminants in water, sediments and biota. The study has also provided baseline information on the Lake that will become the basis for long-term monitoring of water quality changes. It has already identified evidence of negative impacts on the Lake as a result of nutrient loading from the rivers and the atmosphere. It is predicted that further modification of river discharges due to agricultural expansion would lead to a switch in phytoplankton composition from diatoms to blue-green algae, with loss of water clarity, possible toxicity and major impacts on biodiversity. The scientific information generated by the Team is of high quality, and will be of long-term value to scientists, planners and policy-makers.

(b) National Capacity-Building. This component consisted of formal and informal training of staff and communities for raising conservation awareness.

Staff training was divided into two parts, i.e. research-related training and environmental education. The research-related training in turn comprised two types: formal university education under M.Sc. and Ph.D. programmes and on-the-job training of counterpart staff in fish ecology, taxonomy and limnology. The university programme started late due to delays in the Government selection and appointment of trainees, and this disrupted the plan of overlapping the graduated students with the project scientists, as the latter had largely completed their assignments before the students returned. By the end of the project, 10 professional staff from the three riparian countries had been given training, eight to M.Sc. and two to Ph.D. levels. Although not all students returned to work together with the project scientists, they were, however, in continuous contact with the three Scientific Teams (systematics/taxonomy, ecology and limnology) and undertook their dissertation works, which were focused on the Lake, in consultation with them. The dissertation works are considered an important and integral part of the scientific outputs of the project. The six counterpart technical staff--two from each country--were attached to the three scientific study Teams as full-time members, and as such obtained on-the-job training by working with the scientists. The counterpart training programme was a successful venture and is expected to boost the research capability of the riparian countries. Unfortunately, the same could not be said for the short-term training of staff in environmental education. Although twenty-two people from the three countries were trained for six months in environment and education-related disciplines, the utility of this output is difficult to determine. Not only was the rationale for the overall programme unclear, but also the choice of participants did not

guarantee the long-term application of the training provided, given that the careers of some of the trained staff were not directly related to the management of the Lake or its environment.

Conservation awareness activities were carried out mainly in southern Malawi, including in 18 schools and 18 villages in Nankumba Peninsula. In addition, the project organized workshops for 40 students and 90 traditional leaders from lakeshore communities, and also produced a variety of video and graphic products, including posters and flyers. The project made considerable use of drama for promoting environmental awareness, and Theatre for Africa (TFA), a South African company, was contracted to take charge of developing and performing plays illustrating specific environmental issues. Eleven actors from the riparian countries were recruited and trained by TFA in environmental theatre, and the troupe was well received in all three countries by more than 108,000 people. The deployment of theatrical and artistic skills of a high international standard did much to raise the public profile of the project and provided valuable lessons in the power of these media in communicating environmental messages. More could have been done, though, to tie these efforts into local institutions and strengthen artistic resources within the region. On the basis of the project's experience, theatrical and visual arts should be encouraged to play a more prominent role in future efforts to enhance the management of the Lake and its catchments.

(c) Environmental Legislation. This component proposed to study the compatibility of the existing legislation of the three riparian countries for the management of the Lake. As appraised, it was to have been implemented by legal experts under the project's management. However, this was changed during the first year of the project by transferring total responsibility for financing and implementation of the component to FAO. It is now being implemented by FAO under its Technical Cooperation Programme (TCP) as an international project for the three riparian countries, which entailed the time-consuming preparation of a project document acceptable to each of the Governments. Having approved the document in February 1998, the three countries have now completed national review reports, and these are to be consolidated into a single document report following a joint workshop that will be organized shortly. Subsequently, a draft agreement for international cooperation in the management of Lake fisheries, supported by legal instruments to harmonize current legislation, will be prepared for consideration and approval by an inter-governmental meeting.

(d) Protected Area Management. The main output expected under this component was a Strategic Plan for Nankumba Peninsula, with special attention to the problems of the LMNP. This study was to be based on the information gathered during a first phase study and was to be carried out in consultation with local communities. Implementation of this component was held back due to administrative delays and was carried out in 1999 by an international consulting firm. The resulting strategic plan for Nankumba Peninsula was produced after intensive consultation with the local communities. The main problem identified was unregulated access to natural resources, with consequent misuse affecting agriculture, fishing, forests, wildlife and tourism. The study proposed to resolve these problems by empowering local communities to take legal ownership of the land and natural resources, to regulate their utilization, and to develop a tourism industry that is compatible with the sustainable utilization of the natural resources. The report was well received by all stakeholders, although the delay in implementing the plan appears to have discouraged local communities, whose expectations for a rapid development programme were raised during the preparation of the plan.

4.3 Net Present Value/Economic rate of return:

As a biodiversity conservation study project, no economic analysis was carried out for the project at appraisal or at completion.

4.4 Financial rate of return:

Being a project that essentially gathered scientific information, financial analysis is not applicable.

4.5 Institutional development impact:

The project's institutional impact has been significant as it strengthened the research capacity of the riparian countries. In particular, the training of 10 graduate students, with the opportunity of focusing their dissertation studies on the Lake, has raised the research institutions' operational capability. Having proven their research skills by preparing sound dissertation papers, it is reasonable to assume that they will continue to undertake further research for better understanding and management of the Lake and its catchment. They will also be instrumental in training other young professionals from the riparian countries. On-the-job training given to the counterpart staff throughout the entire project implementation period also represents an important contribution to institutional strengthening, complementing and supporting the skills of the research graduate students. Together, these research staff will be able to lay the foundation for a meaningful research programme for the Lake.

Although the scientific information gathered by the project will facilitate the work of many concerned governments and other institutions, the project did not achieve sustained involvement by all relevant technical agencies in its execution of the scientific work program. Fishery and wildlife departments were involved in the project as members of the SC to deal with the overall management of the project but, except for the scientific conferences and meetings organized by the project in 1999, there were no other fora in which they could regularly discuss technical and scientific issues. Such weak linkages with these agencies during project preparation and implementation will not necessarily reduce the project's long-term impact in guiding the future of Lake management, but they will certainly delay it. This was noted as one of the project's shortcomings. The other provision for technical interaction with local institutions was in the context of the RAG, but the group was not firmly established by the project management and this opportunity for creating regular intellectual linkages was missed.

5. Major Factors Affecting Implementation and Outcome

5.1 Factors outside the control of government or implementing agency:

The project was not affected by any factors outside the control of government.

5.2 Factors generally subject to government control:

The main factor subject to government(s) control that haunted the project was the difficulty in rehabilitating the Kyela research station in Tanzania and establishing the Metangula station in Mozambique. The lack of decisive action to resolve this impasse meant that rehabilitation of the Kyela station was initiated and completed after considerable delays, while the Metangula station is yet to be built. In addition, the governments' delay in

nominating graduate trainees lost valuable time, ultimately hindering the return of the students until after the departure of the project scientists.

5.3 Factors generally subject to implementing agency control:

Two factors that were under the absolute control of project management have reduced the impact of the project. The first was the termination of the work of the Senior Ecologist in January 1998 and the initiation of a new programme in June 1998, using another ecologist, with insufficient attention paid to the work carried out previously. As explained earlier (para 4.b), the ecological data collected during 1997 has yet to be fully processed. The second factor is the negligence in establishing the Research Advisory Group, as this could have been an important technical link with other government agencies.

5.4 Costs and financing:

At project appraisal, total project costs were estimated at US$5.44 million. This was expected to be financed through a GEF Grant amounting to SDR 3.5 million (US$5.0 million). A further CIDA Grant, amounting to CDN$ 4.00 million was provided under a separate agreement. At completion, total project costs amounted to US$7.60 million, of which GEF financed US$4.96 million and CIDA US$2.64 million. The bulk of the GEF and CIDA funds were spent on research activities. In addition to GEF and CIDA, DFID has also contributed significantly to the project by paying the costs related to the repair and operation and maintenance of the research vessel. DFID also provided access to the facilities at Senga Bay.

6. Sustainability

6.1 Rationale for sustainability rating:

The project aimed at producing important scientific information essentially as a one-off output. Obviously, research activities cannot continue at the same intensity after the project has closed, but this should not be seen as a sustainability issue. The project's highly relevant scientific products are now at the disposal of all planners and managers involved in the preparation of the proposed Lake Malawi Environmental Management Project and it will be up to them to use these products over many years to come. However, sustainability of project activities becomes relevant with regard to capacity-building. According to the ICR mission, the institutional strengthening obtained through staff training, both at professional and technical levels, will remain as a sustainable achievement of the project. This is because the three governments intend to use the staff in carrying out scientific work within their respective institutions, while the international academic linkages fostered by the project also secure future international cooperation on a long term and self-sustaining basis. The environmental awareness programme appeared to have had a considerable positive impact on the communities it covered, even though its overall geographical coverage was necessarily limited. Project design did not provide for the continuation of this programme beyond the life of the financing agreement, and sustainability is therefore limited to the capacity-building aspect of this work.

6.2 Transition arrangement to regular operations:

Once the project closed, all the staff returned to their respective institutions and are now working there. All project outputs in terms of studies and reports have been placed at the disposal of the Governments. The fish samples collected by the project for the three

countries are now at the project headquarters and will be transferred to the countries to enrich their reference collections. The three Governments have decided to keep Senga Bay with all its facilities as it is, and with support from the GEF are taking steps to develop the station into an International Centre for Aquatic Research and Education (ICARE). The countries also recognize the importance of conserving the lake ecosystem and that the success of this will depend in tri-national participation and management of the Lake. There is also consensus that any follow-up management actions will need to be placed in a regional framework of cooperation and harmonized policies for sustainable management of the Lake and its watershed, which should also address poverty alleviation linked to improved natural resource management, land use and other strategic economic activities such as tourism development. However, the countries have expressed some concern related to the various levels of readiness, capacity and overall political commitment by the three riparian states to be equal partners to implement an ecosystem management approach to manage the Lake jointly. The countries recognize that establishing such capacities and appropriate regional institutions will take considerable effort, support and time. Furthermore, findings from the work carried out by the project clearly illustrate that the three countries have different priorities and impacts on the lake ecosystem and also face different constraints in their capacity to manage the Lake resources. Since not all three countries are equally ready for development of their national programmes in the lake basin, some flexibility in support for the countries will be required in order to assist preparation of such national programmes while enabling each country to collaborate with each other at its own pace and on the transboundary areas or sectors where such strategic collaboration and consultation is essential. Finally, it would be also desirable that the researchers trained under the project carry on their work relationship with the TA personnel and their institutions in order to ensure continuity of research on the Lake.

7. Bank and Borrower Performance

Bank

7.1 Lending:

The Bank provided significant inputs during the conceptualisation and preparation of the project. During preparation, the Bank was able to persuade GOM to put on hold a proposed mass tourism development in LMNP, which would have compromised the Park's essential conservation functions. By questioning the wisdom of establishing a tourism complex in such a fragile area without studying potential environmental impacts, the Bank missions encouraged GOM to study the matter carefully before embarking on any tourism development activity. The inclusion of the Nankumba Peninsula strategic plan within the project design was a direct consequence of this dialogue.

In spite of the significant contribution to the formulation of such a relevant scientific programme focusing on conserving the biodiversity of the Lake, the appraisal mission did not provide a workable institutional base to the project. This failure can be seen from two angles. Firstly, there was inadequate reflection in project organization and management of the regional nature of the project. The Grant Agreement was signed by GOM, the SC was chaired permanently by a PS from GOM and project resources were controlled by GOM, with no provision for the Governments of Tanzania or Mozambique to directly expend project resources or to be accountable for them. Even the civil works in Kyela and Metangula were to be financed through the UNDP offices in Tanzania and Mozambique, respectively. Not a single agreement or letter of understanding was signed between the donors and the project on the one side, and the Governments of Tanzania and Mozambique as well as UNDP on the other during project preparation or at appraisal. This situation led to disagreement over the distribution of resources and benefits between the participating countries, which was

exacerbated by the lack of progress on Kyela and Metangula research stations. The second weakness was the lack of clarity in describing the management functions of the SC and the Project Administration. Clear-cut distinction of the policy guidance role of the SC and the managerial role of the PM at appraisal would have reduced some of the friction recorded during implementation between chairmen of the SC and the PM.

7.2 Supervision:

A total of nine full supervision missions were carried out by the Bank during project implementation. Although the supervision missions started early, the first coinciding with the official launch of the project, the first three missions (July 1995-March 1996) were very brief and did not provide the technical and managerial support needed by a project management team with little experience in implementing a project of this sort. While the initial missions provided guidance on the requirements to be fulfilled, such as completion of the PIP and procurement plan, they did not make available sufficient technical advice. The last of these initial missions was fielded in March 1996, but after this supervision mission there were only regular follow-ups conducted by the Country Office with no full HQ supervision missions conducted for about 12 months. This period coincided with the time when the project moved into full implementation and increasing management complexity. In addition, during this time, the World Bank Task Managers changed three times, impairing continuity in the engagement with stakeholders, including other donors. It was only after task management of the project is transferred to the then newly merged Southern and Eastern Africa Rural Development Division, and with the assignment of the project to a new Task Manager in early 1997, that the situation improved substantially. From this period onwards, not only did the frequency of missions increase (two each on 1998 and 1999) but the quality of supervision changed in that missions became more thorough in reviewing technical and other issues. The composition of the missions was also more relevant to the project as they included scientists that could engage in technical discussions and guide the project staff. These latter missions undertook constructive dialogue with the project scientists and encouraged them by providing advice where necessary. Defining better the scientific outputs of the project was one of the supports provided by these missions, which were indeed instrumental in assisting the scientists to achieve their objectives successfully. During this period, an increased openness to collaborate with other donor partners resulted in the participation of representatives from CIDA and DFID. All supervisions since March 1997, including in the MTR, were joint missions with either one or two of the other donors participating. Therefore, not only did the supervision missions provide a thorough review of the project, but they also established good linkages between the project and other donors on one hand, and between the donors and ministry staff on the other. On the negative side were the inability of the supervision missions to detect and solve the problem concerning the first Senior Ecologist, as well as the lack of early resolution of the deadlock in rehabilitation of Kyela and Metangula research stations.

7.3 Overall Bank performance:

Overall, the Bank's performance should be considered as satisfactory, but only marginally so. The difficulties mentioned above in the project's institutional design, as well as weakness in the appraisal and earlier supervision missions had implications on some aspects of project implementation despite the general outcome of the project as satisfactory. Still, the project objectives of establishing the scientific basis for conserving the Lake's biological diversity were well served by the three components, i.e. research, capacity-building and environmental legislation. The well-balanced technical design of the Project's core science programme, as well as the Bank's decision to resist the proposed dubious tourist development

in LMNP, could not be considered to outweigh the initial shortcomings. Likewise, although it cannot compensate for earlier more modest Bank performance, the high quality supervision of the last six missions was indeed instrumental in assisting the project to achieve its objectives successfully.

Borrower

7.4 Preparation:

Overall, the borrower participation during project preparation was considered satisfactory. During project preparation, all three countries were keen to upgrade their policies for safeguarding the environment. To this effect, they were undertaking institutional and policy reforms to ensure the protection of the environment and biodiversity. The creation of the scientific, educational and policy basis for conserving the Lake's biological diversity under the project was thus in line with these countries' development objectives. One important weaknesses that can be identified is however the lack of inter-governmental discussions on the project during project preparation. Although GOM in its capacity of SADC Sector Coordinator for Inland Fisheries signed the Trust Fund Agreement representing all the riparian countries, there was no prior agreement on the common strategy that should be followed by the riparian countries. In addition, it should have been anticipated that an institutional arrangement that gave an unbalanced authority among the three countries would have created friction between them. However, the blame in this matter should be shared equally between the Governments and the Bank.

7.5 Government implementation performance:

This is not applicable as there was no specific Government implementing the project, but three Governments represented in the SC.

7.6 Implementing Agency:

The performance in Project implementation has fallen short of expectations, if consideration is made of the delays recorded in the initial years, and the fact that construction of the proposed research station in Mozambique is yet to be completed. The slow Project start up seriously affected some activities, e.g. the missed opportunity in the overlap of returning graduate students with project scientists as a result of belated enrolment to the universities. A major criticism generally leveled against the SC was also its involvement in micro-managing the project, instead of being limited to advising and guiding the PM. This led at times to paralysis when urgent decisions should have been taken, because the PSs chairing the SC (there were at least four different PSs who chaired the SC during project implementation) were not always available for consultation and may have deferred some decisions to the SC, who met, at best, every four months. Another example of poor performance was the excessive delay (about 3 years) in awarding the contract for preparing the Nankumba Peninsula Strategic Plan due to time consuming discussions on tendering. In addition, neglect in establishing a Research Advisory Group should be considered a major shortcoming of the SC since the project forfeited the opportunity of obtaining scientific advice when this was required. The SC should also have addressed reasons for the disagreement between the PM and the first Senior Ecologist and resolved it in the best interest of the project. Towards the later years of the project, the perception of the other member countries portrayed the SC as if it was implementing a Malawian project, implying a loss of project ownership in the other two countries. On the positive side, it should be recorded that the high profile the project enjoyed was thanks to the three countries' decision

to assign senior officers to the SC. This enabled the project to resolve some issues as they arose, such as for instance, facilitating the lake-wide survey covering the three countries.

7.7 Overall Borrower performance:

The performance of the SC has been less than satisfactory. This rating is influenced by the initial delays in project start-up, failure to complete the Metangula research station in Mozambique, and the generally strained relationship between the chairman of SC and the PM and representatives of Tanzania and Mozambique.

8. Lessons Learned

The following positive and negative lessons can be drawn from the Project:

- The project objective of acquiring knowledge of the Lake's biodiversity was fully justified by the serious lack of hard data on the nature of the Lake's biodiversity and productive systems. The standards applied in the research component were generally of a high order, and were guaranteed by strong linkages with academic institutions of international repute. Parallel to generating scientific information, the project also rightly sought to build the institutional capacity of the riparian states through higher-level university education and on-the-job staff training. This was a far sighted decision as it provided the riparian countries with a cadre of scientific personnel that can now build upon the research undertaken by the project to guide the future of Lake management.

- An important lesson related to the project's institutional design stems from its weak horizontal linkages with national institutions for which the project's scientific findings have most relevance. In Malawi such institutions include the Fisheries Department, especially the Fisheries Research Unit; the Water Resources Department of the Ministry of Water Development and the University of Malawi. Although such weak linkages with the national agencies will not necessarily reduce the project's long-term impact in determining the future of Lake management, they will certainly delay it.

- During its extended phase, the project enabled initiation of an environmental monitoring program based on key parameters identified during the project as critical to the maintenance of the ecosystem in its current structure and functions. This activity now stands as a major foundation for riparian cooperation in the management of the Lake resources. The decision to extend the project to strengthen riparian capacities for collaboration in the implementation of such a cooperative monitoring program was a sound one and has significantly contributed to leverage greater GEF funding for preparation of the next phase of the program.

- The project demonstrated that establishing appropriate regional institutions will take considerable effort, support and time. Project findings illustrate that the three countries have different priorities and impacts on the lake ecosystem and also face different constraints in their capacity to manage the lake resources. Since not all three countries are equally ready for development of their national programmes in the lake basin, an important lesson from the project for the next phase is that some flexibility in support for the countries will be required in order to assist preparation of such national programmes while enabling each country to collaborate with each other at its own pace and on the transboundary areas or sectors where such strategic collaboration and consultation is essential.

- Implementation of the project has demonstrated that combining the scientific research program with development activities, such as area development planning, in a situation where

management resources were limited, pulled management attention away from the core science program without ensuring timely implementation of the other components. Ideally, scientific programs should not be saddled with non-research activities. If this is unavoidable, it is essential that ample management resources be provided.

- While it may seem obvious, the experience of the project makes it necessary to re-state that insufficient preparation of a project component will invariably affect the progress of the project, as this will have to be accomplished by project management during implementation, hence delaying project execution. This was the case with the failure to determine the suitability of equipment and facilities at Senga Bay during appraisal, as it compelled project management to sort it out after project effectiveness, slowing down the project.

- Equally obvious, lack of clarity in describing the roles of the different actors in a project will predictably result in confusion and tension among the parties, as exemplified in the project by: (a) occasional friction between the Chairman of the SC and the PM, as they both considered themselves as having the lead management role; and (b) UNDP's lack of recognition of the task of constructing research stations in Tanzania and Mozambique, thus leading to significant implementation delays.

- An important lesson stems from inadequate reflection during project preparation concerning the organization and management requirements of the regional nature of the operation. In its capacity of SADC Coordinator for Inland Fisheries, the Government of Malawi signed the Trust Fund Agreement on behalf of the two other riparian countries, but there was no provision for the Governments of Tanzania or Mozambique to directly expend project resources or to be accountable for them. This situation led to frequent disagreements over the distribution of resources and benefits between the participating countries. The lesson here should be that protocols and other formal agreements regarding objectives, commitments, legal accommodations and implementation arrangements among participating countries in a regional initiative should be made as much as possible during project preparation and their formal signing identified as an important benchmark for project effectiveness. The process of coming to agreement on basic protocols deepens the understanding of what is to be undertaken while revealing unanticipated complications that would have hindered implementation if left unresolved.

- A related lesson is that multi-country initiatives impose a higher management burden than single country programmes. In addition to the added logistical requirements, multi-country initiatives require careful attention to the development of a sense of equity among partners, the maintenance of clear channels of communication, and the promotion of the benefits of collaboration. This is confirmed by recent experience in East Africa with programmes of considerable complexity such as the Lake Victoria Environmental Management Project and the Nile Basin Initiative.

- Project activities which are considered crucial for the realization of subsequent ones should be dealt with during project preparation and in the form of agreements during project negotiations, in order to avoid delay in the planning of the activities affecting those that follow. Under the project, there were sufficient grounds to make agreements on a training plan and selection of the graduate students key points during project negotiations, as early resolution of these issues by the governments would have guaranteed the trainees' early return to the project station to achieve the intended overlap with project scientists.

- The deployment of theatrical and artistic skills of a high international standard did much to raise the public profile of the project and provided valuable lessons in the power of these

media in communicating environmental messages. More could have been done, though, to tie these efforts into local institutions and strengthen artistic resources within the region. On the basis of the project's experience, theatrical and visual arts should be encouraged to play a more prominent role in future efforts to enhance the management of the Lake and its catchments. Overall, the environmental awareness programme supported by the project appeared to have had a considerable positive impact on the communities it covered, even though its overall geographical coverage was necessarily limited. Again, project design did not provide for the continuation of this programme beyond the life of the financing agreement, and sustainability was therefore limited to the capacity-building aspect of this work.

- Another positive lesson relates to the use of bilateral donors for supporting specific components of the project. In the GEF project, this funding arrangement provided focus and greater efficiency in the management of the limnology and water quality component that was supported by CIDA. Bilateral donor support also has the potential to provide flexibility to the implementation of the project during unexpected situations. The GEF project benefited greatly from the participation of DFID which provided timely assistance for maintenance of the RV Usipa during critical periods of project implementation.

- The quality of Bank supervision of the project was compromised by the high turnover of Task Managers, at least during the first half of the life of the project. This resulted in a loss of institutional memory and disruptions to the smooth relationship between the Bank and the implementing agency so important for the success of any project. On the contrary, if staff continuity is maintained, Bank's focus on the project becomes consistent and issues become clearer, ensuring a lasting relationship with the borrower and co-financiers as was proven during the last three years of project implementation.

- Finally, the decision to hold a joint review meeting of the ICRs for the GEF/SADC Lake Malawi/Nyasa Biodiversity Conservation Project and the IDA Fisheries Development Project, given their significant learning potential and the obvious linkages to the Lake Malawi Environmental Management Project (currently under preparation), should be considered as a good practice. The preparation of an intensive learning ICR (ILI) for the Fisheries Development Project (FDP) and the required Beneficiary Impact Assessment Study enabled a more complete assessment of the impact of the project on groups of beneficiaries at the village level, including shortfalls that affected the project's impact as perceived by these beneficiaries, and beneficiaries' perceptions of the corrective measures that would have been undertaken to address these problems. The beneficiary study complements the assessment conducted by the FAO ICR mission team while providing baseline data and field-level perspectives from selected stakeholder communities to help evaluate FDP support to fisheries extension. This data set, together with the above lessons learnt from the GEF project, provide critical inputs and baseline information against which the intended development and environmental impact of the next project will be evaluated.

9. Partner Comments

(a) Borrower/implementing agency:

Between October 16 and 25, 2000, the ICR mission team (led by FAO) met will all beneficiary institutions and key government agencies that were involved in the implementation of the project. Based on the mission discussions and the Government inputs into the ICR process, the FAO-led ICR team prepared and discussed an Aide Memoire with the Ministry of Natural Resources and Environmental Affairs at the ICR mission wrap-up

meeting on October 25, 2000. The meeting was chaired by the Principal Secretary of the Ministry and Chair of the Project's Steering Committee, Mr. George Mkondiwa, and was attended by the Directors of Fisheries, Forestry and Parks and Wildlife and representatives from cooperating donor partners (DFID and CIDA). Following the wrap-up meeting, the ICR Mission Team Leader revised the draft Aide Memoire to incorporate comments made by the Government and donor agencies during the meeting. A copy of the final ICR mission Aide Memoire is presented in Annex 7a of this ICR document. The Government also participated at the ICR Review Meeting in Washington on December 19, 2000, via a video-conferencing link to the Malawi Country Office in Lilongwe. The Government's Evaluation Report is enclosed as Annex 7c of this ICR.

(b) Cofinanciers:

A Letter of Appreciation from the Canadian International Development Agency was received and is available in the project file. The letter was forwarded to Ms. Barbara Kafka, former Country Director, and was signed by Ms. Wendy Miller, Chief of the Malawi Program, Southern Africa Division, CIDA.

(c) Other partners (NGOs/private sector):

No additional feedback on the ICR document had been received from other partners by December 29, 2000.

10. Additional Information

The final ICR Mission Aide Memoire prepared by FAO and discussed with the Government on October 25, 2000, is presented in the ICR document as Annex 7a. In addition, more detailed information on the project is given in a note entitled "Background and Project Implementation Experience," included in the ICR as Annex 7b. The Government's Evaluation report is presented as Annex 7c of the ICR.

Annex 1.

Key Performance Indicators/Log Frame Matrix

Outcome/Impact Indicators: Indicator/Matrix	Projected in last PSR[1]	Actual/Latest Estimate
Documentation of the distribution of biodiversity in Lake Malawi Creation of a regional framework for conservation and development of Lake Malawi/Nyasa	A Biodiversity Map and Management Plan, drawing on the research, planning and legal review outputs of the project and other relevant published information in order to recommend appropriate Lake management strategies.	Databases containing information on fish distributions and ecology and shoreline habitats exist but have only been analysed to a limited extent. The project made an outstanding contribution to scientific understanding of the functioning of the lake and its catchments as a productive system and reservoir of biodiversity. However, the synthesis of project findings into management recommendations for conservation and development was not fully achieved, with the framework for regional collaboration remaining at an early stage of development.
Preparation of a plan for ecologically compatible development in the Nankumba Peninsula and Lake Malawi National Park	A Nankumba Peninsula strategic plan	The Nankumba Peninsula strategic plan was fully developed through stakeholder participation, and is currently being incorporated in part into a management plan for Lake Malawi National Park.
Scope for regional harmonisation and strengthening of lake-related environmental legislation reviewed	A legal review report and new or amended environmental legislation proposed in draft.	Process for harmonising regional fisheries legislation under way in all three countries as a first stage in this process.
Awareness raised among all sectors of society on issues related to the biodiversity of Lake Malawi/Nyasa	Development of a conservation awareness programme, including media productions, for all sectors of society.	International standard theatrical and artwork products raised awareness of issues related to the Lake on many levels, from village to central government and political. A community environmental awareness programme was successfully implemented, albeit within a limited geographical range.

Output Indicators: Indicator/Matrix	**Projected PSR/1**	**Actual/Latest Estimate**
Research Component:		
(a) Biodiversity Surveys	Biodiversity report and maps showing critical habitat and biodiversity hotspots	A digital biodiversity atlas comprising 17 vector and raster maps, relational databases and data tables on a single compact disk, and multi-media presentations on 4 PAL format video tapes and 3 compact disks. These are accompanied by a final report and user manual.
(b) Limnology and water quality monitoring	Report on water quality of lake habitats outlining major threats to biodiversity	Report on water quality outlining major threats to biodiversity and including investigations of river discharge; atmospheric nutrient deposition; deep water renewal; nutrient upwelling and nutrient cycling; factors controlling algal abundance and composition, and contaminants in water, sediments and biota. The report provides recommendations for future management of the Lake's water quality.
(c) Fish taxonomy and ecology	Primary scientific information on species distribution and ecology	Report on fish systematics and taxonomy, detailing the revision of eight species groups (including more than 100 species) and a description and discussion of the distribution and species richness of mbuna (rocky shore cichlids) and non-mbuna cichlids. 5 reference collections of fish: one in each of the riparian countries with back-ups in Belgium and RSA. Report on fish ecology presents information derived in the project's final year on temporal trends and species composition of demersal trawl stocks; life history characteristics of 40 important demersal cichlid species; the diets of 9 important demersal species; a lakewide study on fish population continuity in 2 species

(d) Rehabilitation of research stations	Species identification manual Enhanced facilities for local and visiting scientists	and an assessment of the influence of suspended sediments on the distribution and abundance of rocky and sandy-shore cichlid species. An illustrated guide to the sandy-shore fishes was in an advanced state of preparation in October 2000. Senga Bay (Malawi): laboratories rehabilitated; two offices constructed; one dwelling converted into a systematics laboratory; fish store constructed; water pump, standby generator, laboratory equipment, three vehicles and one boat procured. Cape Maclear (Malawi): Research station rehabilitated; one boat procured. Kyela (Tanzania): a new research facility constructed; one boat procured. Metangula (Mozambique): planned construction of a new research facility not initiated by October 2000; one boat procured.
National Capacity Building Component: (a) Training	32 individuals trained in scientific, technical and education disciplines Informal and formal information exchange programs	10 persons completed postgraduate training in scientific disciplines. 22 persons trained in environmental education (6-month residential courses). Academic associations formed with the Universities of Manitoba and Waterloo (Canada) and Rhodes University (South Africa). Study tours for students of environmental education carried

		out in the Republic of South Africa and Malawi.
b) Conservation awareness	Conservation awareness program including media productions	Study tour for traditional leaders in Nankumba conducted to visit village trusts in northern Botswana. The first village trust was established in Nankumba Peninsula. Environmental Education Centre at Cape Maclear rehabilitated and one bus for community conservation programmes provided. Plays related to lake ecology developed by Theatre for Africa and performed to more than 100,000 people in the three riparian countries. 11 actors and one production manager trained. Conservation awareness programs based on information gained from the six-month training course mounted in 18 schools and 18 villages in Nankumba. 2 workshops were held for school Wildlife Club patrons (school administrators and teachers) from area schools. 1 workshop was organized for 40 school students (two students from each Wildlife Club in 20 schools). More than 80 traditional leaders from lakeshore communities participated in environmental awareness workshops. A two day workshop was held on water quality monitoring for students and teachers from 10 schools.

Environmental Legislation Component:	Recommendations to riparian countries for revisions to environmental legislation relating to the lake. New or amended legislation drafted as necessary	Analysis of relevant fisheries legislation in an advanced state in all three countries under an ongoing FAO-TCP project, with the intention of preparing a regional review of fisheries management options. International cooperation in other Lake-related environmental fields limited under this project to monitoring rather than regulation. Not yet achieved but revision of fisheries legislation is planned under a second-phase FAO-TCP project.
Protected Areas Management Component: Strategic plan for Nankumba peninsula	Community roles in park and lake management identified. Strategic plan for Nankumba peninsula and Lake Malawi National Park	Strategic plan for Nankumba peninsula and Lake Malawi National Park developed through stakeholder participation and identifying community roles in park and lake management Two parks planning meetings held in May 1999 to discuss strategies for the formation of Trans-Frontier Natural Resource Management Areas

[1] End of project

Annex 2

Project Costs and Financing

Project Cost by Component (in US$ million equivalent)

Project Cost By Component	Appraisal Estimate US$ million	Actual/Latest Estimate US$ million	Percentage of Appraisal
Research	2.46	4.18	
Strengthening National Capacity	0.36	1.32	
Legislation	0.13		
Protected Areas	1.09	0.35	
Project Administration	0.83	1.18	
Total Baseline Cost	4.87	7.03	
Physical Contingencies	0.57	0.57	
Total Project Costs	5.44	7.60	
Total Financing Required	5.44	7.60	

--Actual/Latest Estimate includes costs expended under CIDA Grant
--Comparison under "Percentage of Appraisal" would not be valid as the appraisal estimates are based on GEF funds only, while the actuals include both GEF and CIDA funds

Project Costs by Procurement Arrangements (Appraisal Estimate)

(US$ million equivalent)

Expenditure Category	ICB	Procurement NCB	Method[1] Other[2]	N.B.F.	Total Cost
1. Works	0.00	0.57	0.00	0.00	0.57
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2. Goods	0.07	0.00	0.00	0.00	0.07
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3. Services	0.16	0.00	0.00	0.00	0.16
Contracts	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
4. Consultants	0.57	0.00	2.84	0.00	3.41
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
5. Vehicles	0.10	0.00	0.00	0.00	0.10
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
6. Operating Costs	0.00	0.00	1.13	0.00	1.13
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Total	0.90	0.57	3.97	0.00	5.44
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

--Appraisal Estimates by Procurement Arrangement consist of GEF funds only

Project Costs by Procurement Arrangements (Actual/Latest Estimate) (US$ million equivalent)

Expenditure Category	Procurement Method[1] ICB	NCB	Other[2]	N.B.F.	Total Cost
1. Works	0.00	0.56	0.00	0.00	0.56
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2. Goods	0.00	0.22	0.39	0.00	0.61
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3. Services	0.20	0.78	0.00	0.00	0.98
Contracts	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
4. Consultants	0.60	0.00	3.40	0.00	4.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
5. Vehicles	0.00	0.20	0.00	0.00	0.20
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
6. Operating Costs	0.00	0.00	1.25	0.00	1.25
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Total	0.80	1.76	5.04	0.00	7.60
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

--Actual/Latest Estimates comprise both GEF and CIDA funds

1/ Figures in parenthesis are the amounts to be financed by the Bank Loan. All costs include contingencies.

2/ Includes civil works and goods to be procured through national shopping, consulting services, services of contracted staff of the project management office, training, technical assistance services, and incremental operating costs related to (i) managing the project, and (ii) re-lending project funds to local government units.

Project Financing by Expenditure Category (in US$ million equivalent)

	Appraisal Estimate			Actual/Latest Estimate			Percentage of Appraisal		
	Bank	Govt.	CoF.	Bank	Govt.	CoF.	Bank	Govt.	CoF.
1. Works	0.57			0.56			98.2		
2. Goods	0.07		0.60	0.04		0.57	57.1		95.0
3. Service Contracts	0.16		0.65	0.23		0.65	143.8		100.0
4. Consultants	3.41		1.20	2.68		1.20	78.6		100.0
5. Vehicles	0.10			0.20			200.0		
6. Operating Costs	1.13			1.25			110.6		
7. Unallocated			0.30			0.22			73.3

Source for Bank funds is GEF; source for CoF is CIDA

Annex 3

Economic Costs and Benefits

N/A

Annex 4

Bank Inputs

(a) Missions:

Stage of Project Cycle	No. of Persons and Specialty (e.g. 2 Economists, 1 FMS, etc.)		Performance Rating	
Month/Year	Count	Specialty	Implementation Progress	Development Objective
Identification/Preparation 02/92	*?*	Information not available		
Appraisal/Negotiation 02/93	*11*	M, MM, AD, FI, WL, FI, FI, E, W, W, WS		
Supervision Supervision 1, 09/95	*2*	E, R		
Supervision 2, 12/95	*2*	E, R		
Supervision 3, 03/96	*2*	E, R	U	S
Supervision 4, 03/97	*3*	NM, DI, CI	U	S
Supervision 5 (MTR), 01/98	*7*	E, NM, NM, R, CI, DA, DI	S	S
Supervision 6, 09/98	*8*	NM, NM, R, CI, CI, CI, DI, DI	S	S
Supervision 7, 03/99	*9*	NM, NM, NM, R, E, CI, CI, CI, DI	S	S
Supervision 8, 09-10/99	*5*	NM, NM, A, R, E	S	S
Supervision 9, 08/2000	*1*	NM	S	S
ICR ICR Mission (led by FAO)	*3*	FI, AD, ID	S	S

A = Agriculturist; AD = Adviser; CI = CIDA representative; DA = DANIDA representative; DI = DFID representative; E = Economist; FI = Fisheries Specialist; ID = Institutional Development Specialist; M = Management Specialist; NM = Natural Resource Management Specialist; R = Agricultural Research Specialist; S = Sociologist; W = Wildlife Specialist; WS = Water Specialist.

(b) Staff:

Stage of Project Cycle	Actual/Latest Estimate	
	No. Staff weeks	US$ (,000)
Identification/Preparation	96.40	230.70
Appraisal/Negotiation	69.0	200.9
Supervision	139.03	418.34
ICR	3.36	15.11
Total	307.79	865.05

Break-down of Bank Inputs by Fiscal Year

Identification/Preparation					
1992			33.90		71.70
1993			62.50		159.00
Total			**96.40**		**230.70**
Appraisal/Negotiation					
1994			69.00		200.90
Total			**69.00**		**200.90**
Supervision					
1995			40.10		141.40
1996			19.60		49.90
1997			12.40		46.30
1998			28.00		67.40
1999			24.90		67.30
2000			14.03		46.04
Total			**139.03**		**418.34**
ICR					
2001			3.36		15.11
Total			**3.36**		**15.11**

Annex 5

Ratings for Achievement of Objectives/Outputs of Components

(H=High, SU=Substantial, M=Modest, N=Negligible, NA=Not Applicable)

	Rating
Macro policies	*NA*
Sector Policies	*NA*
Physical	*M*
Financial	*M*
Institutional Development	*SU*
Environmental	*H*
Social	
Poverty Reduction	*NA*
Gender	*NA*
Private sector development	*NA*
Public sector management	*M*

Annex 6

Ratings of Bank and Borrower Performance

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HU=Highly Unsatisfactory)

6.1 Bank performance	*Rating*
Lending	*U*
Supervision	*S*
Overall	*S*

Note: Overall Bank Performance is being rated as satisfactory, but only marginally so, given the difficulties discussed in the institutional design of the project, as well as the noted weakness in the appraisal mission which had implications on some aspects of project implementation despite the satisfactory outcome of the project. It is however recognized that the Bank provided valuable inputs during the conceptualization and preparation of the project. The project objectives of establishing the scientific basis for conserving the Lake's biological resources were well served by the three project components, i.e. research, capacity-building and environmental legislation. The call for the project to accumulate a large scientific data base, and at the same time, to produce professional and technical staff that could undertake further scientific work on the Lake, were appropriate development objectives supported by the project design. Although these or any other achievements cannot compensate for the earlier shortcomings at appraisal, it is recognized that the role of project supervision and overall implementation support was indeed instrumental in assisting the project to achieve its objectives successfully.

6.2 Borrower performance	*Rating*
Preparation	*S*
Government implementation performance	*U*
Implementation agency performance	*U*
Overall *U*	

Note: Borrower participation during project preparation was considered satisfactory. During preparation, all three countries were keen to upgrade their policies for safeguarding the environment. To this effect, they were undertaking institutional and policy reforms to ensure the protection of the environment and biodiversity. The creation of the scientific, educational and policy basis for conserving the Lake's biological diversity under the project was thus in line with these countries' development objectives. One important weaknesses that can be identified was however the lack of inter-governmental discussions on the project during preparation. Although GOM signed the Trust Fund Agreement representing all the riparian countries, there was no prior agreement on the common strategy that should be followed by the riparian countries. However, the blame in this matter should be shared equally between the Governments and the Bank. The other negative ratings are mainly due to the Steering Committee inability to manage differences among the riparian countries and failure to rehabilitate Metangula research station in Mozambique.

Annex 7.

List of Supporting Documents

Annex 7a: The final ICR Mission Aide Memoire prepared by FAO and discussed with the Government on October 25, 2000, is presented in Annex 7a below.

Annex 7b: More detailed information on the project is given in Annex 7b below entitled "Background and Project Implementation Experience."

Annex 7c: The Government's Evaluation report is included below as Annex 7c.

List of Supporting Documents:

In addition to reviewing all project files, the ICR Mission Team consulted the following key project documents:

--GEF/SADC Lake Malawi/Nyasa Biodiversity Conservation Project: Scientific Plan, July, 1996

--Management strategy--Conservation of Biodiversity: Time to Act, June 1999.

--Conservation priorities report, September, 1998.

--Ecology report, September 30, 2000.

--Limnology/water quality report, September, 1998.

--Extended Abstracts of the Senga Bay Wrap Up Scientific Conference of the SADC/GEF Lake Malawi/Nyasa Biodiversity Conservation Project, June, 1999.

--Report on Systematics and Taxonomy,June, 2000.

--Report on the 18-month Environmental Education Training Course for Tanzanian, Malawian and Mozambican Officers, September, 1998.

--Lake-wide Physical Processes/Water Quality Management Model for Lake Malawi/Nyasa, May, 2000.

--Nankumba Peninsula Strategic Plan, Volumes I and II, July, 1999.

--A Biodiversity Atlas for Lake Malawi/Nyasa, August, 2000.

--Beneficiary Impact Assessment Study of the Fisheries Development Project, September, 2000.

--Action Plan and Justification for a no-cost Extension of the GEF/SADC Lake Malawi/Nyasa Biodiversity Conservation Project,July 1999.

ICR AIDE MEMOIRE

Table of Contents

A. INTRODUCTION

1. A mission[1] from the FAO/World Bank Cooperative Programme (CP) visited Malawi from 16 to 26 October, 2000 to prepare an Implementation Completion Report (ICR) for the GEF/SADC Lake Malawi/Nyasa Biodiversity Conservation Project (the Project). The mission worked primarily with the Ministry of Natural Resources and Environmental Affairs (MNR&EA) and with the Project Administration Unit (PAU). Discussions were also held with other concerned government institutions - notably the Departments of Fisheries, Water Resources and National Parks and Wildlife, as well as donor agencies that supported the Project. These included the Canadian International Development Agency (CIDA), the Department for International Development (DFID), formerly ODA, and the Food and Agriculture Organization of the United Nations (FAO). The mission visited the main project headquarters at Senga Bay, Cape Maclear and Lake Malawi National Park and the Fisheries Research headquarters at Monkey Bay.

2. The mission would like to express its appreciation for the excellent support and cooperation provided by the Government and its staff during the preparation of the ICR. Mission findings are presented below.

B. BACKGROUND

General

3. Lake Malawi/Nyasa (the Lake) is an international lake bordered by three countries: Malawi, Tanzania and Mozambique. Malawi is a major beneficiary, as the greater part of the Lake's surface area and about 80% of the total lakeshore population are found within this country. The Lake is one of the oldest on earth, and is the fourth largest and ninth deepest lake in the world. Recent studies indicate that there are over 800 fish species in the lake, of which some 90% are endemic to the area. Such a large number of species is unmatched by any lake in the world, and this makes the Lake a unique reserve of biodiversity. In spite of this wealth of biodiversity, however, the ecological requirements and distribution limits of the fish were not known for most of the species. The lack of basic scientific information was the main reason for conceiving the Project as it was intended to carry out essential research initiatives to understand the Lake's ecosystem.

Project Objectives and Components

4. The objectives of the Project were to assist the riparian countries in creating the scientific, educational, and policy basis for conserving biological diversity of the Lake and its unique ecosystem. The Project's activities were organized into four components as shown below.

(a) **Research**, consisting of: (i) biodiversity surveys to inventory fish species and their distribution, identify critical habitat and biodiversity hotspots in the lake, produce a map of critical habitats, and identify threats to the lake's biodiversity; (ii) studies on the taxonomy, ecology and distribution of the cichlid species; (iii) a limnology and water quality monitoring programme to identify pollution threats to

[1] Consisting of: Pietros Kidane (Mission Leader, CP), Anthony G. Seymour (Environmental Specialist, Consultant) and Robert Hall (Institutions Specialist, Consultant). Dr. Robert Hecky, who was the coordinator for the limnology and water quality programme, has assisted the mission as a resource person.

hotspots and fish replenishment area; and (iv) the modest rehabilitation of the Cape Maclear Research Station in Malawi, the Kyela Centre Fisheries Research Station in Tanzania, and the Metangula Fisheries Research Station in Mozambique.

(b) **Strengthening National Capacity**, comprising "on-the-job" training of professional and technical staff from the riparian countries in ecology, taxonomy, limnology and environmental education. The training was to focus on strengthening local capacity for research and conservation planning activities for future Lake project/programmes. Activities under this component would increase conservation awareness among all sectors of society, from decision-makers to Lake resource users, through informal and formal educational initiatives implemented by the Wildlife Society of Malawi and the development of a conservation awareness programme, including media productions. Financing was also to be provided for rehabilitation of the Environmental Education Facility at Lake Malawi National Park, which had established an important educational link with the local schools and residents of the Park's enclave villages.

(c) **Strengthening Environmental Legislation**, including the review and evaluation of the compatibility of the existing legislation among Malawi, Mozambique and Tanzania for the management of the Lake'sbiodiversity. The results of the review would be presented at an environmental legislation conference of the three countries, and would culminate in a report to the riparian governments providing recommendations for revising and strengthening legislation and enforcement ability, while creating a harmonised and effective legal framework for the conservation of the Lake.

(d) **Protected Area Management** involving the preparation of a Strategic Plan for Nankumba Peninsula and Lake Malawi National Park. The Strategic Plan would be prepared in two phases. The first, dealing with data survey and collection of information, would be financed by the CIDA Industrial Cooperation Programme (CIDA, INC). The project would finance the second phase which would emphasize community participation in the planning process, identify community roles in Park and Lake conservation and conclude with proposals for preferred development options. Assistance would also be provided to the Government of Malawi (GOM) to design a funding mechanism to address recurrent funding for the sustainable development, management and maintenance of Lake Malawi National Park and the continued monitoring of biodiversity conservation indicators.

5. The Project, to be implemented over four years, was expected to prepare a comprehensive Biodiversity Map and Management Plan (BMMP) for the Lake based on the information it would collect. It was to be financed by the Global Environment Facility (GEF) and by CIDA, but to be executed by the World Bank. However, although the main project documents present the project as being financed by GEF and CIDA, the British aid agency DFID has from the outset contributed to the project significantly by providing the Senga Bay research facilities, equipment, maintenance of the satellite receiver, research vessel and skipper to serve under the project. During implementation, FAO also took responsibility for implementing the environmental legislation component by providing finance under its Technical Cooperation Programme (TCP).

6. As the sector coordinator for inland fisheries, forestry and wildlife within SADC, Malawi was to be responsible for the implementation of the Project on behalf of the riparian

countries. Therefore, the Malawian line ministry, i.e. the Ministry of Forestry and Natural Resources, now MNR&EA, was to take charge of the Project. A Steering Committee (SC) would be established, under the leadership of the Principal Secretary (PS) of this Ministry, to guide the Project. The SC would include members from the Departments of Fisheries and National Parks, or equivalents from the riparian countries, NGO/community representatives and international experts as needed. A Project Administration Unit (PAU) would also be set up in Senga Bay to carry out the day-to-day management of the Project. The PAU would be headed by a Project Manager (PM) who would be assisted by a Financial Controller, three scientific experts to lead the research, conservation planning and training components; and an international law expert to look after the environmental legislation component. The Wildlife Society of Malawi - an NGO - would be contracted for the conservation awareness activities of the Project; while the (then) Ministry of Physical Planning and Surveys (MPPS) would supervise the preparation of the Strategic Plan for Nankumba Peninsula and Lake Malawi National Park. The rehabilitation of the two research stations in Mozambique and Tanzania would be the responsibility of the respective Governments. However, the procurement and disbursement for the rehabilitation of these stations would be the responsibility of the United Nations Development Programme (UNDP). A Research Advisory Group (RAG), consisting of the Chief Fisheries Officers and Chief National Parks and Wildlife Officers from the riparian countries would participate in periodic reviews, and advise the PM on the Project's research activities.

7. The Project was declared effective on July 31, 1995 and formally launched in September 1995. It was closed on June 30, 2000, after an extension of eleven months. At completion, Project costs were estimated at US$ 7.6 million, of which GEF financed US$4.96 million and CIDA US$2.64. These costs do not include expenditures incurred by DFID who also contributed significantly to the project by paying the costs related to the repair and operation and maintenance of the project's research vessel. DFID also provided access to the research facilities at Senga Bay.

C. PROJECT IMPLEMENTATION AND RESULTS

Overview

8. A considerable delay was experienced in starting up the Project, primarily due to the slow pace of working of the SC. The SC, which was expected to meet three times a year, held its first meeting in September 1995, i.e., about three months after the Project was declared effective, and its second meeting took place only in April 1996, and that in the absence of the Tanzanian delegation. Since the SC was expected to approve all major project activities, its infrequent meeting at the beginning of the Project resulted in serious implementation delay. Therefore, the approval of the revised Project Implementation Plan (PIP), completed by the PM in February 1996, thefinalization of the recruitment of project staff, designation of trainees as well as the procurement of equipment and goods were held up pending formal approval.

9. Furthermore, some works that were necessary to keep the facilities and equipment at the Project site in Senga Bay functional, were overlooked at appraisal, and emerged, as problems during project commencement. These had to be tackled as prerequisites for smooth project implementation, and naturally required time for their realization. The shortcomings identified within Senga Bay included deficiencies and disrepair of site facilities and lack of maintenance of equipment. Essential works in refurbishing and construction of facilities, repairs and maintenance of laboratory equipment and of the research vessel (R.V. Usipa) were, therefore, found to be critical for starting Project activities. Several months passed before the Project could secure the necessary funds and carry out the corrective measures that could render the site facilities functional. As some of these deficiencies at Senga Bay were identified after the arrival of the scientific project staff, who in turn were fielded belatedly around mid-1996, slow start up was further aggravated. For all practical purposes, project

implementation got off to a good start only towards the end of 1996, about a year and a half after project effectiveness. By this time, all of the scientific work started to gain momentum, unlike the two components related to environmental legislation and the protected areas management, which lagged behind. The national capacity building component also started to move forwards as about half of the research students arrived at the project site in November 1996. By January 1997, five of the six counterpart staff had settled in the site and commenced work with the scientists, thereby obtaining on-the-job training envisaged under the project. To the contrary, by this time, little progress was made in implementing the environmental education and the building of conservation awareness activities. Theatre for Africa (TFA), contracted to play a major role in the building of conservation awareness, obtained no objection for its proposal from the World Bank only in January 1997, while the environmental Education Specialist, assigned to implement the education programme, assumed responsibility only in March 1997.

10. Because of the delays experienced in the initial year of the Project, and due to the need for including some additional activities, it became necessary to update and revise the original PIP. The PIP was therefore revised and a new report prepared in February 1996, before the arrival of the scientific staff. The revision included a procurement plan, a training plan and a more detailed research programme. It should be noted that project design had overlooked a number of important activities that were necessary for the successful implementation of the project, and some of these, such as repair and procurement of laboratory equipment for Senga Bay, were corrected while revising the PIP. Apart from this, project design was deficient in other areas also, particularly in project organization and management arrangements. The project document lacked clarity, and confused management roles, which should be the PM's responsibility, with those of policy guidance and coordination, which should have been the domain of the SC, being composed of high level officials from the three countries. Instead, the SC became excessively involved in the day-to-day management of the Project, leading inevitably to delays in implementation.

11. Because of the delayed start of the project, theMid-Term Review (MTR) was postponed from August 1997 to January 1998. The MTR mission concluded that in spite of the delays recorded, the core scientific, training and environmental education programmes remained viable and that objectives would be achieved as planned. The MTR also defined the scope of the vaguely described BMMP (paras. 5 and 13). Among other things, the review mission encouraged the riparian countries to look into the possibility of developing a suitable institutional structure and financing arrangement to take responsibility for Project assets and lay the foundation for sustainable joint management of the Lake.

12. The project closing date was extended from July 31, 1999 to June 30, 2000 in order to strengthen the capabilities of the riparian countries for collaboration in the implementation of an ecological monitoring programme and to enable other critical training activities supported by CIDA. This was in line with MTR recommendations, and a monitoring proposal, prepared by the students and counterpart staff, was implemented during the extension period. This entailed mainly the collection of water and fish samples and meteorological data for comparison with established baselines. A further extension of the CIDA grant to December 2000 was made in order to consolidate the monitoring programme and develop international waters monitoring indicators.

Implementation of Specific Components

(a) Research

13. The Project called for ambitious Lake-wide studies to enable the formulation of recommendations for the management of the Lake. It was anticipated that the project would identify critical habitats and biodiversity hotspots and suggest measures to demarcate them, identify threats to biodiversity posed by water quality issues, and prepare a Biodiversity Map and Management Plan (BMMP) for the Lake based on the information provided by the species distribution, habitat and water quality analyses. Such a broad goal was, however, found to be unrealistic within the Project's timeframe, and it was better defined during the MTR to contain the following three elements: (i) interim resource management recommendations and strategies that could be supported by hard data collected by the Project; (ii) identification of critically needed follow-on scientific work to be included in a possible second phase project; and (iii) recommendations that would be used to develop terms of reference for preparing a second phase project. These clarifications on the type of management plan that was required enabled the project to become more focussed and goal-oriented.

14. Although the frequent breakdowns of the research vessel, Usipa, influenced the progress of the lake-wide surveys initiated in June 1997, this work was largely completed by the end of 1998. By this time, the bulk of the sampling work within the three riparian countries was completed. Sandy shore, rocky shore and pelagic (offshore) cruises were undertaken, and fish were sampled by bottom trawling at different depths and (on rocky shores) by gill nets. This exercise helped to assess the species composition, distribution and ecological status of the fish fauna. During the lake-wide cruises the coastal habitat zones within eight kilometres on either side of the sampling stations were surveyed, and fishers in the area were interviewed.

15. **Ecology.** The Fish Ecology Programme was conducted in two phases. During the first phase, June 1997 – January 1998, a huge amount of data was collected during the lake-wide survey, including fish distribution by depth, locality and sediment type; life history information, such as breeding condition and size distribution; diet and trophic categorization, and the genetic differentiation of stocks. Unfortunately, no ecological analysis of the information gathered during the first phase was carried out after the departure of the Senior Ecologist in January 1998, although the Lake-wide data contributed to a preliminary analysis of biodiversity presented in the Taxonomy report. A second fish ecology programme was conducted from June 1998 to July 1999 with a new ecologist, who instead of building on the methodology started by his predecessor developed a new programme with the advice and concurrence of the PM. Given that the main mechanised fishery in the Lake was demersal trawling, targeting between 150 – 300 species, it was felt that the ecological studies should focus on the areas where this type of fish fauna occurs. The second phase was therefore confined to the southern part of the Lake, in an area wheredemersal trawl stocks exist but no trawl fishing was taking place. The reason for restricting the study area was also explained by limited time available before the project was due to close, yet it is not particularly clear why the new scientist did not pay sufficient attention to completing the first-phase programme.

16. In spite of the time constraint, the second-phase ecological study accomplished its tasks remarkably well. The Ecology Team undertook a monthly series ofdemersal trawl catches from the same location but at different depths, and most important species were studied. The life history characteristics of many common species were determined and seasonal diet variability of some species reported. Among other things, the study has provided valuable insight into the impact of sedimentation on species diversity and abundance in rock- and sand-dwelling fish communities. Two counterpart staff who were full time members of the Ecology Team led by the Project Ecologist participated in the planning and realization of the ecological studies, thereby obtaining on-the-job training. The Ecology Team has produced a substantial report presenting the findings of the second

phase of research, while some preliminary observations on fish distribution derived from the lake-wide surveys are included in the report on systematics and taxonomy.

17. **Systematics.** The Systematics Team was led by a Senior Systematist/Taxonomist and supported by an Assistant Systematist/Taxonomist, two counterpart staff and the university students enrolled in systematics. The primary function of this programme was to clarify as far as possible the identities of the many fish species found during the project surveys. This was not merely a matter of identification, since less than half of the Lake's cichlid species have been formally described. The Team was therefore engaged in confirming existing descriptions, informally describing new species, revising and redefining genera and species groups, and deriving keys for field identification.

18. At project completion, the Team had succeeded in developing the most comprehensive collection of fishes ever taken from the Lake. The bulk of the collection was made during the lake-wide survey cruises, but these were supplemented by other fish collecting trips. Three reference collections have been assembled, one for each of the riparian countries, with back-up specimens held in the Africa Museum at Tervuren in Belgium, and the JLB Smith Institute of Ichthyology in Grahamstown, South Africa. In addition to more than 300 fish species which had already been formally described, the Team noted and collected literally hundreds of undescribed species, many of which were collected in sufficient numbers to allow formal description in the future.

19. The Systematics Team developed an extensive library at Senga Bay, and databases developed under the project's systematic work are now assembled on CD. Counterpart staff acquired a high level of skill during this programme, and graduate students were supported in their research endeavours for their dissertations. A guide to the fishes of the lake is currently in preparation. In addition to the work on fishes, some work on the distribution of algae was carried out under the limnology and water quality programme.

20. **Limnology and Water Quality.** This study, which was carried out by the Fresh Water Institute of the Department of Fisheries and Oceans (Winnipeg, Canada), focussed on studying the water quality of the Lake, although some support in fish ecology and habitat research were also provided. The Limnology Team was by far the largest as it benefited from periodic visits of expertise in different fields from Canada and the United States. The Limnology Main Team consisted of a Coordinator mostly residing in Canada, the Resident Limnologist, two counterpart staff and the graduate students enrolled in Limnology. This team has benefited from the support of about forty people who visited Senga Bay at different times of the project implementation period, and contributed to the water quality study by providing specialist inputs to the research programme.

21. At project completion, the Limnology Team had succeeded in producing the first comprehensive survey of the water quality of the Lake and its rivers. Its results are presented in the Water Quality Report produced at the end of the project which outlines the major threats to biodiversity and describes investigations of river discharge; atmospheric nutrient deposition; deep water renewal; nutrient upwelling and nutrient cycling; factors controlling algal abundance and composition, and contaminants in water, sediments and biota. The water quality study has also provided baseline information on the Lake that will become the basis for long-term monitoring of water quality changes. Some of the main findings of the water quality studies are the identification of first evidence of changes in the rivers feeding the Lake and the impact of the nutrient loading from these and the atmosphere. In particular, it is projected that further modification of river discharges as a result of agricultural expansion would eventually lead to a switch in phytoplankton composition from diatoms to blue-green algae, with loss of water clarity, negative impacts on biodiversity and possible toxic effects. The scientific data generated by the study is of high quality, and will become invaluable in formulating development programmes and management plans in the Lake and its catchment areas.

22. **Other Research Activities.** During the course of the project, several other research-related activities were undertaken which were not foreseen at appraisal. These included: the provision of Geographic Information System (GIS) support for the treatment of erosion hazard on land and biodiversity mapping in the lake, studies on sedimentation, cloud cover and precipitation carried out by Centre for Earth Observation Science (CEOS); genetic studies to support the Systematics and Ecological Teams, carried out mainly by the University of Hull and the University of Montpellier II; a Bilharzia study conducted with the assistance of DANIDA; and a Cooperative Agreement with the DFID-funded Ncheni Project to undertake research on Rhamphochromis and Diplotaxodon species in terms of taxonomy, genetics, distribution, general biology and life history. All these activities were useful complements to the mainstream scientific studies of the Project.

(b) Strengthening National Capacity

23. This component consisted of formal and informal training for Project and other staff, as well as a community conservation awareness programme. The Project provided for nine professional staff (three from each country) to study for higher degrees (M.Sc. and Ph.D.); for the training of six counterpart staff (research or assistant research officers) on the job by including them as members of the three main research programmes (i.e. ecology, systematics and limnology); for short-term training (six months) for 24 people in environmental education; and for a programme to raise biodiversity conservation awareness among the Lakeshore communities. Unfortunately, the two latter programmes were not formulated in sufficient detail during project appraisal, and this had to be done during implementation with the assistance of CIDA funding.

24. **The Training Programme.** Given the Project's slow start, the capacity building programme was undertaken with considerable delay. Under the long-term training of graduate students, a total of 10 people were given training: eight to M.Sc. and two to Ph.D. The Fresh Water Institute implemented the university education programme under the CIDA tied funds and seven of the students (including one Ph.D.) were sent to study in Canada, while two students (of which one a Ph.D. student) were sent to South Africa. The Republic of South Africa financed part of the student costs in this country. An additional student completed a post-graduate degree at the University of Malawi.

25. The graduate student programme started late because the riparian countries took considerable time in finalizing the nomination of the trainees, not appreciating the lead time needed to fulfill the enrollment requirements. With regard to the Mozambican trainees, there was an added factor which delayed their early start as they were required to upgrade their English language proficiency before they could join the universities. The time lag between the planned and the actual commencement of graduate studies meant late return of the students to the project and hence little time to work with the Project scientists who were completing their assignments. Apart from this missed opportunity, the graduate training programme was one of the most successful elements of the Project. The three countries have strengthened their scientific staff, creating the basis for continuing the work on the Lake commenced by the Project. In addition, the dissertation works carried out by the students, which were all focused on the Lake and its catchment, are important scientific outputs on their own right, and are considered an integral part of the Project's scientific outputs.

26. As explained in the previous paragraphs, the six counterpart staff were assigned two each to the three scientific studies as members of the study teams. As such, they have obtained on-the-job training in the different research disciplines by working with the Project scientists. In this process they have significantly improved their skills in their respective fields. They have since returned to their mother institutions within the three countries, and are expected to enrich the research capabilities in these institutions.

27. The Project proposed to train 24 people in environmental education, and this was accomplished through the implementation of two six-month courses held at CapeMaclear. The first course for ten people was conducted from July 1997 to January 1998, and was followed by a second course for 12 people from February to August 1998. The rationale for this training programme was not clearly explained or understood, nor the length of the training or areas of focus. Ideally, the training should have targeted individuals who would be able to transfer the knowledge acquired on the environment to other people, e.g. school teachers or extension workers. It would also have been sensible to train people who had roles to play in the planning or execution of environmentally related tasks associated with the Lake. Another indication of the lack of clarity of the course is the overemphasis on fish-related scientific and technical subjects, which were beyond the need of imparting basic environmental appreciation to lay-people. There was perhaps a need to have critically studied the purpose of the training and accordingly designed a well-focused programme for the different trainees in accordance with their roles in society. So far there has been no formal evaluation of this training programme, and it is thus difficult to assess the outcome. From information provided to the mission some trainees, e.g. school teachers and individuals working with communities, are transferring the education they have received to students and member of the communities, respectively, while others have had little opportunity to make use of the training obtained.

28. **The Community Awareness Programme.** The design of the conservation awareness subcomponent called for a variety of environmental education activities at the community level and in the schools through the fostering of school wildlife clubs. The program was to be based in Cape Maclear at the Environmental Education Centre in Lake Malawi National Park. The project provided funding for rehabilitation of the Environmental Education Centre and housing for an Environmental Education Officer and a Community Education Officer. The programme was revised substantially following the availability of additional funds from CIDA. The activities carried out under the conservation awareness programme comprise:

- 18 schools received conservation awareness programs based on information gained from the six-month training course;
- 2 workshops were held for school Wildlife Club patrons (school administrators and teachers) from area schools;
- 1 workshop was organized for 40 students (two students from each Wildlife Club in 20 schools);
- 18 villages in the Nankumba Peninsula received conservation awareness programs;
- nearly 90 traditional leaders from lakeshore communities participated in environmental awareness workshops;
- a two day workshop was held on water quality monitoring for students and teachers from 10 schools.

29. In addition to the above, the Project also provided a bus for environmental education activities and instruments for the Wildlife Band, a locally-recruited musical group that promotes environmental awareness. The Wildlife Band and a pair of Malawian comedians toured villages in the Nankumba Peninsula as part of the community-based conservation awareness program. Overall, the environmental awareness programme supported by the project appeared to have had a considerable positive impact on the communities it covered, even though its overall geographical coverage was necessarily limited. Project design did not provide for the continuation of this programme beyond the life of the financing agreement, and sustainability was therefore limited to the capacity-building aspect of this work

30. Theatre for Africa (TFA), a South Africa-based professional theatre company, was contracted on a sole source basis to develop and perform a series of innovative plays with relevant environmental messages for populations living along the lakeshore. Two actors from each of the riparian countries were recruited and trained by the theatre company in all aspects of environmental theatre. The troupe performed in all three countries and is said to have provided performances seen by more than 108,000 people in the three riparian countries. The performances of TFA were very well received by both rural and urban audiences.

31. The deployment of theatrical and artistic skills of a high international standard did much to raise the public profile of the project and provided valuable lessons in the power of these media in communicating environmental messages. More could have been done, though, to tie these efforts into local institutions and strengthen artistic resources within the region. On the basis of the project's experience, theatrical and visual arts should be encouraged to play a more prominent role in future efforts to enhance the management of the Lake and its catchments. Even thoughthe effectiveness of drama in promoting environmental awareness is acknowledged, the appropriateness of including such activity in a scientific research project is questioned, as is the sustainability of a conservation awareness program through a Project of fixed duration.

(c) Strengthening Environmental Legislation

32. This component proposed to study the compatibility of the existing legislation of the three riparian countries for the management of the Lake, with a view to developing an effective and harmonized legal framework for the conservation of its biodiversity. For this purpose, it was envisaged that the GEF funds be used to finance the legislative review of the three countries, to be discussed in a regional workshop, and the preparation of a report that would contain the main recommendations to the riparian countries. This component was not implemented as planned, as the implementation and financing responsibility was transferred to FAO in the early stages of the Project. Following the communication of FAO's interest in assisting this component, project management concurred with the idea of allowing FAO to fund and implement the programme, so that the savings made from this component could be used for other project activities.

33. FAO proposed to provide assistance under its Technical Cooperation Programme (TCP), for the three riparian countries in the context of an international project. This meant that the three countries had to concur with the TCP assistance, which is generally time consuming. The TCP project document was approved in February 1998 with 18 months duration, but its implementation was delayed because the Government of Tanzania refused to sign the document due to disagreement on the name of the Lake used in the TCP document. Following discussion between the three governments on the matter, the document was revised to the satisfaction of the three governments and was signed by all countries in July 1999. Accordingly, national consultants in law and natural resource management were recruited in September 1999 in each of the riparian countries to assist the relevant government agencies. The national consultants are now completing the preparation of their respective country reports, which will be consolidated into a joint report with the assistance of FAO and international consultants. Representatives of the three countries will review the joint report in a workshop to be organized under the TCP. Subsequently, a draft agreement for international cooperation in the management of Lake fisheries, supported by legal instruments to harmonize current legislation, will be prepared for discussion by an inter-governmental meeting hosted and facilitated by the project.

34. In order to ensure the successful implementation of the TCP assistance, FAO has approved another TCP support in May 2000 to the amount of US$ 299,000. This guarantees the availability of funds for the task, but it is not easy to estimate the completion date precisely, as this will depend on how fast the three countries want to move. It should be recognized that the

component as it now appears in the TCP has a different scope to that originally envisaged: broader in its inclusion of capacity development and the development of a framework for environmental monitoring as project objectives, but narrower in legal scope in that at this stage it is not proposed to include more than the fisheries sector in the legal harmonization initiative, as requested by the riparian governments.

(d) Protected Area Management

35. This component aimed at solving the increasing land and resource-use conflicts in the Nankumba peninsula, where the lack of an appropriate planning framework was seen as a constraint to rational development and the conservation functions of the National Park. The study to produce a Nankumba Peninsula Strategic Plan followed an initial information-gathering first phase conducted in 1994-95 that was carried out under a contract with an international consulting firm. There was a delay of almost four years between the two phases occasioned by administrative failures, and the second phase was implemented between January and July 1999. Its objective was to prepare, in consultation with the local communities, a strategic development plan for the peninsula to resolve development and resource-use issues at the local level and provide for potential sources of economic growth, especially tourism.

36. The consulting team gathered current information for planning purposes and from the outset used a strongly participatory approach to the planning process, including consultations through 27 meetings with 41 of 91 villages in the planning area. The principal problem identified was the *de facto* open-access to natural resources and consequent unsustainable resource use regimes affecting agriculture, fishing, forests, wildlife and tourism. Access to resources was inequitable between local and other stakeholders, and although local communities were marginalised and had no incentives to work towards sustainable management, they were in the great majority on the ground and were able effectively to veto initiatives towards sustainable resource use by other stakeholders.

37. The consultants produced a comprehensive plan, in which solutions to the problems in the area were seen as (a) the empowerment of local communities to take legal ownership of their land and natural resources, replacing open access by community access, and (b) developing the tourism industry in a planned and coordinated fashion and, under the new access regime, largely to the benefit of the local population. A basic tool in the strategic plan was the concept of the Village Trust as a means of conferring a *legal persona* on a community, thereby enabling it to enter into contracts, including land leases, and providing a variety of new avenues for the profitable management of village resources. The plan also proposes a system of zoning relating to land use, tourism and infrastructure development, describes a management process for the implementation of the plan and suggests an ambitious investment programme.

38. The strategic plan was very well received by the project management, the Government of Malawi and the World Bank, and there is no doubt that this component of the project was completed to a high standard and with considerable imagination. There is concern, however, that the planning exercise was undertaken without an agreed mechanism for its implementation. In consequence, expectations by communities in Nankumba Peninsula which could have been raised considerably through the consultancy team's high-profile public presence have yet to be realized.

Organization and Management

39. An internationally recruited PM and a Financial Controller were recruited by July 18, 1995. The TOR for the PM reflected an underlying uncertainty in whether the manager should be a management professional or a scientist. The person chosen for the post had strong scientific qualifications as a fish ecologist with substantial experience on Lake Malawi. The PM produced a

revised PIP by February 1996 and undertook the review of the Senga Bay facilities and equipment, identifying deficiencies which were included in the PIP for correction. As the Project staff had been designed in the context of the GEF grant only, it was found necessary to add administrative capacity in order to accommodate the additional demands of the CIDA programme. Therefore, an expatriate administrative officer was recruited in 1997 for one year, and then replaced by another person after his resignation. The addition of an extra administrator reduced the workload of the PM, although he still had a lot to do given the increase in the number of donors and the complexity of the project (para. 22). As Project implementation progressed it became apparent that the PM was focusing increasingly on the scientific programme, bringing him into conflict with the Senior Ecologist and culminating in non-renewal of the latter's contract and disruption of the planned ecology studies (para. 15). The relationship between the PM and the Chairman of the SC was also tense in cases where differences in interpretation of management responsibility arose.

40. From the outset, the project laboured under a contradiction in that the Project design provided an overlap of authority between the PM and the Chairman of the SC. While on one hand the PM was designated as taking overall project management he was also meant to work on a regular basis with the Chairman, implying a managerial role for the latter. Likewise, problems arose between the riparian countries in the SC due to inappropriate arrangements. The legal agreement establishing the project was with the Government of Malawi, yet the implementation of the project was to involve Tanzania and Mozambique. This discordance between the bilateral basis of the grant agreement and the regional character of the project's objectives and oversight structure was heightened by the lack of progress in the construction and equipping of the Kyela (Tanzania) and Metangula (Mozambique) research stations. Despite these constraints, the project was able to carry-out its activities in all three countries with the support of all parties concerned.

41. An important institutional linkage with operational departments in the three countries, the Research Advisory Group (RAG), was abandoned after its first meeting in 1996, primarily because of the negligence of the PM. Several supervision missions attempted to revive the RAG, but this was resisted by the PM.

42. Administrative problems arose during Project implementation regarding the compensation of counterpart staffs: (a) due to salary differences between officers of the same qualifications but placed in different grades following the staffing plan; and (b) income erosion of Malawian counterparts (who were paid in Kwacha as opposed to the others whose salaries were US dollar-based) due to the devaluation of the Kwacha. These issues persisted throughout project implementation.

D. PROJECT IMPACT AND SUSTAINABILITY

43. The Project has successfully achieved its main objective, i.e. generating useful scientific information and improving the level of understanding of the Lake as a productive system. The nature of this output is such that its impact will be sustained far into the future. This is because any forthcoming development or resource management programmes can be designed from a much better-informed starting point than was possible a few years ago.

44. Parallel to this major output, the Project has also strengthened the research capacity of the riparian countries. In particular, the training of the ten students at M.Sc. and Ph.D. level has raised the research capability of the relevant research institutions in a significant manner. These officers have already proven their research skills by preparing sound dissertation papers for their graduate degrees, and it is reasonable to assume that they will continue to carry out useful research for the better understanding of the Lake and its sustainable management. These officers will also play an important role in the training of young researchers. On-the-job training given to the

counterpart staff represents the other Project contribution to institutional strengthening. The skills of these officers, built over several years of practical research work, will be invaluable to local research institutions. Together with the graduate students they will be able to lay the basis for developing a meaningful research agenda for the Lake, while the international academic linkages fostered by the project also secure future international cooperation on a long term and self-sustaining basis.

45. Obviously, research activities cannot continue at the same intensity after the closure of the Project, but this should not be seen as a sustainability issue. The generation of scientific information and understanding was meant to be a one-off output, to be put at the disposal of all practitioners. There is, however, the belief that some of the activities could have been continued at some level had the project cooperated more closely with the relevant government institutions at a technical level. The capacity strengthening through the training of staff is to be considered sustainable provided the scientists are left to work within the research institutions.

E. GRANT RECIPIENT PERFORMANCE

46. Given the multinational nature of the Project, it is difficult to discuss the performance of one recipient of the grant. On the other hand, the grant agreement was signed by one country only, Malawi, albeit on behalf of the other riparian countries. Malawi also chaired the SC where the representatives of all countries are members. It seems therefore more appropriate to comment on the performance of the SC, without losing sight of the fact that Malawi had more responsibility for the Project than the other countries. The project preparation responsibility was mainly with GOM, and the Government's performance in this respect was satisfactory, although, with hindsight, it becomes clear that more involvement of the relevant technical agencies in the Project would have better served the future management needs of the Lake.

47. The performance in Project implementation, however, fell short of expectations, considering the delays recorded in the initial years, and the fact that construction of the proposed research station in Mozambique is yet to be completed. The slow Project start up seriously affected some of the activities, e.g. the missed opportunity in the overlap of returning graduate students with project scientists as a result of belated enrollment to the universities. A major criticism that is generally leveled against the SC was also its involvement in micro-managing the project, instead of being limited to advising and guiding the PM. This led at times to paralysis, when urgent decisions had to be taken because, as a very busy person, the PS has to attend to many ministerial tasks, including travelling outside the country. In addition, he often deferred decisions in order to confer with the other members of the SC, who met, at best, every four months. Another example of poor performance was the excessive delay (about 3 years) in awarding the contract for preparing the Nankumba Peninsula Strategic Plan due to time consuming discussions on tendering. In addition, neglect in establishing a Research Advisory Group (RAG) should be considered a major shortcoming of the SC since the Project forfeited the opportunity of obtaining scientific advice when this was required, such as during the disagreement between the PM and the first Senior Ecologist. Towards the later years of the Project, the perception of the other member countries portrayed the SC as if it was implementing a Malawian project, implying a loss of project ownership. On the positive side, it should be recorded that the high profile the project enjoyed was thanks to the three countries' decision to assign senior officers to the SC. This enabled the Project to resolve some issues as they arose, such as for instance, facilitating the lake-wide survey covering the three countries.

F. WORLD BANK PERFORMANCE

48. Bank's performance was mixed. The design of the project was less than satisfactory, primarily because it lacked precision in the description of many activities. These included inadequate

planning for the implementation of the two research stations in Tanzania and Mozambique, in which UNDP offices were given implementation responsibility without sufficient agreement; lack of clarity in the preparation of a management plan for the Lake, until this was defined during the MTR; failure to articulate the roles and domain of the SC and the PM; inadequate description of the environmental education and community awareness programme; failure to examine the equipment and facilities at Senga Bay; and slackness in appreciating the repair needs of the research vessel after a long lay-up without maintenance.

49. Bank supervision missions started promptly. Two missions were conducted in the first six months of the project, the first in September 1995 for the project launch, followed by a short mission in December 1995. However, they did not provide the technical and managerial support needed by a project management team with little experience in implementing a project of this sort. While the missions provided guidance on the requirements to be fulfilled, such as completion of the PIP and procurement plan, they did not make available sufficient technical advice. A third mission was fielded in March 1996, but after this supervision mission there were only regular follow-ups conducted by the Country Office with no full HQ supervision missions conducted for about 12 months. This period coincided with the time when the project moved into full implementation and increasing management complexity. When task management of the project was transferred to the then newly merged Southern and Eastern Africa Rural Development Division, and with the assignment of the project to a new Task Manager in early 1997, the situation improved substantially. Not only did the frequency of missions increase (two each in 1998 and 1999) but the quality of supervision changed for the better, as several of these missions included senior scientists. These latter missions undertook constructive dialogue with the project scientists and encouraged them by providing advice where necessary. Defining better the scientific output of the Project was one of the supports provided by these missions, which were indeed instrumental in assisting the scientists to achieve their objectives successfully.

G. LESSONS LEARNED

50. The following important lessons can be drawn from the Project:

- Implementation of the Project has demonstrated that combining the scientific research program with development activities, in a situation where management resources were limited, pulled management attention away from the core science program without ensuring timely implementation of these other components. Ideally, scientific programs should not be saddled with non-research activities. If this is unavoidable, it is essential that ample management resources are provided.

- Insufficient preparation of a project component will invariably affect the progress of the project, as this will have to be accomplished by project management during implementation, hence delaying project execution. This was the case with the failure to determine the suitability of equipment and facilities at Senga Bay during appraisal, as it compelled project management to sort it out after project effectiveness, slowing down the Project.

- Lack of clarity in describing the roles of the different actors in a project will predictably result in confusion and tension among the parties, as exemplified in the project by: (a) occasional friction between the Chairman of the SC and the PM, as they both considered themselves as having the lead management role: and (b) UNDP's lack of recognition of the task of constructing research stations in Tanzania and Mozambique, thus leading to its total neglect.

- Establishing an organizational structure to implement a project that caters for both the regional and national needs of neighbouring countries, in a situation where one country is given more responsibility for the project than the others – as was the case with Malawi – is likely to face difficulties, as this appears to create tension and misunderstanding. It is important that

countries are given equal responsibility when they deal with regional matters, and take full responsibility when operating exclusively for national interests, hence avoiding confusion of the two aspects.

- A project activity which is considered crucial for the realization of a subsequent activity should be made a condition for project effectiveness, in order to avoid a delay in the first activity affecting those that follow. Under the project, there were sufficient grounds to make the selection and appointment of the graduate students a condition for project effectiveness, as this would have guaranteed their early return to overlap with the project scientists in line with the original plans.

- Failure to involve the relevant technical institutions in project execution, particularly when this includes the assistance of expatriate professionals, is likely to generate hard feelings on the part of the ignored institutions – in the Project's example the Fisheries Department. Apart from loss of ownership, such institutions may be handicapped in absorbing and applying Project recommendations intended for their use.

- Disparity of income between counterparts coming from different countries but working for the same project and in the same area leads to problems caused by the injustice perceived by those who are disadvantaged. The Project's experience with counterpart staff working atSenga Bay was that the Kwacha based salaries of the Malawian staff eroded substantially over time while the US$ based salaries awarded to the other counterparts did not. This disappointed the Malawians and created rifts with management. Under all circumstances it is important to ensure that staff of the same position receive the same treatment.

ANNEX 7B

BACKGROUND AND PROJECT IMPLEMENTATION EXPERIENCE

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A. INTRODUCTION AND GENERAL BACKGROUND

Introduction

1. This Annex provides supplementary information and analysis related to the rationale for the project and its implementation performance as measured against objectives stated in the project document. It is based primarily on a review of published and informal project reports, other current and relevant literature, mostly in the fisheries sector, and a series of World Bank supervision reports. In addition, the ICR mission consulted as many people as possible.

Background

Lake Malawi/Nyasa and its Catchment

2. Biological and limnological studies on Lake Malawi/Nyasa have proceeded intermittently since the middle of the 20th century, the basic driving forces for which have been (a) the need to understand the fisheries, and the ecological basis of fish production, and (b) strong scientific interest in the lake's immense biological diversity and the processes governing speciation. A strong interlinking theme arises from the dependency of conventional fisheries science on an understanding of the biology and population dynamics of each individual species in the fishery. Thus some applied fisheries studies have grounded on ignorance of this basic information, while others have included an element of taxonomic investigation.

Knowledge on the Lake at Project Appraisal

3. The Lake is > 700 m deep and it has a total catchment area of more than 100,000 km^2. The level varies annually according to rainfall and evaporation by around 1.2 m. The background lake level is rather variable (e.g. it is estimated to have been about 120 m lower than present levels between 1500-1850AD) but under most circumstances evaporation accounts for 80-95% of annual water loss, with only 5-20% flowing out through the Shire River. Therefore, nutrients entering through rivers are accumulated. But, the lake is permanently stratified, with an upper thermocline (temperature discontinuity) at 40 m (hot season) to 85 m (dry season) below the surface. Nutrients entering with high-density surface runoff plunge deep into the lake and become trapped below the thermocline.

4. Biological productivity starts with photosynthesis in phytoplankton and continues through herbivorous zooplankton; herbivorous and carnivorous plankton-feeding fishes (*chambo, utaka, usipa* and many other pelagic or semi-pelagic species); piscivores, or fish-eaters (*kampango*, other catfishes, *ncheni* and others) and detritus feeders (a huge variety of cichlid and cyprinid species). The importance of bacterial production is not yet understood. Phytosynthesis can only occur in the upper 40-50 m in which light penetrates, i.e. above the thermocline. Photosynthesis removes nutrients from the surface waters, which remain permanently depleted. The overall productivity of the system is therefore limited by the availability of plant nutrients, and depends on mixing processes that release nutrients from deeper waters, primarily wind-induced. Winds are strongest during the dry season, when SE trade winds shift surface water northwards and induce an upwelling of nutrient-rich deep water at the southern end of the lake and to a lesser extent north of Likoma/Chizumulu. Weaker northerly winds blow during the hot season, inducing a lesser upwelling at the northern end of the lake. Internal waves (seiches) generated during the dry-season tilting of the thermocline also induce mixing, although their importance relative to wind effects is imperfectly understood.

5. Nutrient availability (and hence production) appears to undergo substantial year-on-year fluctuation. Studies on the soft sediments of the deep waters of Lake Malawi carried out in the 1980s revealed an undisturbed structure in which cold-season diatomite (the skeletal remains of diatoms) is overlain by rainy-season clastic deposits (river-borne sediments). The "normal" pattern of plankton composition is broken irregularly by blooms of diatom species that are usually of secondary importance – in such years the diatomite deposit is also unusually thick, indicating abnormally high production.

6. A high proportion of the very diverse fish fauna comprises small species with short life cycles, which feed directly on the plankton or on detritus. Fish biomass tends therefore to show similar quite pronounced variation that probably follows the pattern of primary production, itself governed by climatic events.

Types of Fish Resources

7. In the mid-1990s it was suspected that the Lake supported between 500 and 1,000 species of fish, of which only about 300 had been formally described. These included about 60 non-cichlid species (mainly cyprinids, catfishes and mormyrids) of which 26 were known to be endemic to the Lake Malawi system. The great majority of the dominant cichlid fauna were known to be endemic to the Lake. The fish of Lake Malawi may be divided into four categories, as follows:

- **Shallow demersal** (bottom-dwelling fishes found at depths less than 50 m). These comprise numerous cichlids, some cyprinids and catfishes. There is a broad distinction between the rocky-shore fauna, which includes the spectacular variety of small cichlids known as *mbuna*, and the fauna of sandy shores.

- **Deepwater demersal**. (bottom-dwelling fishes found at depths greater than 50 m) There appears to be a faunal break or discontinuity at 40-60 m, which corresponds roughly to the limit of light penetration, so that the fish fauna below the break is quite distinct to that above it. Deepwater demersal fish stocks are composed almost entirely of cichlids and catfish. Some species are common to both the shallow and deep demersal stocks (e.g. *kampango*, and various species which spend their early life in the shallows). The lower depth limit for fishes is about 230 m, below which the lake is anoxic.

- **Semi-pelagic** (midwater and bottom-dwelling fishes) These are inshore stocks, mostly of plankton feeding cichlids, and contain many species of commercial importance (e.g. *chambo, utaka*).

- **True pelagics** (midwater and surface-dwelling fishes) These are fishes which occur lake-wide. They include *usipa* and some other cyprinids, and many cichlids, including the *ndunduma* (Diplotaxodon) and *ncheni* (Rhamphochromis) families, as well as the bathyclariid catfishes.

8. More than 300 species had been formally described, and basic biological information (life history, breeding, diet, growth) had been determined for some of the more commercially important fishes. Various assessments had been made of the abundance of the various fish stocks, although information on the inshore stocks in Tanzanian and Mozambican waters was very sparse. Almost nothing was known about the continuity of fish populations (the amount of

genetic interchange between populations of the same species occurring in different parts of the Lake), an important parameter for fisheries management.

B. THE PROJECT

General

9. During 1992 it was considered that there were strong grounds for applying Global Environment Facility (GEF) funds to the conservation of biodiversity in Lake Malawi. Not only was the spectacular diversity of the fish fauna already well known, there were also a number of specific new or growing threats to that diversity. Prominent among these were:

- increasing concern that heavy fishing pressure in some areas (the southern trawl fishery; inshore artisanal fisheries) was altering the structure of fish communities, and might already have caused some extinctions;
- the expansion of agriculture was leading to an increase in the amount of sediment deposited in rivers and in the lake, where wet-season plumes were very apparent. This was known to be having an adverse effect on several endemic potadromous (river-spawing) fishes, and was presumed to be having some, albeit unknown, impact on the lake itself; and
- the one area in Lake Malawi where fish were afforded legal protection – Lake Malawi National Park (LMNP) – had been proposed as a site for a major mass-tourism development, with adverse implications for the Park's core functions.

10. A worrying background to these perceived threats was the conspicuous lack of hard data on the nature of the lake's biodiversity – it was believed that less than half of the fish species alone had been described – as well as a continuing ignorance of the fundamental workings of the lake as a productive system. Not enough was known about catchment functions, nutrient cycling or trophic relationships to enable reliable predictions to be made of the impacts of anthropogenic change on either biodiversity or production. It was in this context that the Project was designed, through a protracted series of preparation missions between 1992 and 1994.

Project Concept, Objectives and Components

11. The project concept was centred on filling the gaps in knowledge and understanding of (a) the distribution and current status of biodiversity, with particular regard to fish, and (b) catchment and limnological processes which provide the basis of the lake's biological productivity. This was to be achieved through a strong international scientific input over a period of four years. Added to the central thrust in scientific endeavour were four other themes – capacity development in lake-related research disciplines; the development of a strategic planning framework for the Nankumba Peninsula, incorporating LMNP; the strengthening and harmonisation of the regional policy and legal framework for lake management, and environmental education and awareness-raising in relation to the Lake. The objective of the project was to assist the riparian states in creating the scientific, educational, and policy basis necessary for conserving the biological diversity of the Lake and its unique ecosystem.

12. Project components comprised:

(a) **Research**, consisting of: (i) biodiversity surveys to inventory fish species and their distribution, identify and map critical habitat and biodiversity hotspots in

the Lake and identify threats to biodiversity; (ii) studies on the taxonomy, ecology and distribution of the cichlid species; (iii) a limnology and water quality monitoring programme to identify pollution threats to hotspots and fish replenishment areas; and (iv) the modest rehabilitation of the CapeMaclear, Kyela and Metangula fisheries research stations in Malawi, Tanzania and Mozambique, respectively.

(b) **Strengthening National Capacity**, comprising "on-the-job" training of professional and technical staff from the riparian countries in ecology, taxonomy, limnology and environmental education. The training was to focus on strengthening local capacity for research and conservation planning activities for future lake programmes. Activities under this component would increase conservation awareness among all sectors of society, from decision-makers to Lake resource users, through informal and formal educational initiatives and development of a conservation awareness programme, including media productions. Financing was to be provided for rehabilitation of the Environmental Education Facility for Lake Malawi National Park, which had established an important educational link with the local schools and residents of the Park's enclave villages.

(c) **Strengthening Environmental Legislation**, including the review and evaluation of the compatibility of the existing legislation among Malawi, Mozambique and Tanzania for the management of the Lake'sbiodiversity. The results of the review would be presented at an environmental legislation conference of the three countries, and would culminate in a report to the riparian governments providing recommendations for revising and strengthening legislation and enforcement ability, while creating aharmonized and effective legal framework for the conservation of Lake Malawi/Nyasa's biodiversity.

(d) **Protected Area Management,** involving the preparation of a Strategic Plan for Nankumba Peninsula and Lake Malawi National Park. The Strategic Plan would be prepared in two phases. The first phase, dealing with data survey and collection of information, would be financed by the Canadian International Development Agency, Industrial Cooperation Programme (CIDA, INC). The project would finance the second phase which would emphasize community participation in the in the planning process, identify community roles in Park and Lake conservation, and conclude with proposals for preferred development options. Assistance would also be provide to the Government of Malawi to design a funding mechanism to address recurrent funding for the sustainable development, management and maintenance of Lake Malawi National Park and the continued monitoring of biodiversity conservation indicators.

Mid-Term Review

13. A Mid-Term Review (MTR) was carried out in January 1998. The MTR mission concluded that in spite of the delays recorded, the core scientific, training and environmental education programmes remained viable and that objectives would be achieved as planned. The MTR also defined the scope of the required Management Plan for Lake Malawi/Nyasa, descriptions of which in the Project Document and the Grant Agreement were noted to be "somewhat vague". The management plan was to be a single document combining the following three elements: (a) interim management recommendations and strategies for Lake resources that

could be supported by hard data collected during the project; (b) identification of critically needed follow-on scientific work to be undertaken in a second phase project in order to advance development of a more detailed Lake Management Plan; and (c) recommendations that could be used to develop terms of reference for preparation of a second phase project.

14. In addition, the MTR stressed the importance of institutionalising: (a) the environmental education training, and (b) the community environmental awareness-raising programme, so that both would be sustained as part of lake-wide conservation education programmes. The review mission encouraged the riparian countries to look into the possibility of developing a suitable institutional structure and financing arrangement to take responsibility for Project assets and lay the foundation for sustainable joint management of the Lake.

Project Extension

15. During its extended phase, the project enabled initiation of an environmental monitoring program based on key parameters identified during the project as critical to the maintenance of the ecosystem in its current structure and functions. To strengthen riparian capacities for collaboration in the implementation of such a cooperative monitoring program, the project closing date was extended from July 31, 1999 to June 30, 2000, with a further extension of the CIDA grant to December 31, 2000. The monitoring programme was developed and carried out by the project-trained scientific counterparts and students in Malawi, Tanzania and Mozambique with modest funding, consisting of unallocated project funds and contributions from the three riparian countries.The programme was carried out at each of the three research stations, and included the following items:

- regular collection of water samples for nutrient, plankton and quality analysis;
- the monitoring of river water; meteorological data; artisanal fisheries and aquarium fish; and
- analysis of all water and fish samples.

16. In addition, the following other activities were undertaken during this period:

- a plan of action for distilling of all reports, databases, models and other information produced under the project, the preceding UK/SADC project and other relevant research initiatives undertaken by the Fisheries Research Unit (Malawi);
- completion of the research station at Kyela;
- a community outreach programme including musical performances and environmental training for political and religious leaders (Cape Maclear); and
- further work on the guide to the fishes of Lake Malawi.

C. PROJECT IMPLEMENTATION

The Research Component

17. The research component was the core of the project, and took the largest share of the project budget. It was divided into four sub-components: biodiversity surveys; ecological and taxonomic studies; a limnology and water quality programme, and the rehabilitation or construction of physical infrastructure for Lake research within the three countries.

Biodiversity Surveys

18. It was intended that the project should survey and record the distribution of biodiversity, or, more specifically, fish diversity, throughout the lake, including previously unsurveyed areas of Tanzania and Mozambique. This would not be merely a matter of identifying whatever the surveys found, since less than half of the Lake's cichlid species had been formally described. The services of a skilled taxonomist would therefore be required in order to confirm existing descriptions and prepare informal descriptions of new species, and the full team would also include an ecologist as well as counterpart professional and technical staff. Outputs were to comprise: survey reports; maps of species distribution identifying critical habitats and biodiversity hotspots; species checklists for identified hotspots; the identification of main threats to biodiversity and recommendations for mitigation, and recommendations for preliminary measures to protect critical habitats or fish replenishment zones.

19. The research Team responsible for biodiversity, ecological and taxonomic studies eventually comprised a Senior Ecologist, a Senior Systematist/Taxonomist, and an Assistant Systematist/Taxonomist (all internationally recruited), two counterpart research officers, one research student and four assistants assigned to the ecology section, and three counterpart research assistants, two research students and two technicians assigned to thesystematics section. In addition, the Project Manager was part of the ecology team and contributed substantially to its supervision, field work and reporting.

20. The field programme was significantly delayed because of repeated breakdowns of the principal survey vessel, the RV Usipa, and did not commence until June 1997. This left a reduced timetable for the completion of fieldwork, analysis and reporting. In all a total of nine Lake-wide sampling cruises were completed, five concentrating on sandy shore habitats and four on rocky shores. Incomprehensibly, the Project never succeeded in obtaining permission to sample within LMNP – the only part of the Lake in which the diverse fish fauna is afforded legal protection.

21. The outputs of the biodiversity surveys have recently been assembled into a digital biodiversity atlas comprising 17 vector and raster maps, relational databases and data tables which are available on a single compact disk, and multi-media presentations on 4 PAL format video tapes and 3 compact disks. These are accompanied by a final report and user manual. Because of a professional disagreement between the PM and the senior ecologist the Lake-wide surveys were curtailed at the end of 1998, the ecologist was replaced and the Access database entitled "Lake-Wide Sampling Programme", containing fish distribution / ecology information collected throughout the field sampling period, is incomplete in its current form. In addition, it is understood that some revision of earlier field identification is also required, implying the need for a taxonomist to revisit the original field collections. Since these data comprise the Project's single most important information resource related to the distribution ofbiodiversity this is viewed as a serious shortcoming. Two papers included in the report onsystematics and taxonomy (July 1999) present an initial analysis of biodiversity trends in the sandy shore and mbuna communities, as related to depth, habitat type and geographical location.

Fish Ecology, Systematics and Taxonomy Studies

22. The same Team (the ecologist, the taxonomists and their counterparts) was also to study ecological issues related to: (a) the threat ofoverfishing by both artisanal and mechanised fisheries, and (b) the impact on biodiversity of water quality changes, most obviously those related to the growing influx of river-borne sediments resulting from agricultural expansion.

23. Fish ecology studies were performed in two phases. During the first phase, June 1997 – January 1998, a huge amount of data was collected during the Lake-wide survey, including fish distribution by depth, locality and sediment type; life history information, such as breeding condition and size distribution; diet and trophic categorization, and the genetic differentiation of stocks. As mentioned above, no full ecological analysis of the information gathered during the first phase was carried out after the departure of the Senior Ecologist in January 1998, and beyond the raw data and the preliminary description of biodiversity trends referred to above, the initial programme can be said to have yielded no tangible outputs.

24. A second senior ecologist was appointed in June 1998, and in the remaining year of the project a revised fish ecology programme was initiated. It is impossible now to understand why project management took the decision not to complete the analysis and make accessible the lake-wide field data accumulated during the first programme, but instead embark on a suite of new studies. These had three principal focal areas: the ecology of demersal trawl stocks, the differentiation of fish populations of the same species at different locations, and the impact of river sediments on the shallow water fish of sandy and rocky grounds. Its results were published in the "Fish ecology report" in mid-2000.

25. Given that the main mechanised fishery in the Lake was demersal trawling, it was felt that the ecological studies should focus on an area where trawl stocks occur but no trawl fishing was taking place. In consequence an area in the northern part of the South West Arm (SWA) was selected for monthly sampling by trawling. Each month from June 1998 to May 1999 trawl samples were taken at depths of 10, 30, 50, 75, 100 and 125 m on the same sampling stations. The principal outputs from this study are summarised as follows:

(a) A study of temporal trends and species composition confirmed previous reports of seasonal catch fluctuations at all depths, with higher catches in August and September. A distinct faunal discontinuity was observed at 50-75 m, also confirming the findings of the earlier research programme under the Fisheries Development Project (FDP). This discontinuity was related to a change in bottom substrate, from sand (shallow) to mud (deep). At all depths, catches were dominated by about 10 common cichlid and catfish species, and species richness declined with depth, as also observed by the FDP and the project's lake-wide surveys. Catch rates increased with depth, in contradiction to all earlier studies: however this is now believed to be a function of the sampling site selected, which is noted for poor shallow-water catches.

(b) Life history studies were completed for 40 important demersal cichlid species (breeding season, size at maturity, fecundity and mortality), and growth patterns for 23 species. These studies suggested that many species breed earlier than had previously been reported, implying historic under-estimation of spawning stocks. However, some fishery scientists[1] have questioned the validity of this work on the grounds that the length frequency data presented were in some cases inadequate for reliable growth determinations, and in other cases they did not fit the computer-generated growth curves. Estimates of age at first maturity are dependent on growth projections, and these are therefore also called into doubt.

(c) The diets of 9 important demersal species were studied over a period of 8 months, by means of stomach contents and stable isotope analysis. The

[1] O. Weyl, NARMAP fisheries biologist, Monkey Bay, and D. Tweddle, former fisheries biologist under the Fisheries Research Unit (FRU).

results provide a useful complement to earlier studies that paid relatively little attention to offshore species. They indicate some degree of dietary specialisation among the demersal fishes, suggesting that food partitioning helps to reduce inter-specific competition. Any reduction in water clarity would be expected to impair food selectivity, therefore leading to increased competition and reduced diversity.

26. The study on lakewide population continuity (as demonstrated by morphometric, genetic and life history characteristics) targeted one shallow and one deep-watercichlid species at locations between the SWA and Chintheche. The study found that the shallow-water sandy bottom species showed quite distinct differentiation between the different locations, indicating limited genetic interchange, while the deep-water species was much less clearly differentiated. Combining these observations with the knowledge that some rocky shore species are endemic to a single rock outcrop, while at the other extreme theNcheni project, funded by the Department for International Development (DFID), found no genetic differentiation at all among the Lake-wide pelagic species, it is possible to hypothesise a continuum of population segregation related to habitat. Thus, rocky-shore species face the strongest barriers to between-site genetic interchange, while such barriers become progressively weaker over sandy substrates and with increasing depth, disappearing altogether in the pelagic open-water habitat. Although it requires further verification this hypothesis has important implications for fisheries management, and suggests a stronger biological basis for local community management of inshore fisheries than was formerly evident.

27. An assessment of the potential influence of suspended sediments on the distribution, abundance, diversity and some life history characteristics of rocky shore cichlid species at the Maleri Islands was made in parallel with a similar study on sandy-shore cichlids close to the mouth of the Linthipe river nearby. In summary, it was observed that the abundance and diversity of sandy shore species was inversely related to turbidity – i.e. the fish tended to avoid the sediment plume. In contrast, the rocky shore fishes were anchored to their island habitat and lost body condition progressively through the rainy season as periods of high turbidity inhibited feeding behaviour and slowed the growth of rock-living algae which form their diet.

Systematics/Taxonomy Studies

28. The primary function of this programme was to clarify as far as possible the identities of the many fish species found during the project surveys. This was not merely a matter of identification, since less than half of the Lake'scichlid species had been formally described. The team was therefore engaged in confirming existing descriptions, informally describing new species, revising and redefining genera and species groups, and deriving keys for field identification.

29. At project completion, the Team had succeeded in developing the most comprehensive collection of fishes ever taken from the Lake. The bulk of the collection was made during the Lake-wide survey cruises, but these were supplemented by other fish collecting trips. Three reference collections have been assembled, one for each of the riparian countries, with back-up specimens held in the Africa Museum, Tervuren, Belgium, and the JLB Smith Institute of Ichthyology in Grahamstown, South Africa. In addition to more than 300 fish species which had already been formally described, the Team noted literally hundreds ofundescribed species, many of which were collected in sufficient numbers to allow formal description in the future.

30. The Systematics Team accumulated an extensive library atSenga Bay, and databases developed under the project's systematic work are now assembled on CD. Counterpart staff acquired a high level of skill during this programme, and graduate students were supported in their research endeavours for their dissertations. A guide to the fishes of the lake is currently in preparation. In addition to the work on fishes, some work on the distribution of algae was carried out under the limnology and water quality programme.

Limnology and Water Quality Monitoring

31. The water quality programme was seen primarily in the context of potential pollution threats to the lake's biodiversity. Four specific outputs were identified: (i) the provision of baseline information and the identification of long-term trends in water quality; (ii) identification of pollution threats to biodiversity hotspots and fish replenishment areas; (iii) the development of a model for understanding the ecological interactions between the biotic and physical elements of the ecosystem, and (iv) the training of counterpart researchers and technicians from within the region. It was originally envisaged that all of these outputs would be accomplished and reported within 30 months of Grant effectiveness.

32. An agreement was made between the (then) Ministry of Forestry, Fisheries and Environmental Affairs (MOFFEA) and the Freshwater Institute (FWI) of the Department of Fisheries and Oceans (Winnipeg, Canada) to implement the water quality programme under CIDA financing. Ten scientists from FWI made direct inputs to the project. Four subsidiary agreements expanded the range of expertise available to the project, as follows:

- A direct contract to employ an international limnologist to act as Resident Limnologist and leader of the field programme.

- Educational agreements with the Universities of Manitoba and Waterloo: under these agreements 7 researchers from the region were enrolled for higher degrees (6 at M.Sc. and 1 at Ph.D.) and a total of 8 scientists, graduate student supervisors and Canadian graduate students participated actively in the water quality programme.

- A research agreement made with the Centre for Earth Studies (CEOS) of the University of Manitoba to provide for services in remote sensing and GIS analysis: 4 scientists were involved in this activity.

33. In addition many other institutions provided specialist services to the programme on a cost-recovery basis (without charging for salaries or overheads): these included the National Water Research Institute of Environment Canada, Ontario (2 scientists); the University of Minnesota (4 scientists) and the Scripps Institute of Oceanography (2 scientists). Thus the full Limnology Team consisted of a Coordinator mostly residing in Canada, the Resident Limnologist, two counterpart staff, the graduate students enrolled in limnology and a total of 37 visiting scientists who provided specialist inputs to the research programme.

34. The water quality programme was large and its outputs extensive and difficult to summarise. The principal areas of study, and a necessarily oversimplified snapshot of research findings, were as follows:

(i) **River flows and water quality**. This programme focused almost exclusively on Malawi's rivers. It was found that inputs of critical nutrients nitrogen (N) and phosphorus (P) from rivers were much higher than previously estimated.

Those rivers (mostly in southern Malawi) whose catchments were most affected by agriculture and deforestation (e.g. the Linthipe, the Dwangwa and the Songwe) were the largest contributors of N, P and sediment to the Lake, with concentrations 5-10 times higher than in less disturbed catchments. It is believed that catchment modification is increasing the P:N ratio in the Lake's surface waters.

(ii) **Atmospheric deposition**. Nutrients carried from the atmosphere into the Lake by rainfall were also found to be more significant than previously thought. Although probably less in total than river-borne nutrients, atmospheric N and P are contributed largely in solution rather than as particulate forms, and thus contribute more directly to the enrichment of the Lake's surface waters. Seasonal burning in the lands surrounding the Lake is believed to be the main source of atmospheric nutrients.

(iii) **Vertical mixing and upwelling**. The Lake has three distinct water layers separated by temperature discontinuities: the epilimnion, or surface layer, the metalimnion and the deep hypolimnion. The deep waters are rich in nutrients but slow interchange between the layers limits their availability to the productive surface waters. The rates of exchange were found to be lower than previously estimated, making the contributions of river and atmospheric nutrient sources relatively more important in determining the nutrient status of the upper mixed layer. Upwelling is the main form of water exchange, and in the southern Lake is 100 times more important than turbulent mixing.

(iv) **Factors controlling algal growth**. Although surface water nutrient concentrations are low, algal growth appears not to be strongly constrained by nutrient availability. This could be because the current flora is adapted to low nutrient concentrations, or because heavy grazing pressure by zooplankton maintains algal density at a low level. In experiments in which nutrient status was enhanced algal biomass increased only after 2-4 days. An increase in the P:N ratio (see (i) above) will favour N-fixing blue-green algae over the historically dominant diatoms, as has already occurred in Lake Victoria. Such a change would be self-sustaining, since nutrients contained in blue-green alge are quickly recirculated when they die, while diatoms sink on death and constantly remove nutrients from the surface layer.

(v) **Evidence of recent changes in water quality**. Analysis of core samples showed that while biogenic sedimentation remained roughly constant between 1900 and 1960, the rate of algal sedimentation accelerated significantly after 1960 in the southern Lake, in response to increasing nutrient inputs. Comparison of current phytoplankton composition with historic records also gives cause for concern. Changes include a shift towards species more characteristic of nutrient enrichment and poorer light conditions, as well as the appearance of a filamentous blue-green alga which often dominates in highly eutrophic situations and which has toxic forms.

(vi) **The nutrient budget for Lake Malawi/Nyasa**. The current study has reassessed the relative contributions of riverine, atmospheric and deep-lake nutrient sources to the productive surface layer. Rivers and atmosphere contribute roughly equal amounts of N and P, but a much higher proportion of the atmospheric contribution is in soluble form. Mixing from the deep waters contributes as much P as rivers and atmosphere combined, and considerably

more dissolved silica, but relatively little N is derived from this source. Catchment alteration is the most likely source of major change in the nutrient budget, and would be better studied through a dynamic model of nutrient loading than by the static budget approach.

(vii) **Contaminants**. PCBs are significant contaminants of the Lake's surface waters and air, but are below detection levels by 40m depth. Concentrations of persistent pesticides, PCBs and mercury in most fish are low. DDT was the predominant organochlorine, and was found at highest concentration in oily fish and top predators (*ncheni*, *mpasa*). Copper and zinc were the only metals to exceed Sediment Quality Guidelines.

(viii) **Conserving the Lake ecosystem**. The programme made a number of recommendations based on these findings, chief among these being (a) the adoption of an ecosystem approach to Lake management; (b) the initiation of a programme of watershed management; (c) contaminant monitoring, and (d) ongoing ecological monitoring, including the establishment of a tripartite ecosystem monitoring agency.

The Rehabilitation of Research Facilities

35. Although not provided for in the project document, considerable investment was needed to make the research station at Senga Bay fit for its intended purpose. Although it was judged at project appraisal that the site and its equipment were "ideally suited" for the proposed research programme, the following civil works were carried out early in the project: extension of the main laboratory building to add two offices; construction of a store for the fish collections and conversion of one dwelling house into a systematics laboratory. In addition, the project acquired a new water pump, a standby generator and three vehicles for use at Senga Bay, and purchased necessary laboratory equipment to a value far exceeding the budget of US$5,800.

36. Minor rehabilitation of the Cape Maclear Research Station in Malawi was carried out according to schedule, and provided for the implementation of a bilharzia control programme supported by DANIDA from April 1998 to July 2000.

37. The planned rehabilitation of research facilities at Kyela Centre Fisheries Research Station in Tanzania and Metangula Fisheries Research Station in Mozambique was to have been undertaken by UNDP in these countries following: (a) design and cost estimates prepared by local consultants funded by World Bank trust funds, and (b) joint preparation of two UNDP construction projects, each with a budget ceiling of US$200,000 to include construction and partial equipment. By the time of the MTR it was evident that this course of action stood little chance of success, and project management at Senga Bay was asked to assume direct management of civil works procurement. The construction at Kyela is now completed but, despite repeated attempts by the Government of Malawi, no action was taken by the Mozambican authorities with respect to the Metangula facilities, as local estimates for the work needed have persistently exceeded the available budget.

National Capacity Building Component

38. This component was divided into two sub-components: (i) training, to provide both formal education and on-the-job instruction in fish ecology, taxonomy, limnology and environmental education; and (ii) a conservation awareness program, aimed at all sectors of

society but most especially the rural lakeshore communities whose livelihoods are linked so closely to the lake's productivity.

The Training Programme

39. The project provided for nine professional staff (three from each country) to obtain higher studies under MSc and PhD programmes; to train six counterpart staff (research or assistant research officers) on the job by including them as members in the three main research studies of the Project, (i.e. ecology, systematics and limnology), and short-term training (six months) for 24 people on environmental education. Unfortunately, the last of these training proposals was not formulated in sufficient detail during project appraisal, and this had to be done during implementation with the assistance of CIDA.

40. A total of 10 people were given long- term postgraduate training: eight to M.Sc. and two to Ph.D. levels. The FWI implemented the university education programme under CIDA tied funds and seven of the students (including one Ph.D.) were sent to study in Canada and the United States, while two students (one a Ph.D. student) were sent to South Africa, part-financed by the Republic of South Africa. An additional student completed a post-graduate training at the University of Malawi. The graduate programme started late because of an extended delay in the nomination of trainees by the riparian countries, and the Mozambican trainees were further delayed because they were required to upgrade their English language proficiency before they could join the universities. The time lag between planned and actual commencement of graduate studies meant late arrival of the students to the project and hence little time to work with the Project scientists. Apart from this missed opportunity, the graduate training programme was one of the most successful elements of the Project. The three countries have strengthened their scientific staff, creating the basis for continuing the work on the Lake initiated by the project. In addition, the dissertation works carried out by the students are important scientific outputs on their own rights, and are considered an integral part of the Project's scientific studies.

41. As explained in the previous paragraphs, the six counterpart staff were assigned two each to the three scientific studies as members of the study teams. As such, they obtained on-the-job training in their research disciplines by working with the project scientists. Assessments made by those project staff indicate that the counterpart training was very successful, and that the individuals trained are able to make a strong contribution to research capacity within their mother institutions.

42. **Short-Term Training**. The project recruited a full time Environmental Education Officer and subsequently ran two courses, each of six months. The first course for 10 people was conducted from August 1997 to January 1998, and the second, for 12 people, from March to August 1998. The rationale for these courses is unclear. Ideally, the training should have targeted individuals who would be in a position to transfer the knowledge acquired to others, e.g. school teachers or extension workers, or who had roles to play in the planning or execution of environmentally related tasks. Regrettably, some of the trainees who had been identified by the three governments left the courses to resume posts far removed from the Lake and environmental education. Further, the courses had a heavy emphasis on fish-related scientific and technical subjects which were beyond the need of imparting basic environmental appreciation to lay-people. There was perhaps a need to have critically studied the purpose of the training and accordingly designed a well focused programme for the different trainees in accordance with their professional roles. There has been no evaluation of this training programme, and it is thus difficult to assess the outcome.

The Community Awareness Programme

43. The design of the Conservation Awareness subcomponent called for a variety of environmental education activities at the community level and in schools through the fostering of school wildlife clubs. The program was based in Cape Maclear at the Environmental Education Centre in LMNP. The project provided funding for rehabilitation of the Environmental Education Centre and housing for an Environmental Education Officer (EEO) and a Community Education Officer (CEO). These two officers were to receive on-the-job training from the Wildlife Society of Malawi (WSM), and the sub-component was to be implemented by the WSM in cooperation with the Department of National Parks and Wildlife (DNPW).

44. The sub-component was revised substantially at the beginning of project implementation due to the availability of CIDA funds for use in lake-wide public awareness-raising , and a determination by project management that WSM lacked the capacity to implement such a regional programme. An expatriate Environmental Education specialist was hired to organize the six-month training courses and to provide technical support to the regional conservation awareness programme that was implemented by the EEO and two CEOs. The EEO completed an M.Sc. in Environmental Education through the project, while the CEOs both undertook the six-month training course.

45. Among the activities carried out under this sub-component were the following.

- 18 schools received conservation awareness programs based on information gained from the six-month training course;
- 2 workshops were held for school Wildlife Club patrons (school administrators and teachers) from area schools;
- 1 workshop was organized for 40 students (two students from each Wildlife Club in 20 schools);
- 18 villages in the Namkumba Peninsula received conservation awareness programs;
- nearly 90 traditional leaders from lakeshore communities participated in environmental awareness workshops; and
- a two day workshop was held on water quality monitoring for students and teachers from 10 schools.

46. In addition to these activities, the project also provided a bus for environmental education activities and instruments for the Wildlife Band, a locally recruited musical group that promotes environmental awareness. The Wildlife Band and a pair of Malawian comedians toured villages in the Nankumba Peninsula as part of the community-based conservation awareness program.

47. The programmes listed above were carried out by Malawian project staff with the participation of local technical specialists from the DNPW, Department of Fisheries, the District Environment Officer, and the WSM. The project also produced a variety of video and graphics products including posters, flyers, and environmental videos.

48. Theatre for Africa (TFA), a South Africa-based professional theatre company, was contracted on a sole source basis to develop and perform a series of innovative plays with relevant environmental messages for populations living along the lakeshore in Malawi, Tanzania and Mozambique. 11 actors from the riparian countries were recruited and trained by the theatre

company in all aspects of environmental theatre. The troupe performed in all three countries and is said to have provided performances seen by more than 108,000 people. By most accounts, TFA's performances were very well received by both rural and urban audiences. An informal assessment conducted twelve to eighteen months after the performances determined that there was generally a high level of recall of both the plays and the content of the environmental messages they communicated.

49. While the effectiveness of drama in promoting environmental awareness is accepted, the relatively high cost of TFA and the lack of effective links to existing local drama groups, such as one based at Chancellor College, undercut the sustainability of this approach to environmental awareness. Furthermore, the link between the scientific findings of the project and the environmental messages selected for the plays is unclear. Since the findings and management recommendations derived from scientific research were only available at the end of the four year project, the messages promoted by the conservation awareness program were of necessity based either on the current thinking of the Department of Fisheries and other public agencies or on the opinions of specialists consulted by the authors of the production pieces. While the specialists consulted may have been employed by the project, their opinions were necessarily based on previous experience and understanding rather than on scientific findings of this project.

50. On a more fundamental level, the ICR team questions the appropriateness of adding a community-based conservation awareness component to what was at heart a scientific research project. Not only was the conservation awareness programme a diversion to the Project's narrow management base, but it proved impossible to sustain beyond the Project's short duration.

Environmental Legislation Component

51. This component proposed to study the compatibility of the existing legislation of the three riparian countries for the management of the Lake, with a view to developing an effective and harmonized legal framework for the conservation of itsbiodiversity. For this purpose, it was envisaged that the GEF funds be used to finance a legislative review of the three countries, to be discussed in a regional workshop, and the preparation of a report that would contain the main recommendations to the riparian countries. This component was not implemented as planned, as both implementation and financing responsibility was transferred to FAO early in the Project. Following the communication ofFAO's interest in assisting this component, project management concurred with the idea of allowing FAO to fund and implement the programme, so that the savings made from this component could be used for other project activities.

52. FAO proposed to provide assistance under its Technical Cooperation Programme (TCP) for the three riparian countries in the context of an 18-month international project. Securing the three countries' agreement with the TCP assistance was a slow process. The project document was approved in principle in February 1998, but implementation was further delayed because the Government of Tanzania refused to sign the document due to disagreement on the name of the Lake. The document was eventually revised to the satisfaction of the three governments and was signed by all countries. Accordingly, national consultants in law and natural resource management were recruited in September 1999 in each of the riparian countries to assist the relevant government agencies. The national consultants are now completing the preparation of their respective country reports, which will be consolidated into a joint report with the assistance of FAO and international consultants. Representatives of the three countries will review the joint report in a workshop to be organized under the TCP. Subsequently, a draft agreement for international cooperation in the management of Lake fisheries, supported by legal instruments to harmonize current legislation, will be prepared for discussion by an inter-governmental meeting to be hosted and facilitated by the project.

53. In order to ensure the successful implementation of the TCP assistance, FAO has approved another TCP support in May 2000 to the amount of US$ 299,000. This guarantees the availability of funds for the task, but it is not easy to estimate the completion date precisely, as this will depend on how fast the three countries want to move. It should be recognized that the component as it now appears in the TCP has a different scope to that originally envisaged: broader in its inclusion of capacity development and the development of a framework for environmental monitoring as project objectives, but narrower in legal scope in that at this stage it is not proposed to include more than the fisheries sector in the legal harmonization initiative, as requested by the three countries.

Protected Areas Management Component

54. This component was to focus entirely on the Nankumba Peninsula in southern Malawi, although it has links to the Biodiversity Map and Management Plan in which proposals for additional protected areas were possible outputs. The Nankumba Peninsula divides the two southern arms of Lake Malawi, and comprises an interesting mosaic of indigenous forest, still inhabited by elephant; smallholder and estate agriculture;artisanal and mechanised fisheries, and tourism, centred on but by no means confined to the LMNP. Land and resource-use conflicts were increasing, and the lack of an appropriate planning framework which would guarantee the local communities a fair share of the returns from tourism and other commercial enterprises was seen as a constraint to rational development and a longer-term threat to the conservation functions of the National Park.

55. Preparation of the Nankumba Peninsula Strategic Plan proceeded in two phases. The first phase was financed by CIDA Industrial Cooperation Division (CIDA INC) and implemented by a sole-sourced consulting firm between October 1994 and early 1995 (i.e. prior to project start-up). Work undertaken during this period included the establishment of a natural resources database; the completion of a socio-economic survey and the mapping of existing and historic land and water uses; the identification of transportation, communication, energy, water and waste management issues; and an assessment of tourism potential, markets and facilities.

56. The second phase was financed directly by the project under a contract with an international consulting firm awarded through a competitive tender. There was a delay of almost four years between the two phases occasioned by administrative failures, and the second phase was implemented between January and July 1999. The objective of this work was to prepare the strategic development plan for the peninsula based on the information gathered during phase one and in consultation with the local communities. The plan was to resolve development and resource-use issues at the local level and provide for all potential sources of economic growth, especially tourism. The plan would also pay special attention to the problems of the LMNP, including relationships between the park and its enclave villages, financial sustainability and architectural and landscape plans for infrastructural development.

57. The consulting team gathered up-to-date information for planning purposes and from the outset used a strongly participatory approach to the planning process, including consultations through 27 public meetings with 41 out of 91 villages in the planning area. The principal problem identified was the *de facto* open-access to natural resources and consequent unsustainable resource use regimes affecting agriculture, fishing, forests, wildlife and tourism. Access to resources was inequitable between local and other stakeholders, with local communities marginalized. Although they had no incentives to work towards sustainable management the local communities were in the great majority on the ground and were able effectively to veto initiatives towards sustainable resource use by other stakeholders.

58. The solution to this central problem was seen as: (a) the empowerment of local communities to take legal ownership of their land and natural resources, replacing open access by community access, and (b) developing the tourism industry in a planned andcoordinated fashion and, under the new access regime, largely to the benefit of the local population. A basic tool in the strategic plan is the promotion of the Village Trust as a means of conferring a *legal persona* on a village community, thereby enabling it to enter into contracts, including land leases, and providing a variety of new avenues for the profitable management of village resources. The plan also proposes a system of zoning relating to land use, tourism and infrastructure development, describes a management process for the implementation of the plan and suggests an ambitious investment programme.

59. The strategic plan was very well received by all stakeholders, and there is no doubt that this component of the project was completed to a high standard and with considerable imagination. There is concern, however, that the planning exercise was undertaken in the absence of an agreed mechanism for its implementation. In consequence, expectations in Nankumba, which were raised considerably through the consultancy team's high-profile public presence, are now turning to disappointment as the period of inactivity lengthens. This was the fault of neither the consultants nor the project management: the project design specified a highly participatory planning process without reference to the means, timing or financing of implementation. The village trust concept has taken root, however. The first village trust in Malawi is the Chembe Trust[1], formed with the assistance of a local eco-tourism operator and registered in July 2000. It is expected that the Chembe Trust will enter into a co-management agreement with the DNPW in order to secure a share in tourism revenues, at the same time providing a new incentive towards the conservation of the park's resources.

D. PROJECT IMPACT AND SUSTAINABILITY

60. Impact and sustainability of what was first and foremost a science programme are best considered together. The scientific impact of the project has yet to be fully felt and appreciated. It has been delayed for several reasons. First of all, many of the final scientific outputs of the project are only now emerging, and some will not be apparent until after formal closure at the end of December 2000. The project was strongly affiliated to academic institutions overseas, thus work continued in several fields after the internationally recruited scientists left Malawi and some products such as the guide to the Lake's fishes are still in preparation. A number of M.Sc. and Ph.D. dissertations, which should be regarded as an integral part of the science programme, also await final publication.

61. Secondly, the interim management plan for the Lake, which was intended to bring together the conclusions and recommendations of the science programme, is yet to be brought to its final form. The water quality report does provide a summary of recommendations and discusses options for Lake management, but recommendations related to fisheries and biodiversity are found only in scattered papers within the final reports of the systematics and ecology teams as well as in the PM's final report, and are not completely brought together or synthesised. The project simply ran out of time, and this important output was not finalized. Finally, horizontal linkages with national institutions for which the project's findings would have most relevance were weak at best. In Malawi such institutions include the Fisheries Department, especially the FRU; the Water Resources Department of the Ministry of Water Development and the University of Malawi. Such weak linkages with these agencies during project preparation and implementation will not necessarily reduce the project's long-term impact, but it will certainly delay it.

[1] Chembe is one of the LMNP enclave villages.

62. Although delayed, the impact of the project in determining the future of Lake management is likely to be both strong and sustainable. The standards applied in the research component were generally of a high order, and were guaranteed by strong linkages with academic institutions of international repute. The only research outputs to be openly challenged by other scientists are the analyses applied to parts of the ecology programme, where the mid-stream shift in programme direction imposed extreme time constraints. Otherwise, the project's highly relevant and useful scientific products will be of value to planners and managers of the Lake and its resources over many years to come, and their sustainability should be rated high.

63. Similarly, both the impact and sustainability of the capacity building programme were also high, and this should be considered one of the most successful aspects of the project. The training of 10 regional professionals in research disciplines through the postgraduate studentship programme has made a significant contribution to the availability of local expertise for future application to the Lake, while the international academic linkages fostered by the project also secure future academic cooperation on a long term and self-sustaining basis. The counterpart training was carried out with diligence and has had a modest but significant impact on regional capacity for research on the Lake.

64. The impact of the project's formal training in environmental education is rated low, because of the limited return of course graduates to allied work within the Malawi/Nyasa basin. Further, because the training was a one-off and stand-alone exercise without links to existing regional or national training institutions, it had no sustainability even in the short term. This is considered to be a failure of project design rather than implementation.

65. The environmental awareness programme appeared to have had a considerable positive impact on the communities it covered, even though its overall geographical coverage was necessarily limited. Again, project design did not provide for the continuation of this programme beyond the life of the financing agreement, and sustainability is therefore limited to the capacity-building aspect of this work. The deployment of theatrical and artistic skills of a high international standard did much to raise the public profile of the project and provided valuable lessons in the power of these media in communicating environmental messages. More could have been done, though, to tie these efforts into local institutions and strengthen artistic resources within the region. On the basis of the project's experience, theatrical and visual arts should be encouraged to play a more prominent role in future efforts to enhance the management of the Lake and its catchments.

ANNEX 7C

GOVERNMENT OF MALAWI
EVALUATION REPORT OF THE SADC/GEF BIODIVERSITY CONSERVATION PROJECT

1.0 INTRODUCTION

The SADC/GEF Lake Malawi/Nyasa Biodiversity Conservation Project was implemented between July 1995, when it became effective, and June 2000. This period of implementation included an extension of 11 months which was requested to allow for the execution of a monitoring phase during which the baseline environmental parameters established by the main phase of the project could be monitored to assess the variability.

The Government of Malawi now gives its comments on the design, implementation, outputs and performance of the parties. Comments and views in this Government ICR are being provided to the World Bank for consideration in future project design. Government supported an ICR Mission in mid October by arranging for a number of meetings with stakeholder institutions which took part in project implementation. A final wrap up meeting was convened on the 25th of October 2000 which was chaired by the Principal Secretary in the Malawi Ministry of Natural Resources and Environmental Affairs. The Mission prepared an Aide Memoire which took into account comments made at the wrap-up meeting and contained the perception of the Government. The Government also participated in the WB ICR review meeting held on the 19th of December 2000 via a video-conferencing link.

The experiences and the lessons learnt concerning the design, and implementation of the project will be considered in the planning process of the follow-on project which is underway at the moment.

2.0 PROJECT OBJECTIVE

The main objective of the SADC/GEF Biodiversity Conservation Project was to assist the riparian countries in creating the required scientific, educational, and policy basis for conserving the important biological diversity of the Lake and its unique ecosystem. In the following paragraphs, a description of the components and the efficiency with which these were executed is presented. The final part presents the lessons learnt for consideration in designing similar projects.

3.0 DESCRIPTION OF PROJECT COMPONENTS

a) Research

(i) biodiversity surveys to inventory fish species and their distribution, identify critical habitats and biodiversity hotspots in the lake, produce a map of critical habitats and identify threats to the lake's biodiversity;

(ii) studies on the taxonomy, ecology and distribution of important cichlid species;

(iii) a limnology and water quality monitoring programme to identify threats to hotspots and fish replenishment area; and

(iv) the rehabilitation of the Cape Maclear Station in Malawi, the building of a new Fisheries Research Station at Kyela in Tanzania and at Metangula in Mozambique.

(b) Strengthening National Capacity

Comprising "on-the-job" training of professional and technical staff from the 3 riparian countries in ecology, taxonomy, limnology and environmental and Community education. Financing was also to be provided for rehabilitation of the Environmental Education Facility at Lake Malawi National Park, which was playing an important role in linking up with the local communities in enclave villages in the Nankumba Peninsula.

(c) Strengthening Environmental Legislation

Includes the review and evaluation of the compatibility of the existing legislation on fisheries management and exploitation and handling in the three countries.

(d) Protected Area Management

Was to prepare a Strategic Plan for Nankumba Peninsula and Lake Malawi National Park to ensure that development of the area takes place in harmony with the natural setting.

4.0 FINANCIERS AND IMPLEMENTATION ARRANGEMENT

The Project, to be implemented over a period of four years, was expected to prepare a comprehensive Biodiversity Map and a Management Plan (BMNP) for the Lake based on the information it would collect. All activities were to be financed by the Global Environmental Facility (GEF) and by CIDA.

DFID contributed to the project by providing for the maintenance of a satellite receiver and payment of salary for a British skipper to serve under the project. During

implementation, FAO also took over responsibility for the legislation component by providing finance under its Technical Co-operation Programme (TCP).

Malawi, as the Sector Co-ordinator for Inland Fisheries, within SADC, was to implement the Project on behalf of the other two riparian countries. Therefore, the Malawian line ministry, the Ministry of Natural Resources and Environmental Affairs (MNR&EA), took charge of the Project. A Tripartite riparian Steering Committee (SC) was established, under a permanent chairmanship of the Principal Secretary (PS) of MNR&EA, to guide the Project on policy issues and help remove administrative obstacles to project implementation in each country. A Project Administration Unit (PAU) headed by an internationally recruited project manager and deputised by an equally internationally recruited Financial Controller was also set up in Senga Bay to carry out the day-to-day management of the project. To this outfit were added three scientific experts to lead the research program.

5.0 IMPLEMENTATION OF SPECIFIC COMPONENTS AND ACHIEVEMENTS

a) Research

This component was an ambitious Lake-wide study to collect data for the formulation of recommendations for the management of the Lake. It was believed at the design stage of the project that this activity would identify critical habitats and biodiversity hotspots and suggest measures to demarcate them for special management, identify threats to the biodiversity in these spots from water quality related issues, and prepare a Biodiversity Map and Management Plan (BMMP) for the Lake based on the information provided by species distribution, habitats and water quality analyses.

Such a task was, however, found to be overly ambitious and at the midterm review this scientific output was redefined as follows:

i) interim resource management recommendations and strategies that could be supported by hard data collected by the Project;
ii) identification of critically needed follow-on scientific work to be included in a possible second phase project; and
iii) recommendations to develop terms of reference for preparing a second phase project.

The frequent breakdowns of the research vessel, Usipa which had been idle and unattended since the last project, influenced the progress of the lake-wide surveys initiated in June 1997, but however the workplan was largely completed by the end of 1998.

- **Ecology**

This was conducted in two phases. During the first phase, June 1997 - January 1998, a lot of data were collected during the lake-wide surveys. Unfortunately, the ecological analysis of the information gathered during this first phase was not fully completed after the departure of the Senior Ecologist in January 1998. Only a limited use of this data was made in the analysis of biodiversity presented in the Taxonomy report. A second fish ecology programme was conducted six months latter and for 10 months from June 1998 to July 1999 with a new ecologist, who developed a programme confined to a small section of the southern part of the Lake.

- **Systematics**

The main objective of this programme was to clarify as far as possible the identities of the many fish species found during the project surveys. The Team was therefore engaged in confirming existing descriptions, informally describing new species, revising and redefining some genera and species groups, and deriving keys for field identification.

At the end of the field work, the Team had developed a fairly comprehensive collection of fish from the Lake. Triplicate reference collections were made, one for each of the riparian countries, with back-up specimens held in the Africa Museum at Tervuren in Belgium, and the JLB Smith Institute of Ichthyology in Grahamstown, South Africa. The Systematics Team reported that they collected hundreds of undescribed species, many of which were available in sufficient numbers to allow formal description in the future.

- **Limnology and Water Quality**

This study, was carried out by the Fresh Water Institute of the Department of Fisheries and Oceans (Winnipeg, Canada), and focussed on studying the water quality of the Lake, and rivers flowing into the lake. The Limnology Team was the largest as it benefited from periodic visits of expertise in different fields from Canada and the United States.

The Limnology Team produced the first comprehensive survey of water quality of the Lake and its rivers. Its results were presented in a remarkable Water Quality Report produced at the end of the project which outlines the major threats to biodiversity and describes investigations of river discharge; atmospheric nutrient deposition; deep water renewal; nutrient up welling; nutrient recycling; and factors controlling algal abundance. This provided baseline information on the Lake that will become the basis for long-term monitoring of water quality changes. The scientific data generated by the study are of high quality, and will become invaluable in the formulation of programmes and management plans for the Lake and its catchment areas.

b) Strengthening National Capacity

This component consisted of a long term formal training and a short term informal training in conservation awareness for Project staff and other staff from the riparian countries, as well as community members.

Under the long-term training of graduate students, a total of 9 people were given training: seven to M.Sc. and two to Ph.D. The Fresh Water Institute implemented the university education programme under the CIDA tied funds and seven of the students (including one Ph.D.) were sent to study in Canada, while two students (of which one a Ph.D. student) were sent to South Africa. The Republic of South Africa financed a small part of the student costs in this country.

The graduate student programme started late because the riparian countries took considerable time in finalising the nomination of the trainees, not appreciating the lead-time needed to fulfil the enrolment requirements. With regard to the Mozambican trainees, there was an added factor, which delayed their early start, as they were required to upgrade their English language proficiency before they could join the universities. The time lag between the planned and the actual commencement of graduate studies meant late return of the students to the project and hence no time for the majority of them to work with the Project scientists who were completing their assignments. The graduate training programme was one of the most successful elements of the Project.

The Project proposed to train 24 people in environmental education, and this was accomplished through the implementation of two six-month courses held at Cape Maclear. The rationale for this training programme was not so clearly understood, nor the length of the training or areas of focus. Ideally, the training should have targeted individuals, e.g. school teachers or extension workers who would be able to transfer the knowledge acquired on the environment to other people. It would also have been sensible to train people who had roles to play in the planning or execution of environmentally related tasks. From information provided, some trainees, such as those working with communities, are transferring the education they received to members of the community, while others had little opportunity to make use of the training obtained.

c) The community awareness programme

The design of the conservation awareness subcomponent called for a variety of environmental education activities at the community level and in schools through the fostering of school wildlife clubs. The programme was based in Cape Maclear at the Environmental Education Centre in Lake Malawi National Park. The project provided funding for rehabilitation of the Environmental Education Centre and housing for an Environmental Education Officer and a Community Education Officer. The programme was revised substantially following the availability of additional funds from CIDA.

In addition to the above, the Project also provided a bus for environmental education activities and instruments for the Wildlife Band, a locally recruited musical group that promotes environmental awareness. The Wildlife Band and a pair of Malawian comedians toured villages in the Nankumba Peninsula as part of the community based conservation awareness program.

Theatre for Africa (TFA), a South African-based professional theatre company, was contracted on a sole source basis to develop and perform a series of innovative plays with relevant environmental messages for populations living along the lakeshore. Two actors from each of the riparian countries were recruited and trained by the theatre company in all aspects of environmental theatre. The troupe performed in all three countries and is said to have provided performances seen by more than 108,000 people in the three riparian countries.

d) Strengthening Environmental Legislation

This component was not implemented as planned, as the implementation and financing responsibility was transferred to FAO in the early stages of the Project. Following the communication of FAO's interest in assisting this component, project management concurred with the idea of allowing FAO to fund and implement the programme, so that the savings made from this component could be used for other project activities.

e) Protected Area Management

This component aimed at solving the increasing land and resource-use conflicts in the Nankumba Peninsula, where the lack of an appropriate planning framework was seen as a constraint to rational development and the conservation functions of the National Park. The study to produce a Nankumba Peninsula Strategic Plan followed an initial information-gathering phase conducted in 1994-95 and was carried out under a contract with an international consulting firm awarded through competitive bidding process. There was a delay of almost four years between the two phases occasioned by administrative failures, and the second phase was implemented between January and July 1999. Its objective was to prepare, in consultation with the local communities, a strategic development plan for the peninsula to resolve development and resource-use issues at the local level and provide for potential sources of economic growth, especially tourism.

The consulting team gathered current information for planning purposes and from the outset used a strongly participatory approach to the planning process, including consultations through meetings with villages in the planning area. The principal problem identified was the de facto open-access to natural resources and consequent unsustainable resource use regimes affecting agriculture, fisheries, forestry, wildlife and tourism. The consultants produced a comprehensive plan, in which solutions to the problems in the area were proposed.

6.0 ORGANISATION AND MANAGEMENT

An internationally recruited Project Manager (PM) and a Financial Controller were in place by July 18, 1995. The TOR for the PM reflected an underlying uncertainty in whether the manager should be a management professional or a scientist. The person chosen for the post had strong scientific qualifications as a fish ecologist with substantial experience on Lake Malawi. The PM produced a revised PIP by February 1996 and undertook the review of the Senga Bay facilities and equipment, identifying deficiencies, which were included in the PIP for correction. As the Project staff had been designed in the context of the GEF grant only, it was found necessary to add administrative capacity in order to accommodate the additional demands of the CIDA programme. Therefore an, administrative officer was recruited in 1997 for two years.

The legal agreement establishing the project was with the Government of Malawi only, yet the implementation of the project was to involve Tanzania and Mozambique. This discordance between the bilateral basis of the grant agreement and the regional character of the project's objectives and oversight structure was heightened by the lack of progress in the construction and equipping of the Kyela (Tanzania) and Metangula (Mozambique) research stations. Despite these constraints, the project was able to carry out its activities in all three countries with the support of all parties concerned.

Administrative problems arose during the Project implementation regarding the compensation of counterpart staff: (a) due to salary differences between officers of the same qualifications but placed in different grades following the staffing plan; and (b) income erosion of Malawian counterparts (who were paid in Kwacha as opposed to the others whose salaries were US dollar based) due to the devaluation of the Kwacha. These issues persisted throughout the project implementation.

7.0 MAJOR FACTORS AFFECTING PROJECT IMPLEMENTATION

a) PROJECT DESIGN

Agreement with one country: The agreement for the provision of the grant for project execution was signed with only one country, Malawi even though the activities were to take place in Mozambican and Tanzanian territories. This caused administrative problems as foreign staff members had get clearance to go to these territories to execute activities of the work program. This was a problem for achieving regional co-operation as the other two countries always felt that they did not have a real hand in the whole programme. This explains in part why the appointment of staff and candidates for the project execution and training program respectively met with delays as government officials had at that time not fully understood their expected roles and responsibilities in the three countries.

No linking with national research systems: An important weakness in the project design was definitely the weak linking of the project with any of the Fisheries research institutions in the three countries. This affected both continuity and transmission of research findings. The fact that only seconded staff with limited influence to their institutions were placed at the project site made it very difficult to channel the findings of the project into the national research systems for interpretation and final dissemination to the end users.

The project got involved in activities for which such cooperation was needed. The lake wide surveys for example, could have benefited from a series of lake wide data collected during quarterly lake wide surveys of the Malawi Fisheries Research Unit which were run using its own Research Vessels since 1993. This data is much richer and stabilised in terms of temporal and spatial variability and if it had been associated with the data the project collected in its lake wide surveys which covered less than 2 years could have allowed for better interpretation than what was done. This aspect of the work of the project is key for use of the data in policy formulation and decision making of some of the findings of the project especially on the ecological work.

High expatriate content: The high content of expatriate staff was inbuilt in the project design. This was probably justified by the desire to deliver the ultimate in science. This goal was definitely achieved in some of the components but there was some capacity building opportunities that could have been missed

Assumption on left over equipment from a preceding project: A mistake was made by believing that the equipment left over by the preceding SADC/UK project in Senga Bay would be ready for use in this project. An expert opinion should have been sought.

Small size of the PAU for a big project: The size of the project administrative unit was not commensurate with the activities for the project. Two important posts of Administrator and procurement should have been foreseen at the design stage. Considerable delays were experienced due to the problems of procuring vital equipment for project implementation.

8.0 LESSONS LEARNT FOR FUTURE PROJECTS

1. All future regional projects on the shared Lake Malawi/Nyasa should have the legal agreement signed by all three countries taking part in the project execution. There should also be separate budgeting for the activities to be done in each country with separate teams recruited to management the project administrative units.

2. Projects of this complexity should have their procurement plan done as part of the project appraisal with the documentation done to a stage where what would be remaining would just be the signing of contracts.

3. The Steering Committee structure copied from the preceding project, the UK/SADC Pelagic Fish Assessment Project is not the right institution to monitor and guide project implementation within a regional context and especially for projects that require follow-on activities. The Steering Committee worked fairly well for the first project which had a fairly finite and a once-for-all kind of mandate which was to quantify the magnitude and the potential for fisheries of the pelagic zone fish stocks.

   Future regional projects design should consider using a Committee of Principal Secretaries from the three countries supported by a permanent and well qualified Technical Committee composed of practising scientists from the three countries. This Committee would meet regularly and they would report to the PSs. The Committee of PSs would only meet if major policy issues arise which require discussion and eventual agreement by all parties for their resolution.

4. The Research Advisory Group proposed in the project design was an important feature of project implementation. It would have assisted in many aspects of the project implementation process including playing referee role in the conflict which led to the non renewal of the contract of the first ecologist and the subsequent modification of the ecology program.

5. The Project should not have punished the Malawian counterpart staff by paying them in an eroding Malawian currency pegged at the rate of exchange ruling at the time of effectiveness of the project. As the salaries of these counterpart staff was quoted in US$ in the project budget, it means that the project actually made savings at the expense of these people. Even though a correction factor was applied to the salaries at close to the end of the project, the Malawian counterpart staff ended up with much less total earning than their Tanzanian and Mozambican colleagues in similar positions.

6. The Government feels that the choice of a Project Manager with a high technical competence than administrative ability **was correct.** This is contrary to the recommendation of the World Bank ICR report that The Manager should have been a pure administer. The Government feels that a pure administrator would not have been able to produce the revised Project Implementation Plan (PIP) and the various documents including the "Time to Act" which the technical Project Manager was able to put together. It is a feeling of Government that technical projects should be managed by technically competent people with good verifiable prior experience in managing projects.

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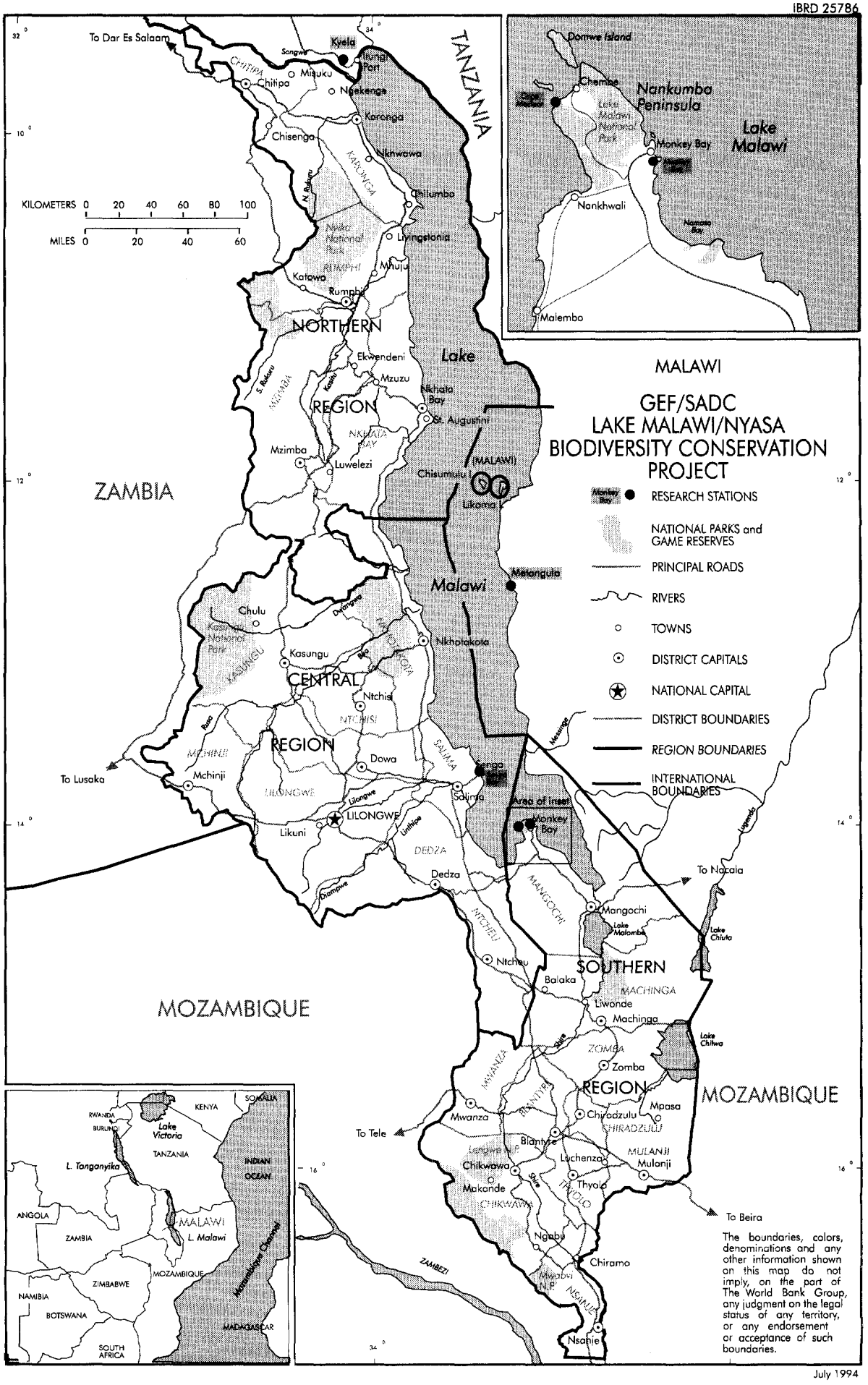

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