Report prepared for
the project
"Taking Biodiversity Conservation to the Proposed Lake Piso Nature Reserve in Liberia"

an initiative of Farmers Associated to Conserve the Environment funded by Critical Ecosystem Partnership Fund

Biodiversity and environmental Impacts of Human Activities on the proposed Lake Piso Nature Reserve

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Abbreviations

3 Cs	the three objectives of forest management in Liberia: Community, Commercial, and Conservation
CEPF	Critical Ecosystem Partnership Fund
CI	Conservation International
EIA	Environmental Impact Assessment
FACE	Farmers Associated to Conserve the Environment
FDA	Forestry Development Authority
FFI	Fauna & Flora International
GEF	Global Environment Facility
GIS	Geographic Information System
GoL	Government of Liberia
GPS	Global Positioning System
HQ	headquarters
IDP	Internally Displaced People
IUCN	World Conservation Union
km	kilometre
LFR	Liberia Forest Re-assessment project
MOU	Memorandum of Understanding
MPEA	Ministry of Planning and Economic Affairs
n	Number (of observations)
NR	Nature Reserve
NGO	Non-Governmental Organisation
NP	National Park
NRM	Natural Resources Management
NTFP	Non timber forest product
PRA	Participatory Rural Appraisal
RRA	Rapid Rural Appraisal
SNP	Sapo National Park
UN	United National
UNMIL	United Nations Mission in Liberia
UTM	Universal Transverse Mercator (a global geo-positioning grid)
WGS	World Geodetic System (see http://www.wgs84.com/wgs84/wgs84.htm)
WWF	World-Wide Fund for Nature

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We look forward to future cooperation.

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Foreword

This report is comprehensive field assessment information resulting from the CEPF funded project "Taking Biodiversity Conservation to the Proposed Lake Piso Nature Reserve" which was implemented by FACE. One of objectives of the project was to establish a computerized database on the area. It is hoped that the information will be useful for decision-making purposes. Lake Piso region is a designated site for RAMSAR (Wetland of international importance) and one of the seven IBAs (Important Bird Areas) in the country. The area has also been proposed for protection by the Government of Liberia (GoL).

Although the report presents the results of rapid biodiversity and socio-economic assessments of the proposed Lake Piso NR, it further discusses key issues relating to future management of the area as brought forth in a training workshop held (July 15-18, 2006) in Sembehum, Tombey Chiefdom, Grand Cape Mount County. These issues include participatory and collaborative efforts for sustainable management of this ecologically important landscape, contribution from the local people to future management plan framework and the concerns of the local communities in terms of conservation of the area. The report also advances important recommendations for future management framework for the area. Interestingly, though an important conservation 'hotspot', the site of the proposed Lake Piso NR contains a lot of settlements with about 20,000 – 28,000 people and a wide range of natural resources, a situation that involves great challenges for management planning and implementation of a plan for whatever protected area category chosen for the site. These challenges will mainly have to do an integrated approach that meets the requirement or criteria for natural resources management and conservation while at the same time meeting local communities' needs and also ensuring that other sectoral concerns (e.g. resource exploration) do not outweigh community and conservation interests.

Therefore we think the report will be an important tool for decision making process and should be an essential reference document for future planning initiatives for the area. Now that a database is being established, we request all environmental partners working or intending to work in the proposed Lake Piso Nature Reserve to make all contributions necessary for upgrading the database on a continuous basis so that, in a space of time, a volume of information can be readily available for planning and other purposes. We also appeal to all partners as well as individuals and groups of individuals in the public and private sectors interested in seen the area under protected area management to join the join the campaign advocating for the gazettement of the area as a protected area .

Thanks

Theophilus V. Freeman
Chairman
Board of Directors
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Summary

For four decades now nature lovers of been concerned about serious conservation actions for the Lake Piso wetlands and surrounding ecosystems. The area has been proposed by the Liberian Government for protected area management. However no concrete action has been taken for gazettement. While hoping for legislative action to do so, local environmental NGOs have maintained their conservation zeal for the area over the years with support from their international partners.

With a grant from Netherlands Committee of the IUCN (NC-IUCN), Farmers Associated to Conserve the Environment (FACE) successfully created conservation awareness in the Lake Piso region which lead to the foundation of a community-based environmental organization called "Piso Conservation Forum" or PCF in July 2004. In 2005, FACE received a grant from the Critical Ecosystem Partnership Fund (CEPF). The intent of the grant (Taking Biodiversity Conservation to the Lake Piso Nature Reserve in Liberia) was to engage local communities in conservation actions and stir up conservation interest among them. This project was refreshment for PCL and an action that built conservation interest throughout the region.

Through the management of the Forestry Development Authority (FDA), the people of the region now aware of the Liberian Government's plan to gazette the proposed reserve for protected area management. This was released to participants in an awareness raising training workshop. This report is timely in that it contains valuable information that will support gazettement action. It also contains data that will be useful for development of future management for the area. It is interesting to note that the site has high biological integrity and values as mentioned in the LFR 2004 faunal surveys report (Waitkuwait et el, July 2003). This FACE assessment report confirms the LFR faunal surveys report, which suggests that the proposed Lake Piso Nature Reserve has high conservation potential. The report concludes with a world of encouragement and challenge to the Government of Liberia to ensure legislative enactment, declaring the proposed Lake Piso Nature Reserve as a protected area.

Based on the results of data gathered during the FACE assessments, which have resulted to the production of this report, it is recommended that the size of the proposed Lake Piso Nature Reserve be increased to from 31, 000 hectares to 60,000 hectares This will allow future management programme for the area to cover more sites with conservation potential. The challenge now is to take all measures necessary for the sustainable management of the area, meaning legislative enactment, development of long-term management plan and implementation of the plan. It is also recommended that the region be gazetted as 'MULTIPLE USE PROTECTED AREA' instead of "Nature Reserve' because of the large number of settlements and how these settlements are spread over the entire region. Finally, it is recommended that in future management plan, each of the four ecosystems be subjected to a management regime that will be suitable for its management sustainably. Other recommendations include: (1)That the new proposed Lake Piso nature Reserve should not go beyond Lofa River in the southeast because any extension beyond the river will include some communities in Bomi County; (2)That a future management plan for the area should consider zoning, such that strictly protected parcels classified as 'nature reserve' would be mixed with parcels classified as 'game reserve', 'communal forest', 'cultural site' and/or 'multiple sustainable-use reserve', all of which are legally recognised protected area types defined under the Protected Forest Area Network Law of 2003. This is intended to protect key conservation areas but also ensure (and simultaneously regulate) local residents' access to fishing, hunting and wood collection zones, as well as culturally important sites. If adequate core conservation areas are protected and corridors are maintained between them through sustainable-use regimes, local extinctions might be overcome as species like the chimpanzee, olive colobus,

buffalo, various antelopes & hornbills and other species repopulate empty niches; (3)That the Liberian Government, through the Forestry development Authority and the national Legislature, gazette the area as 'MULTIPLE USE' protected area; (4)That the FDA and its international partners seek financial and technical assistance for the management of the area; (5)That ecotourism opportunities should be encouraged for the area as a pilot site from where successful ecotourism practices can be extended to other parts of Liberia; (6)That the Bureau of Fishery at he Ministry of Agriculture take immediate actions to control the destructive fishing practices in the area; (7)That the local communities be provide legal, financial and technical support to them conserve and manage their biological resources; and (8)That the capacities of the local authorities be improved to meet existing and future environmental challenges in the area.

1. Introduction

1.1 Background to Lake Piso Conservation Efforts

Since 1968, there have been growing concerns for the management of the proposed Lake Piso Lake Piso Nature Reserve, especially for conservation of the mangroves and the highland forest capping the Cape Mount Mountain which over looks Lake Piso and Robertsport, the Headquarters of Grand Cape Mount County. The beautiful scenery of the landscape, which people visitors adore especially for ecotourism purposes, seems to add more fuel to these concerns. Concerns for conservation actions for the area began with the Naturalist Society of Liberia (NSL), the first national environmental NGO established in February 1968. NSL was transformed into the Wildlife Society of Liberia (WSL) in 1978. When the mandate of WSL was expanded from a restricted wildlife conservation program to a broader environmental conservation goal, the Society for the Conservation of Nature of Liberia (SCNL) was formed to replace it. SCNL in collaboration with the Forestry Development Authority (FDA) intensified conservation awareness campaigns in the Lake Piso region until the advent of the Liberian civil crisis which started on December 24, 1989. Campaign for gazetting the area as a protected area was first initiated by FDA and SCNL in the late 1980s; this effort was aborted due to the civil crisis.

Campaign for gazettement again resumed in the late 1999; this time by a group of Liberian environmental NGOs and the FDA. This group consisted of international and national environmental institutions. In 1999, the group conducted a conservation awareness workshop in the area. The workshop was held in Tallah, a town on the northern bank of Lake Piso. Over 200 participants, including local inhabitants, international NGOs, national NGOs, and Government institutions attended this important meeting. Farmers Associated to Conserve the Environment (FACE) was commissioned by the UNDP to conduct the workshop on behalf of the UN-ETG. Since then, FACE has cherished the Lake Piso region as a priority operational site in Liberia. In 2001, FACE received a small but significant grant from the Netherlands Committee of the IUCN (NC-IUCN) for the area. The grant, (project # 6AF00242A) entitled '*Mangrove Conservation in Liberia through Poverty Alleviation Strategies*', was intended to restart conservation actions in the Lake Piso region and also to help the local communities fight the difficult livelihood situations the civil war plunged them into. One great result of this project was the formation, for the first time, of a community-based environmental organization called '*Piso Conservation Forum*' (PCF) on July 11, 2004.

The lack of baseline information on the biodiversity and socio-economic situations of this site of conservation potential has been a crucial limiting factor in making management decision for the area, especially for its gazettement for protected area management. In 2004, Fauna and Flora International (FFI) in collaboration with the Forestry Development Authority (FDA), Ministry of

Planning and Economic Affairs (MPEA) and the Environmental Protection Agency (EPA) conducted rapid faunal and socio-economic surveys in the area. These surveys were conducted under a CEPF-funded project, *Intensification of the Liberia Forest Re-assessment*, which was intended to support the *Liberia Forest Re-assessment* (LFR) project. The goal of the LFR project was to promote sustainable forest management and conservation of Liberia's biological diversity, and to improve overall environmental management in the country.

1.2 Background to the CEPF Grant

The project, '*Taking Biodiversity Conservation to the Lake Piso Nature Reserve in Liberia*', was initiated to establish a database on the area and to keep going the environmental conservation fever that was developed in the area by previous conservation projects. LFR surveys were conducted at the time when the country was unstable politically, economically and socially. Changes were taking place rapidly everywhere in the country. These changes definitely affected the results of the 2004 LFR surveys, especially when internally displaced people (IDPs) were returning to their homes and rebuilding their shattered lives. Furthermore, the need to create conservation awareness in the region was a motivation for initiating the project. This implies community empowerment, an approach believed to be effective in attempting to mitigate prevailing threats and preventing the occurrence of future threats in the area. Thus the need for further surveys and continuation of conservation actions in the Lake Piso region were basic reasons for this CEPF-funded project. This grant was awarded to FACE for a period of twelve consecutive months. Specifically, the goal of rant project was to promote conservation in the proposed Lake Piso Nature Reserve in order to reduce biodiversity loss. The project objectives were two: (1) to establish a computerized database on the biological resources and socio-economic factors relating to management and conservation needs of the proposed Lake Piso NR and (2) building the capacities of the local communities of Lake Piso region in order to enable them efficiently manage and conserve the biological resources of their communities.

1.3 Implementation of the Project

The project period was November 2005 – October 2006. Specific activities implemented where as follow:

- Training local community and Piso Conservation Forum (PCF) members in the production of energy-efficient devices;
- Training local community and PCF members in tree nursery management;
- Conducting biodiversity inventory of the proposed Lake Piso NR;
- Conducting socio-economic surveys in the communities of the proposed Lake Piso NR and
- Conducting a training workshop in environmental education and awareness raising.

1.4 Methodological issues

The biodiversity inventory and socio-economic surveys were based on participatory rural appraisal (PRA) and rapid rural appraisal (RRA) methods as well as assessment techniques developed and applied by FFI in the conduction of the LFR surveys.

The methods allow information collection in partnership with local communities. The techniques were effective in minimizing bias and calming suspicion of individual respondents and target groups through dialogue. They were also found to empower local community members to express their views on relevant issues.

The PRA/RRA methods were tailored for the biodiversity and socio-economic surveys:

- To understand administrative structure of the target communities;
- To understand local people's livelihood practices and sources of livelihood;
- To understand the level of communities' dependency on biological resources,

- To understand communities' needs and priorities in terms of livelihoods;
- To motivate local communities and ensure their active involvement in future management plan of the area from the assessment stage, and
- To ensure successful and sustainable subsequent conservation in the Lake Piso region.

Before the actual field activities, the survey team members received two-day training in PRA/RRA techniques, GPS reading and data recording. The training exercise concluded with testing of the survey methods and data forms in two selected communities (Latiah and Tolsor) in the Lake Piso region. This rapid exercise was intended:

- For the survey team to comprehend participatory approach to community and biological resources assessment;
- Understanding the range of tools needed for conducting socio-economic and biological surveys; and
- Promoting participatory approach for elaborating future protected area management plan for the area.

2. Description of the proposed Lake Piso Nature Reserve

The proposed Lake Piso Nature Reserve is the first Wetlands of International Importance nominated in Liberia. It is also one of the nine proposed Important Bird Areas (IBAs) in Liberia identified by SCNL and BirdLife International on the basis that it supports a significant assemblage of biome-restricted (Guinea-Congo forest biome) bird species (Fishpool & Evans, 2001).

The proposed nature reserve, covering about 31,000 hectares, is located in southern Grand Cape Mount County north-western Liberia. It lies within Latitudes 60°30' – 7°00' and Longitudes 10°55' – 11°30'. Based on the 2004 map (see Figure #1), the proposed site extends from the Mano River at Liberia's border with Sierra Leone to the Lofa River between Grand Cape Mount and Bomi Counties. It is about 72 miles west of Monrovia.

The climate in the area is tropical, as in all parts of Liberia, with two major seasons: dry (sunny) and rainy (wet) seasons which occur from September through April of the following year and from April through September of the same year respectively. The area falls within Liberia's maximum rainfall zone receiving up to about 4000-4800 mm of rain annually. The daily temperature falls between 27 and 32^0C and the daily humidity may rise up to about 80% during the dry season.

The site rises in altitude from 0 to about 322 meters above sea level with Cape Mount rising to the highest point. Except Cape Mount with rough and step terrain, the rest of the site is generally flat and very low in altitude. Sand soil (regosoil) extends 8-10 km from the sea shore towards inland. Beyond 8-10 km other soils begin to appear (e.g. sandy clay, clayish loam, sandy loam and laterite). Also, alluvial soil occurs along the banks of rivers and creeks/streams.

The bulk of the present proposed Lake Piso NR is wetlands consisting of Lake Piso, rivers,greeks/streams, lakelets and lagoons. Mano, Maffa, Mawua, Manii, Moffe, Maa and Lofa are rivers and creeks in the area. The Lofa, one of Liberia's major rivers, is in the southeast and forms the boundary between Grand Cape Mount and Bomi Counties. In the northwest is the Mano River, another major river of Liberia; it forms the border of Liberia with Sierra Leone. The other rivers are minor but important for navigation and travelling in the Lake Piso region. Lake Piso is a

most prominent feature of the region with Cape Mount the next. “Piso” is a Vai word which is actually pronounced *“peehnso’’,* meaning *pigeon hole.* Some elder informants in the region revealed that many years ago pigeons lived in caves on the bank of the lake. Over a period of time the caves expanded and formed a single large cave in which water developed and gradually transformed into a lake (Lake Piso), thus the name “pigeonhole” (or “peehnso” in Vai). The lake was also called Fisherman’s Lake because of the abundance of fish and intensive fishing activities in it. This name has not been heard for many years. Lake Piso, one of Liberia’s gifts from Mother Nature and a pride to Grand Cape Mount County, is the symbol of the proposed Lake Piso NR. Some people prefer calling it a ‘lagoon’ instead because it opens directly into the sea. This water body covers an area of approximately 100km² (c. 40sq miles) and has a maximum depth of approximately 4-5m (Gatter, 1997). It is an important water catchment area with rivers and streams flowing into it (e.g. the Maffa, Mawua, Manii and Moffe Rivers). An interesting feature of the lake is the famous Massatin Island with an area of about 3.6 km². Local knowledge of the island reveals that the island was named after a leprous old lady called Massa who lived on the island with her husband many years ago. Further information disclosed that herds of cow were raised in the area. The site was abandoned during World War II; the cows remained there and changed to wild buffalos. Another interesting feature is the floating (or Moving) Island. It is a small island (less than a hectare in size). There are rumours that the island moves at certain time of the year. Some locals said the island has not moved during the last fifteen years.

Some unpublished articles on the area mention four ecosystems in the region; they include wetlands (including coastal wetlands dominated by mangrove vegetation and inland wetlands), marine, savannah woodlands, and tropical highland forest. Vegetation types reported in the area are the tropical evergreen high forest, mangrove swamp forest, freshwater swamp forest, and coastal savannah.

Vai and Mendi are the two ethnic groups in the region with Vai dominating. There are about 42 settlements. The human population up to 2004 is estimated at about 16,000 – 21,000.

3. Results of the Surveys

3.1 Biodiversity inventory

The inventory was conducted on March 5 – 18, 2006. *)*. The north-western strip of the proposed Lake Piso NR was surveyed from 5-6 March, central 7-11 and 17-18 March and south-east 12-18 March. Observations were made on ecosystems, vegetation types and habitats, biodiversity species, and threats to biodiversity conservation in the area. (See map in Figure# 1)

3.1.1 Ecosystems

Five ecosystems noticed in the area were marine, coastal wetlands, inland wetlands, savannah woodlands, and highland montane forest. The coastal ecosystem stretches from the southeast through the south to the north-west of the proposed nature reserve. It is characterized by the Atlantic Ocean, beautiful beaches, and varieties of plant species, estuaries and lagoons. The coastal wetlands lie adjacent to the beaches. These wetlands consist of mangrove swamps, Lake Piso, the Mawua River (which runs parallel to the Atlantic Ocean from the Mano River and empties into the ocean at a point near Lake Piso), streams, creeks and ponds. The water bodies in the area taste salty most of the time.

The inland wetlands ecosystem is found beyond 8 – 10 kilometres from the seashore. This ecosystem is mainly characterized by non-brackish streams, creeks and ponds, Raphia palm and Mitragyna species.

The next ecosystem is the savannah woodlands. The savannah woodlands are found in patches forming mosaic with secondary forests throughout the area, especially in the south-eastern and north-western strips of the area. Characteristic features of this ecosystem are coastal savannah grass fields often with the presence of fire-resistant dwarf trees (Parinari macrophylla). Other dominant tree species found are oilpalm (Elaise guineensis) and African spice (Xylopia staudtii) The third ecosystem is the Cape Mount Forest (a highland motane forest). The forest covers the cape (Cape Mount). Diversities of fauna and flora species are represented here according to informant hunters. The mountain (Cape Mount) lies between the Atlantic Ocean and the Piso Lake and projects into the sea in the west of the region. The county (Cape Mount County) is named after this land form. The piece of forest (about 41.4 sq. km) covering this three-ranged mountain is unique in the sense that it is bordered by two bodies of water, the Atlantic Ocean in the south and Lake Piso in the north.

TABLE # 1: Fauna observation data

FACE bio-inventory data sheet # 1					
Site:	Proposed Lake Piso Nature Reserve				
Surveyors:	Abraham Kromah, Varney Candollei, Eric fahnbulleh, Richard Sambolah				
name of fauna species		**Observation**			
common/English	Local	type of observation	community of observation	location of observation	Date
Red colobus monkey	Gogoway	Track	NW of Robertsport	Beach	5-Mar-06
Sooty mangabey	Kpon-keh	Seen	Sowei Beach	residence/ captivity	5-Mar-06
Black & white-tailed (African Pied) hornbill	Kpeakpea/ Gongon	Seen	Near maveima	air	5-Mar-06
Mona monkey	Loah	Seen	Maveima	motor road	5-Mar-06
Forest francolin	Corcorye-eh	heard	Sowui	ground	6-Mar-06
Black & white-tailed (African Pied) hornbill	Kpeakpea/ Gongon	Seen	Sawilor	farmland bush	6-Mar-06
Maxwell's duiker	Woi	Track	Sawilor	motor road	6-Mar-06
Mona monkey	Loah	Heard	Kpalahn	Secondary forest	7-Mar-06
Iguana	Kana	Seen	Tallah	old farmland	8-Mar-06
Red colobus monkey	Gogoway	Seen	NE Robertsport	mangrove forest	10-Mar-06
White-faced whistling-Duck	Yorngeima	Seen	Massatin Island	bank of Lake Piso	11Mar-06
Red colobus monkey	Gogoway	Heard	Bolomie	Savannah woodland	14-Mar-06
Olive monkey	Sonwhen	Seen	Latiah	savannah woodland	15-mar-06
Black & white-tailed (African Pied) hornbill	Kpeakpea/ Gongon	Heard	Tolosor	high forest	16-Mar-06
Red colobus monkey	Gogoway	Heard	Fomba	mangrove orest	17-Mar-06
Maxwell's duiker	Woi	Track	Fomba	high forest	17-Mar-06
White-breasted Guineafowl	Corcorye-eh kaema	seen	Fomba	high forest	17-Mar-06
Forest buffalo	Ceeh	Track	Bombjah	old farmland	18-Mar-06
Maxwell's duiker	Woi	Dung	Bombojah	farmland	18-Mar-o6
Sooty mangabey	Kpon-keh	Seen	Bombojah	high forest	18-Mar-06

3.1.2 Fauna

TABLE # 1 shows fauna species recorded in the area. Monkeys dominate the record with Red colobus monkey (3n), Sooty mangabey (2n), Mona monkey (2n) and Olive monkey (1n). Local informants mentioned abundance of monkeys (particularly Red Colobus monkey) in the mangrove stands at four main sites of the proposed Lake Piso NR. The sites include (1) the north-western strip, (2) the mangrove stands within the communities of the towns of Sawilor, Keba, Falie, Fomba and Bombojah in the north of the middle portion, (3) the Cape Mount Forest and (4) the community forest reserve shared by Bombojah and Fomba in the southern strip of the area

TABLE # 2a: Flora species recorded in the proposed Lake Piso NR

FACE bio-inventory data sheet # 2				
Site:	Lake Piso Nature Reserve			
Surveyors:	Abraham Kromah, Varney Candollei, Eric fahnbulleh, Richard Sambolah			
Flora species				
Scientific name	**local/ trade name**	**habitat**	**Date of observation**	**remark(s)**
Anoppyxis klaineana	Kokoti	highland primary forest	18-Mar-06	found in the Cape Mount Forest
Anthonotha fargrans	Kibakoko	highland primary forest	18-Mar-06	found in the Cape Mount Forest
Avicennia germinans	Black mangrove	coastal swamp	8-Mar-06	found in mangrove swamp
Beilschmedia mannii	Kanda/ Magao	highland primary forest	15-Mar-06	found in the Fomba-Bombojah community forest
Bussea ocidentalis	Samanta	primary high forest	15-Mar-06	found in the Cape Mount Forest
Calpocalyx aubrevillei	Calpocalyx	highland primary forest	16-Mar-06	found in the Fomba-Bombojah community forest
Dialium aubrevilei	N/A	highland primary forest	17-Mar-06	found in the Cape Mount forest
Erythopleum ivorense	Sasswood	highland primary forest	17-Mar-06	found in the Cape Mount forest
Funtumia spp	N/A	lowland secondary forest	12-Mar-06	found in lowland secondary forest

A Sooty mangabey seen in captivity at Sowei Beach in the north-western strip was reportedly captured in November 2005 when the mother was shot and killed. Also two dead bodies of Mona monkey were seen in the hands of two children near a village called Maveima just about three kilometres east of the village (Sowei Beach) where the Sooty mangabey was seen. The dead monkeys were being carried for sale at a price of L$ 225.00 each. The local people confirmed the abundance of Red colobus monkey and Sooty mangabey in this part of the region while Sooty mangabey and Olive monkey dominate in the south-eastern strip. The monkeys are said to live in mangrove communities mainly. This environment was reportedly secure for them.

Forest buffalo was reported in the communities of Sowei Beach where the Sooty mangabey was seen in captivity and in the community of Tallah (north of the central part of the region and near Lake Piso). However, no observation was made on this charismatic mammal.

Maxwell's duiker was the only antelope species recorded (3n), although informant hunters report of the presence of Black duiker, yellow-backed duiker and Ogilby's duiker.

Other fauna species recoded in the area were Black & white-tailed hornbill (2n), Iguana (1n), White-faced whistling-duck (1n) and white-breasted Guinea fowl (1n).

TABLE # 2b: Continuation of some flora species recorded in the proposed Lake Piso NR

FACE bio-inventory data sheet # 2				
Site: Lake Piso Nature Reserve				
SSurveyors: Abraham Kromah, Varney Candollei, Eric fahnbulleh, Richard Sambolah				
Flora species				
Common/ English name	**local/ trade name**	**habitat**	**Date of observation**	**remark(s)**
Haplormosia Monophylla	Black gum	riverine	9-Mar-06	found at the bank of Lake Piso
Laguncularia Racemosa	White mangrove	coastal swamp	7-Mar-06	found in mangrove swamp
Mitragyna Ciliate	Abura	swamp primary forest	14-Mar-06	inland swamp
Nauclea Diderrichii	Bilinga	secondary forest	10-Mar-06	found in lowland secondary forest
Parinari Excelsa	Rough-skin plum	secondary forest	11-Mar-06	found in lowland secondary forest
Parinari mycrophylla	savannah rough-skin plum	savannah woodland	11-Mar-06	fire-resistant savannah woodland tree species
Rhizophora mangle	Red mangrove	coastal swamp	8-Mar-06	found in mangrove swamp
Uapaca Guineensis	Rikoio	lowland secondary forest	5-Mar-06	found mainly in the NW of Lake Piso
Vocanga Africana	Na	lowland secondary forest	6-Mar-06	not common
Xylopia Staudtii	African spice	secondary forest	11-Mar-06	found in lowland secondary forest

3.1.3 Flora

Flora species recorded were mainly trees. A total of 19 common tree species were recorded in the region: two recoded in the north-western strip, eleven in the central part and six in the south-eastern strip. (See *TABLEs 2a* and *2b below*

3.1.4 Threats

Threats observed in the area were burning of vegetation (savannah grass and patches of bush), fishing, hunting, sand mining, fuelwood harvesting, farming, dumping of garbage in Lake Piso and power-chain sawing (commonly known as pit sawing).

At the time of the year (dry season) the surveys were conducted, savannah woodlands everywhere were constantly set on fire by unidentified community members.

Another serious threat observed on the beach at a point about three kilometers northwest of Robertsport dumping of rotten fish (known as boney) on the beach (reportedly by Senegalese fishermen). Similar incidence was observed in Lake Piso near a place called Fanti Town northeast of Robertsport. The survey team saw occupants of a Fanti fishing boat dumping rotten fish in the Lake. Fishing with very small sieve nets (locally known as half-finger and one-finger size nets) were observed popularly used by fishermen, especially those using canoes. Three kinds of fishing vehicles along with their numbers were recorded in the Lake Piso region. These include three ships (seen on sea), twenty-two boats (operated by Ghanaian and Senegalese fishermen) and 105 canoes (operated by Liberians).

Hunting was observed a serious threat in the area. Also capturing birds with snares was observed a common practice in Robertsport. This was reported by local informants and SCNL members who conduct regular bird watching in the area. Migratory birds in particular are captured and the rings removed from their legs. The birds may be killed and eaten or kept in captivity.

Sand mining was noticed on the bank of Lake Piso at two points between a town called Falie and another town called Latiah, both on the Robertsport-Monrovia motor road. As reported by local informants, sand mining in these and other places on the banks of the lake has been going on for many years. At one of the points (near Falie), a sand mining site was observed plied by vehicles very frequently, indicating severe sand mining pressure in the area.

Fuelwood harvesting was also observed a serious threat. At a point between Sembehum and Tolsor on the Robertsport-Monrovia motor road, the survey team observed intensive harvesting of fuelwood from the Cape Mount Forest. Similar situation was also observed in a mangrove stand at about one kilometre north of Sembehum. (See map: Figure # 1).

Farming was observed in every community. It appears to be the second most important livelihood activity to fishing. Sites severely affected by farming include a strip of land (bordering Lake Piso) between Latiah and Sembehum on the Robertsport-Monrovia motor road and the slopes of Cape Mount. No destruction was observed in the mangrove forests, at least in areas where the survey team did transecting.

Power-chain sawing was noticed in the Cape Mount Forest. Also local informants reported seeing two power-chain-saw operating groups in the area between November 2005 and March 2006.

Dumping of garbage and human waste in Lake Piso is a sinister that was noticed in every quarter of Robertsport near the lake and other settlements around the lake. This was reported a common practice for ages.

3.2 Socio-economic surveys

For the administration and population data, 30 towns/villages were surveyed in order to gather data over a larger part of the lake Piso region, including the four political sub-divisions of the county sharing lake. Livelihood assessment was done in 40% the settlements. Most of then in the north-western strip were no socio-economic data has been collected recently.

TABLE # 3: Administration, GPS Coordinates and Population estimates

District/ Chiefdom	**Clan**	**29N**	**UTM**	**Town / Village**	**Pop.**	**% men**	% women
Gawular	Manobala	259151	745833	Banalor	50	40	60
Tewor	Kiawu	228035	764236	Barkah	1450	53	47
Gawular	Kiahon	255916	748177	Bendu	1220	42	58
Tombey	Kiatamba	260535	737111	Bolomie	1340	47	53
Gawular	Kiazolu	269519	732217	Bombojah	570	43	57
Gawular	Kiahon	256313	745641	Bulu	520	54	46
Gawular	Manobah	258429	744464	Buluma Zokaii	1150	45	55
Tombey	Sombai Ballah	255863	738586	Falie	1080	40	60
Gawular	Zogbo	268357	735206	Fomba	4	75	25
Tewor	Sambolah	243170	754265	Gongokor	518	43	57
Tewor	Kiawu	229872	764221	Hunkpeh	1350	51	49
Gawular	Kiazolu	260588	741722	Jorkorni	680	46	54
Tallah Township	Sombai	244313	753069	Kebah	550	43	57
Tewor	Kiawu	227419	764780	Kru Town Beach	550	43	57
Tallah Township	Sandwoh	241874	749232	Kumea	1080	49	51
Tombey	Pusah	249454	740555	Latiah	560	45	55
Tombey	Kiakpongbo	258242	740295	Mando	385	48	52
Tewor	Gataweh	245754	759130	Ngeemah-I	850	52	48
Tewor	Sambolah	244379	770741	Sawilor	750	44	56
Tewor	Kiawu	228781	766146	Sawu Town	1150	48	52
Tombey	Sombai Wahlor	242042	742072	Sembehum	300	57	43
Tewor	Sambolah	235529	756961	Sowee Beach	600	48	52
Tewor	Kiawu	228190	763220	Taililor Beach	1000	45	55
Tallah Township	Tallah Proper	245389	749031	Tallah	535	46	54
Tombey	Sewah	745728	745728	Toloser	542	45	55
Tewor	Gataweh	243860	759104	Varbarlor	385	48	52
Tallah Township	Senwah	243457	748339	Waima	550	44	56
Tewor	Kiawu	226776	765768	York Island	460	45	55
Gawular	Kiawhon	252627	752578	Ziabla	520	40	60
		Total=		**30**	**21449**	**47.1**	**52.9**
		Average settlement estimates			715	47.1	52.9

TABLE # 4: Livelihood activities

Livelihood of Respondents	**# respondents**	**% respondents involvement**
Trading	12	9.5
Carpentry	2	1.6
Farming and fish processing	8	6.3
Farming	28	22.2
Farming and marketing	4	3.2
Farming and fishing	12	9.5
Farming and petty trading	2	1.6
Farming, hunting and carpentry	2	1.6
Fish trading	7	5.6
Fishing	43	34.1
Fishing and trading	6	4.8
Total	**126**	**100.0**
Most important livelihood activities		
Fishing exclusively		39.7
Farming exclusively		22.2
Fish business and farming b together		15.8

3, 2.1 Administration

Four political of the six political sub-divisions of the Grand Cape Mount County was covered by the surveys. There were (1) Tombey chiefdom, (2) Garwular District, (3) Tallah Township and (4) Tewor District. The other two (not near the Lake Piso region) include Gola koneh and Porkpa districts. See TABLE # 3 for the communities surveyed.

3.2.2 Demography

Forty-two (42) were reported in the proposed Lake Piso region. The surveys were conducted in 30 of them. The total population estimate of the 30 settlements was 21, 449 with an average of about 715 people per settlement. A total population projection for the entire region was about 28,000. Men account for about 47.1 and women 52.9 of the population estimates. See TABLE # 3 for the population estimates.

3.2.3 Livelihoods

The total number of interviewees (respondents) was 126. Information gathered from them revealed fishing to account for 39.7% of the local people's livelihood activities. Next to fishing was farming (22.2%), followed by fish business and farming together (15.8%). Carpentry (1.6%) came to the bottom of the livelihoods table (See TABLE # 4 for the details).

The average weekly income of the local people based on all their livelihood activities was estimates at US$ 14.29 (*see TABLE 5*). About 58% (US$8.24) of this amount is spent on weekly family food along. The balance income is spent on family health, equipment/tools, children school requirements, wearing for the family, and other needs of the family.

TABLE # 5: Community's income-expenditure

TABLE # 5: Income and expenditure summary		**Total weekly income**		**Family food**	
		L$	US$	L$	US$
TABLE # 5a	Total weekly estimates:	38945	683.25	19130	335.61
TABLE # 5b	Total weekly estimates:	28610	501.93	21845	383.25
TABLE # 5c	Total weekly estimates:	35100	615.79	18205	319.39
	Sum =	**102655**	**1800.96**	**59180**	**1038.25**
	Average estimates	**815**	**14.29**	**470**	**8.24**

3.2.4 Dependence of local people on biodiversity resources

As presented in TABLE # 4, fishing and farming appear to be the two major livelihood activities of the local people. Observations of the survey team support this result as they were the two activities noticed throughout the period of the surveys. The TABLE also reveals that more than 77% of the people's livelihood activities is directly related to exploitation and utilization of biological resources.

4. Discussions

4.1 Ecosystems and habitats

The Lake Piso region represents a classic example of every major ecosystem in Liberia (highland forest, lowland forest, coastal wetlands, inland wetlands, savannah woodlands, and mountain ecosystems). Five distinct ecosystems have been mentioned in the results section.

As can be seen on the map proposed by this report (Figure # 2), the proposed area borders the Atlantic Ocean from the southeast to the northwest. This portion expresses the marine ecosystem.

Lake Piso, mangrove swamps, rivers, estuaries, streams/creeks, lagoons, ponds and other forms of marshy sites form the wetlands ecosystem. This ecosystem is further broken down into sub-

ecosystems: coastal ecosystem (consisting of estuaries, Lake Piso, streams/creeks, lagoons, ponds and other forms of brackish waters) and inland wetlands (rivers, streams/creeks, inland swamps, ponds and other forms of marshy sites). The coastal ecosystem consists of habitats for many species of fauna (avifauna and insects, monkeys, reptiles, fish, shrimps, lobsters, crabs etc) and flora (mangrove species etc).

The savannah woodlands ecosystem is very distinct and characterized by discontinued coastal savannah grassland with *Parinaria macrphylla* (a dwarf, fire resistant tree rarely exceeding 10 meters in height) sparingly distributed in the grass field. In some areas, the trees form clusters. They have high coppicing ability when severed at least two feet above ground. Other common tree species found are *Elaise guineensis* and *Xylopia staudtii*. This ecosystem was found to be a habitat for many species of avifauna, monkeys, duiker, reptiles and insects etc.

Lowland forest ecosystem can be found further from the coast (at least 10 kilometres inland). This ecosystem has been severely destroyed through farming activities. Isolated remnants of lowland forest exist in communities (e.g. Bombojah, Fombah, Gesakor---a satellite village of Sawilor, Gongokor, and Sowei). Though severely destroyed, this lowland ecosystem can be restored in time space through holistic conservation actions (controlled farming, watershed protection, communal forestry, habitat protection etc).

Lastly, there exists the highland forest ecosystem (Cape Mount Forest). This ecosystem is structured into two inseparable ecosystems co-existing: the highland tropical forest and mountain ecosystems. It is a very unique ecological system formed between two chief bodies of water: the Atlantic Ocean on the southeast to northwest and Lake Piso in the north (see Figure # 2). In rare cases one finds a tropical montane forest with this situation.

4.2 Fauna

Lake Piso region has lost most of its lowland forests over the last five decades. Interestingly though, the region still contains varieties of fauna species some of which are endemic to the area. Though hunting pressure in three decades (1960s, 1970s and 1980s) severely reduced wildlife populations in the area, some important fauna species such as monkeys (e.g. Red colobus, Mona monkey, Sooty mangabey and Olive colobus), Chimpanzee, antelopes, and forest buffalo are still reported present. The Cape Mount Forest is reported a habitat for Pygmy hippopotamus while Manatee is reported seen in Lake Piso and the Maffa River occasionally. The 2004 FFI faunal surveys report (Sambolah et el, October 2004) on the area indicated a total of 450 observations on fauna species (See TABLE # 6). Mona monkey (130n) tops the list followed by Bushbuck (70), Lesser spot-nosed monkey (66n), Red river hog (42n), Maxwell duiker (35n), Forest buffalo (34n), Chimpanzee (19n), and Olive colobus (18n). Giant forest hog (1n), Slender-snouted crocodile (2n) and White-crested hornbill (2n) went at the bottom of the list.

TABLE # 6: Overall number of animal recordings in Lake Piso forest block

Species	**Sites* encountered**	**Total record-ings**	**Species**	**Sites* encountered**	**Total record-ings**
Black duiker	5	13	Chimpanzee	1	19
Maxwell's duiker	7	35	Mona monkey	6	130
Yellow-backed duiker	2	7	Olive colobus	4	18
Bushbuck	8	70	Lesser spot-nosed monkey	2	66
Forest buffalo	4	34	Slender-snouted crocodile	2	2
Red river hog	2	42	White-crested hornbill	1	2

Giant forest hog	1	1	Yellow -casqued hornbill**	2	5
Water chevrotain	3	6	**Total**	**Out of 8 possible sites**	**450**

The following information was also provided on the area by SCNL.

Avifauna:

- Lake Piso region holds 51 of the 184 of the Guinea-Congo Forests biome species and 2 of the 14 Upper- Guinea Forests restricted range species.

- A total of 164 species have been identified from 44 families at the site.

- Two key bird species of global concern have been recorded at the site including *Illadopsis rufescens*- Rufous-winged Illadopsis (NT) and the *Lamprotornis cupreocauda* – Copper-tailed Glossy Starling (NT).

- The area is of national importance for wintering water birds,
- The lake is attractive to water birds

- It blends coastal rainforest, steppe-like savannahs, swamp forest, freshwater lakes and dying lagoons (undergoing a change in salinity).
- 95% of the Liberian population of White-faced whistling-Duck (*Dendrocygna viduata)* inhabits this area
- It is of great importance for wintering herons/egrets and waders.

General:

- Five species including *Cercopithecus petaurista*- Lesser spot – nosed, *Colobus polykomos* - Black & White Colobus, *Cephalophus silvieultor*- Yellow – backed duiker, *Cephanlophus obilgyl* Ogilby's duiker and *Syncerus caffer nanus*- Forest buffalor are considered as protected Wildlife Liberia.
- It (the Lake Piso region) is a proposed protected area.
- The beach is significant for egg-laying turtles and resting places for ducks, terns, herons, egrets and waders

4.3 Flora

Between 1947 and 1972, a number of collections were made in the area involving more than 150 different individual floral species by five botanists (J. T. Baldwin in 1947, J. W. A. Jansen in 1968/1970, M. J. Dinglage in 1972, A. de Glier in 1978).

Recently in August 2004, Dr. Carel C. H. Jongkinds along with forestry and botany staff of the University of Liberia and the Forest Development Authority collected botanical specimens in the Lake Piso region. The collection was done for the Liberia Forest Re-assessment project. The results, documented in a botanical assessment report (see Carel C. H. Jongkinds and Jamison Suiter, September 2004) indicate that the area is rich in faunal and floral species. Bellow is a section of that report ("Advances in Botanical Knowledge of Liberia Supported by the Liberia Forest Re-assessment Project").

"Another 6 days were spent visiting the hills/mountains of Cape Mount, south-east of Robertsport. However the heavy rains limited collecting. Except for one day all other days and nights were 'rained out' and therefore this part of the expedition was much less successful than the one around Tallah.

Cape Mount is an area of rocky slopes almost without soil. It also has less steep, clayish areas which are very slippery when wet. Parts of the area have been logged but in remote places relatively undisturbed forest remains. During the time at Cape Mount, 80 herbarium specimens were collected.

In the Lake Piso area, 173 vascular plant species were collected. …. Twenty-one of the eighty-six species on the "Short-list of species of special interest for conservation" were observed, or 24% of this short-list…. The search for these "selected species" was done at random in every place that could harbour forest-species".

Clearly, previous and recent botanical collections in the area prove that the floral richness of the area is incredible. Some of them have values that warrant the protection of their habitat.

The 19 common tree species recorded in the region during FACE rapid biodiversity inventory is quite and interesting figure and which is a substantiated claims of high concentration of flora diversity in the area. This indicates that the site is rich in flora species some of which have great conservation values and are endemic.

4.4 Threats

Threats observed in the Lake Piso region are impacting very seriously on the environment and biological resources of the. These threats were reported to the local authorities in meetings attended by PCF, SCNL, FACE and UNEP the local authorities of Grand Cape Mount County and Robertsport City. Also in an "awareness and training workshop" held on July 15-18, 2006, the threats were revealed to the participants. This revelation (through PowerPoint presentations) was timely in that it gave the participants the zeal to work harder in the workshop. Consequently, they contributed significantly in development a table of threats in the area and a framework proposing issues that should be considered for decision making on the management of the area.

Ten (10) human activities identified by the local people of the Lake Piso region as major threats to biodiversity conservation are farming (shifting cultivation), hunting (using snares/traps, dogs, guns, cutlasses, nets, fire and spears), fuelwood harvesting, power-saw logging (so-call pit sawing), round pole harvesting, charcoal production, use of small sieve nets for fishing, bush fire, use of chemical for fishing and killing birds and dynamiting in water (use of explosives for fishing). These threats listed in *TABLEs 7a* & *7b*.

4.5 Socio-economic parameters

The present proposed Lake Piso Nature Reserve is shared by four sub-political and administrative sections of the county (Tewor District, Tallah Township, Garwular District, and Tombey Chiefdom) and contains 38 settlements. The population estimate for 20 major settlements as reported by Sambolah et el (August 2004) was 8927. At an average of about 13 persons per house, the 1273 houses reported (627 for 20 major towns and 646 for 73 satellite settlements) account for about 16, 550 persons. At that time people were returning to their home gradually but cautiously keeping in mind the problems they encountered during the civil crisis

The recent survey was conducted in 30 settlements (including major and satellite settlements). The total population estimate for the 30 settlements (21,449)seems quite reasonable because more families have returned home and re-established themselves. At an average of 715 persons per settlement, the total population estimate for the entire proposed area with an estimate of 40 settlements would be 28,600. Females account for about 51.1% of this figure and men 48.8%.

They major livelihood activity is fishing followed by farming. However an individual or a family may engage in two or more livelihood activities (fishing, farming, petty trade etc). An average income of US$14.29 on per family level for all livelihood activities is large supported by fishing and farming. More than half (US$8.24) of this amount is spent on family food and the rest for other family maintenance and security issues. Poverty is still a major issue in the region. No paid job opportunities are available. . It is clear that the people depend almost entirely on their biological resources for their living. This issue was raised by the participants in the awareness and training workshop.

In terms of development facilities, there is nothing. Very few communities have access to school, medical centres and good motor roads. Development needs are still high.

5. Other achievements of the project

In addition to the biodiversity inventory and socio-economic surveys, three training activities were carried out by the project. These include (1) training in energy the production of energy-efficiency devices, (2) training in tree nursery development and management, and (3) training in awareness raising and environmental monitoring. The number of community and PCF members who benefited from the training exercises was 8, 3 and 30 individuals respectively. The percentages of these figures representing females are 25, 33 and 46 respectively.

The participants came out with a bulleted-point resolution requesting for:

- Gazettement of the Lake Piso region for protected area management (Multiple-Use PA)
- Measures to reduced threats to the environment
- Provision of training facilities in the community
- Creation of livelihood opportunities
- Tentative management plan for the area
- Monitoring scheme to track human activities and biodiversity loss

6. Lesson learned

Lesson: *Community mobilization and partnership encouragement can influence local community's willingness to committing itself to conservation initiatives.*

The most interesting lesson learned was the motivation of PCF members. FACE recent experience with PCF active participation in the implementation of the project demonstrates that activating local communities and encouraging them to actively and meaningfully take part in conservation activities is a realistic way of sustaining conservation actions in a given region. During the implementation of the project, PCF actively participated in all the project activities. Some members of the organization have committed themselves to monitoring human activities in the area even after the NC-IUCN project ended in December 2004. Also and without secure mobility, some PCF members continue to raise conservation awareness. Without any assurance for compensation, some members continue to provide their service to sustaining the project legacy.

7. Conclusion and Recommendation

Now that adequate and useful data have been generated on most of the biodiversity and socio-economic parameters of the proposed Lake Piso region, the next step is to design a structure for the database. The resulting data of the surveys as well as additional information generated during other project activities will certainly be significant for decision making and for development of a management planning in the future when the proposed Lake Piso NR is gazetted for protected area management. Work has already begun on this phase. When the database is developed, the challenge will be to maintain and regularly update the data. This challenge requires the efforts of all partners working in the area

The challenge will continue to exist as long as the local people continue to develop new livelihood strategies to combat the extreme poverty in the area. This implies that, as measures are taken to minimize existing threats; new livelihood strategies may produce more and new threats to biodiversity conservation.

At the same time, it is important to note that Liberia has committed itself to placing 10% of the country's forest area under protected area management. In 2002, a memorandum of understanding was signed between the Government of Liberia and Conservation International for the conservation of six new sites including Lake Piso and the extension of Sapo National Park. Sapo National Park has been expanded by legislation and Nimba nature Reserve has been gazetted also. This 10% commitment was even exceeded in the latest Liberia forest policy, law and guidelines which set aside at least 30% of the country's forest for conservation purposes. In fulfilment of theses targets, more sites must be legislated into the protected area network of Liberia.

By legislative act, Sapo National Park with its expansion and Nimba Nature Reserve are initial efforts to meeting these targets. Recently (2006) additional four wetlands of international importance in the country were gazetted by the Ramsar Secretariat. They include Kpatawee in Bong County, Gbedin in Nimba County, Montserrado in Montserrado County and Marshall in Margibi County. This gazettement brings to five the number of wetlands of international importance in Liberia. The first is Lake Piso wetlands.

There are good opportunities for long-term conservation actions for the proposed Lake Piso Nature Reserve. To make use of these opportunities will require, international, national and local commitments and efforts first by individual citizens of the area, second by local communities, third by the Liberian Government, and fourth by national and international environmental institutions to is now a good opportunity for an additional area. The local people of the Lake Piso region, on individual and group/institutional levels, expressed their desire for immediate conservation actions for the area. This was done during the July 2006 Lake Piso Awareness Raining and Monitoring Training Workshop at Sembehum, when the Managing Director of the FDA revealed Liberian Government's plan to gazette the proposed Lake Piso Nature Reserve to a protected area.

In this light and to ensure sound biodiversity conservation and sustainable ecosystem management of the Lake Piso region, the following points are **recommended**:

- Based on survey team's observations and data collected during the surveys, some sub-areas of conservation importance were not covered by the current proposed area as shown on the existing map (Figure # 2). Therefore it is recommended that the proposed area be expanded to an area of about 60,000 hectares or more to ensure that important spots for conservation are not left out for future management actions (Figure # 2);

- That the proposed Lake Piso Nature Reserve (as recommended by FACE) should not go beyond Lofa River in the southeast because any extension beyond this river will include some communities in Bomi County, a situation that may have the tendency of complexity in decision making for the area;
- That the Liberian Government, through the Forestry Development Authority and the National Legislature, gazette the area 'MULTIPLE USE' protected area.
- That a land use plan be developed for the proposed Lake Piso Nature Reserve site wit emphasis on watershed management, ecotourism, fishery, agriculture, communal forestry.
- That a future management plan for the area should consider site zoning for different but distinct management regimes especially on the ecosystem level (forest, wetlands, marine and coastal, and savannah woodlands). This will also allow conservation of core areas to ensure repopulation empty niches by fauna and flora species that have become extinct or are near extinction.
- That the FDA and its international partners seek financial and technical assistance for the management of the area;
- That the Bureau of Fishery at he Ministry of Agriculture take immediate actions to control the destructive fishing practices in the area;
- That the local communities be given legal, financial and technical empowerment for the management of the Lake Piso region and adjacent areas; and
- That the capacities of the local authorities be improved to meet existing and future environmental challenges in the area.

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Appendix

TABLE # 5a: Income and expenditures from community livelihood activities

Respondent's age	Respondent's main livelihood activity	Respondent's weekly income		Respondent's weekly expenses on family food	
Age	**Main livelihood activity**	**L$**	**US$ eqv.**	**L$**	**US$ eqv.**
25 years	Fishing	500	8.77	115	2.02
34 years	Fish selling	750	13.16	500	8.77
36 years	Fishing	825	14.47	525	9.21
19 years	Fishing	400	7.02	350	6.14
41 years	Fishing	1720	30.18	825	14.47
54 years	Farming and fishing	700	12.28	450	7.89
35 years	Fishing	1050	18.42	350	6.14
37 years	Fishing and marketing	250	4.39	350	6.14
56 years	Fishing	500	8.77	350	6.14
28 years	Fishing	1750	30.70	1050	18.42
45 years	Fishing	750	13.16	350	6.14
42 years	Farming	1750	30.70	700	12.28
41 years	Farming and fishing	1400	24.56	350	6.14
36 years	Fishing and marketing	1400	24.56	1050	18.42
46 years	Fishing	1750	30.70	1750	30.70
37 years	Farming and fishing	400	7.02	200	3.51
45 years	Fishing	525	9.21	300	5.26
49 years	Farming and fishing	825	14.47	350	6.14
60 years	Farming & marketing	150	2.63	250	4.39
42 years	Farming	750	13.16	350	6.14
46 years	Farming	500	8.77	350	6.14
49 years	Farming, hunting, carpentry	350	6.14	250	4.39
57 years	Fishing	1750	30.70	700	12.28
33 years	Fishing and marketing	500	8.77	350	6.14
65 Years	Farming and fishing	700	12.28	450	7.89
49 years	Farming	750	13.16	350	6.14
35 years	Business	350	6.14	350	6.14
34 years	Petty trading	825	14.47	700	12.28
39 years	Fishing	2100	36.84	200	3.51
24 years	Fishing	1400	24.56	700	12.28
25 years	Fishing	1400	24.56	400	7.02
29 years	Fishing	1400	24.56	25	0.44
29 years	Fishing	1400	24.56	20	0.35
36 years	Fish selling	1050	18.42	300	5.26
35 years	Fish selling	825	14.47	100	1.75
73 years	Farming	350	6.14	50	0.88
	Total weekly estimates:	**38945**	**683.25**	**19130**	**335.61**
	Estimated average weekly:	309	5.42	152	2.66

TABLE # 5b: Income and expenditures from community livelihood activities

Respondent's age	Respondent's main livelihood activity	Respondent's weekly income		Respondent's weekly expenses on family food	
Age	**Main livelihood activity**	**L$**	**US$ eqv.**	**L$**	**US$ eqv.**
52 years	**Farming**	**825**	**14.47**	**750**	**13.16**
32 years	**Fishing**	**700**	**12.28**	**420**	**7.37**
42 years	**Farming**	**825**	**14.47**	**300**	**5.26**
29 years	**Fishing**	**1050**	**18.42**	**300**	**5.26**
28 years	**Fishing**	**700**	**12.28**	**700**	**12.28**
71 years	**Petty trading**	**1050**	**18.42**	**850**	**14.91**
63 years	**Farming**	**825**	**14.47**	**700**	**12.28**
33 years	**Fishing**	**1050**	**18.42**	**750**	**13.16**
34 years	**Farming**	**825**	**14.47**	**175**	**3.07**
46 years	**Farming**	**350**	**6.14**	**300**	**5.26**
44 years	**Farming**	**525**	**9.21**	**300**	**5.26**
27 years	**Farming**	**800**	**14.04**	**175**	**3.07**
27 years	**Petty Trading**	**825**	**14.47**	**350**	**6.14**
68 years	**Petty Trading**	**0**	**0.00**	**750**	**13.16**
32 years	**Farming**	**350**	**6.14**	**350**	**6.14**
45 years	**Farming and fish processing**	**150**	**2.63**	**350**	**6.14**
58 years	**Farming and fish processing**	**150**	**2.63**	**350**	**6.14**
48 years	**Farming and fish processing**	**2100**	**36.84**	**1750**	**30.70**
45 years	**Farming and fish processing**	**115**	**2.02**	**350**	**6.14**
78 years	**Carpentry**	**150**	**2.63**	**350**	**6.14**
72 years	**Farming and fishing**	**1050**	**18.42**	**350**	**6.14**
45 years	**Petty Trading**	**1050**	**18.42**	**350**	**6.14**
35 years	**Petty Trading**	**150**	**2.63**	**350**	**6.14**
40 years	**Farming and Petty trading**	**1050**	**18.42**	**75**	**1.32**
45 years	**Fishing**	**70**	**1.23**	**750**	**13.16**
42 years	**Farming**	**0**	**0.00**	**700**	**12.28**
73 years	**Farming**	**1750**	**30.70**	**350**	**6.14**
65 Years	**Farming and fishing**	**500**	**8.77**	**450**	**7.89**
42 years	**Farming**	**700**	**12.28**	**350**	**6.14**
46 years	**Farming**	**150**	**2.63**	**350**	**6.14**
33 years	**Fishing**	**350**	**6.14**	**750**	**13.16**
34 years	**Farming**	**350**	**6.14**	**175**	**3.07**

TABLE # 5c: Income and expenditures from community livelihood activities

Respondent's age	Respondent's main livelihood activity	Respondent's weekly income		Respondent's weekly expenses on family food	
Age	**Main livelihood activity**	**L$**	**US$ eqv.**	**L$**	**US$ eqv.**
41 years	Farming and fishing	900	15.79	350	6.14
36 years	Fishing and marketing	1400	24.56	750	13.16
46 years	Fishing	2400	42.11	2100	36.84
37 years	Farming and fishing	1750	30.70	200	3.51
45 years	Fishing	400	7.02	300	5.26
52 years	Farming	200	3.51	175	3.07
32 years	Fishing	825	14.47	420	7.37
42 years	Farming	100	1.75	300	5.26
29 years	Fishing	1225	21.49	300	5.26
28 years	Fishing	1050	18.42	700	12.28
49 years	Farming	700	12.28	350	6.14
27 years	Petty Trading	0	0.00	350	6.14
68 years	Petty Trading	825	14.47	750	13.16
32 years	Farming	0	0.00	350	6.14
45 years	Farming and fish processing	700	12.28	350	6.14
58 years	Farming and fish processing	600	10.53	350	6.14
48 years	Farming and fish processing	150	2.63	1750	30.70
45 years	Farming and fish processing	1050	18.42	350	6.14
49 years	Farming, hunting, carpentry	115	2.02	250	4.39
27 years	Farming	350	6.14	175	3.07
49 years	Farming and fishing	750	13.16	350	6.14
60 years	Farming & marketing	350	6.14	250	4.39
71 years	Petty trading	2100	36.84	1400	24.56
63 years	Farming	700	12.28	700	12.28
25 years	Fishing	825	14.47	350	6.14
34 years	Fish selling	500	8.77	500	8.77
36 years	Fishing	750	13.16	525	9.21
19 years	Fishing	400	7.02	350	6.14
41 years	Fishing	400	7.02	825	14.47
35 years	Business	1750	30.70	350	6.14
	Total weekly estimates:	**28610**	**501.93**	**21845**	**383.25**
	Estimated average weekly:	227	3.98	173	3.04

TABLE # 5d: Income and expenditures from community livelihood activities

Respondent's age	Respondent's main livelihood activity	Respondent's weekly income		Respondent's weekly expenses on family food	
Age	**Main livelihood activity**	**L$**	**US$ eqv.**	**L$**	**US$ eqv.**
34 years	Petty trading	350	6.14	700	12.28
39 years	Fishing	825	14.47	400	7.02
24 years	Fishing	2100	36.84	700	12.28
25 years	Fishing	1400	24.56	400	7.02
45 years	Fishing	1400	24.56	1050	18.42
29 years	Fishing	50	0.88	175	3.07
29 years	Fishing	1400	24.56	175	3.07
36 years	Fish selling	1400	24.56	300	5.26
35 years	Fish selling	1050	18.42	100	1.75
54 years	Farming and fishing	825	14.47	105	1.84
35 years	Fishing	700	12.28	350	6.14
37 years	Fishing and marketing	1050	18.42	350	6.14
56 years	Fishing	250	4.39	350	6.14
28 years	Fishing	1050	18.42	750	13.16
45 years	Fishing	500	8.77	350	6.14
78 years	Carpentry	750	13.16	350	6.14
72 years	Farming and fishing	1050	18.42	350	6.14
45 years	Petty Trading	1050	18.42	350	6.14
35 years	Petty Trading	1050	18.42	350	6.14
40 years	Farming and Petty trading	150	2.63	105	1.84
57 years	Fishing	1050	18.42	700	12.28
33 years	Fishing and marketing	1750	30.70	350	6.14
46 years	Farming	500	8.77	300	5.26
44 years	Farming	210	3.68	300	5.26
71 years	Fishing	525	9.21	350	6.14
35 years	Farming	1750	30.70	1300	22.81
64 years	Farming	350	6.14	420	7.37
27 years	Fish selling	525	9.21	350	6.14
	Total weekly estimates:	**35100**	**615.79**	**18205**	**319.39**
	Estimated average weekly:	279	4.89	144	2.53