Sample Abstract

Presentation title: Gender Mainstreaming

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Abstract:

Mozambique is poor country and the target of major tropical cyclones such as Gombe, Idai, Eloise, Kenneth, Shallane, Freddy, Alvaro, Filipo ,Gormane, El nino, and was recently devastated by tropical cyclone Olga. Putting biodiversity in danger of extinction and putting the Mozambican Population in a humanitarian crisis. We have already restored more than two hundred hectares devastated by major tropical cyclones (recovery of lowlands for agricultural production and environmental management), creation and formalization of natural resource management committees ,creation of community agendas for the sustainable use of land and other natural resources ,mapping and micro-zoning of community lands and creation of agro-

livestock associations(inclusion of children and women in the creation of self-employment through agricultural production and job creation through the green economy),raising children’s awareness of the sustainable use of land and other natural resources (lectures in schools),raising communities awareness of children’s rights in society, including children in decision-making on sustainable use of land and other natural resources, raising awareness among children’s about planting trees and mangroves in areas devastated by major tropical cyclones as a way of mitigating landslides or erosion, raising awareness among children’s about moving out of flood-prone areas and areas in danger of landslides, raising awareness among children’s about collecting plastic bags from water and land, and raising awareness among children’s about combating climate change (uncontrolled fires) in Mozambique. Our activities are taking place in the the Village of Ngoo,in the Partial Reserve of Lake Niassa, Mozambique. My participation in this event will enable me to gain technological and scientific experience in the areas of conservation, restoration agriculture, social/gender inclusion (children, young people, men and woman) in decision-making in the sustainable use of land other natural resources, climate change mitigation and obtaining cooperation partners to fund our activities so that we can expand the same activities to other communities most affected by and vulnerable to climate change in Mozambique.

WORK CARRIED OUT

We have worked with KULIMA, project called Delimitation of Communities Lands (formalization and creation of natural resources management committee, creation agendas for use land and other natural resources, creation of agri-livestock associations, mapping and microzoaning of communities lands, sensiblization of communities on sustainable use of land and other natural resources), Muembe District, Niassa Province, Mozambique. EMAIL: kulimaniassa@gmail.com.

We have worked with COMMONWEALTH YOUTH CLIMATE CHANGE NETWORK, Project called Youth Ocean Protect (sensitizing communities to retreat in flooding areas, sensitizing communities to combating uncontrolled burning, sensitizing communities to planting trees and mangroves in areas devastated by major natural disasters,we have restored more than 200 hectares devastated by major natural disasters (recovery of lowlands for agricultural productiopn and environmental management),creation of agro-livestock associations (including womenin the creation self-employment through agricultural production and creation jobs trhrough green economy) ,sensitizing communities for collect plastic bag in lake and communities sensibilization to practice conservation agriculture to contribute to fighting hunger, proverty and chronic malnutrition). Lake District, NiassaProvince,Mozambique. ADRESS: Linktr.ee/CYCN, +48452514361.

See the images below of the work carried out in the locality of Ngoo, Cobue Administrative Post, Lake District, Niassa Province, Mozambique.

With your support we would like to expand our activities (same activities) in communities most affected by tropical cyclones such as Chia,Mbueca,Mala and Chicoa, all communities are located in Lake Niassa Partial Reserve in Mozambique.The project will chover **3000** families living within the Lake Niassa Partial Reserve.In the five communities where the project will be implemented, **609** hectares of land have been devastated and need rapid intervention to restore and **19600** trees need to be planted to restore the degraded areas .The expected results: formalization and creation of natural resources management committees ,well-restored landscapes ,communities well aware of the sustainable use of land and other natural resources ,creation of communities agendas for the use of land and other natural resources, combating hunger,chronic malnutrion and poverty by 2030.

The outer (Western) limit of the proposed Ramsar site is the international boundary between Mozambique and Malawi, which defines the Mozambique's total territorial waters in Lake Malawi/Niassa. The borders geographical coordinates points in the Lake are according to the Government entity in charge of the border demarcation. In the terrestrial side of the proposed Ramsar site, the limits are defined by the border with the Republic of Tanzania in the North, the border with Malawi in the South and topographic features – which include the river basins of Messinge, Lungula and Luchimua rivers - in the Eastern side of the Ramsar site.

The Ramsar site excludes the two islands of Chisumulu and Likoma and the Malawian territorial waters around them:

1. Geographical coordinates (latitude/longitude, in degrees and minutes):

Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.

Please see Point Reference in the map. Points A to I are the limits of the proposed Ramsar site inland.

Coordinates

Point Reference Lat Lon

A 11º 34” 21.34 S” 35º 25” 03.61 E”

B 11º 57” 35.12 S” 35º 00” 39.77 E”

C 12º 13” 45.30 S” 35º 18” 00.02 E”

D 12º 30” 9.14 S” 35º 12” 45.73 E”

E 12º 38” 34.73 S” 35º 20” 30.32 E”

F 12º 56” 06.90 S” 35º 15” 02.38 E”

G 13º 01” 21.18 S” 35º 24” 08.96 E”

H 13º 17” 17.76 S” 35º 12” 04.74 E”

I 13º 29” 08.25 S” 34º 56” 21.89 E”

COC 12º 30” 28.50 S” 34º 51” 28.50 E”

Please, see Point Reference in the map. Points Reference 1 to 17 (note, these are official numbers) are the limits in the border between Malawi and Mozambique, in the Lake.

Coordinates

Point Reference Lat Lon

1 11º 34” 27.4 S” 34º 40” 0.10 E”

2 11º 57” 58.2 S” 34º 31” 55.97 E”

3 12º 11” 18.09 S” 34º 20” 48.22 E”

4 12º 33” 47.65 S” 34º 28” 25.10 E”

5 12º 50” 59.51 S” 34º 29” 56.48 E”

6 13º 04” 11.51 S” 34º 33” 13.29 E”

7 13º 20” 55.41 S” 34º 31” 48.94 E”

8 13º 29” 00.40 S” 34º 35” 54.95 E”

9 11º 34” 25.90 S” 34º 58” 14.40 E”

17 13º 41” 58.00 S” 34º 52” 01.03 E”

2. General location:

Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town. The Lake Niassa and its Coast is located in the Niassa Province, in the Northeast of Mozambique.

The waters of the Lake border the District of Lichinga (Administrative Post of Meponda), and the District of Lago (Administrative Posts of Lichinga, Lunho and Cobue). The coast on the Mozambique portion of the Lake is 254 Km long and represents 20% of the total coast line of the Lake. It lies on the border with Tanzania at the north, and with Malawi at the east and south.

The nearest large town is the capital of Niassa Province – Lichinga – at a distance of about 62.15 Km (from Meponda), 105.22 Km (from Metangula), 113 Km (from Lunho) and 176 Km (from Cobue), in a south-east direction. Lichinga has a population of 142,253 inhabitants (http//: www.ine.gov.mz).

3. Elevation: (in metres: average and/or maximum & minimum)

554 m (average), 319 (min.), 1,413 (max)

4. Area: (in hectares)

1,363,700 ha, including the water body

5. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland. Lake Niassa (also known as Lake Malawi/Nyasa in Malawi and Tanzania, respectively) , referred hereafter to as Lake Niassa, with a total surface area of 18,720 Km2 is the third largest lake in Africa, after Lake Victoria and Tanganyika, and it is a shared natural resource among three countries: Mozambique, Malawi and Tanzania. This lake is the world’s third deepest lake with a depth just over 700 m, and it’s the southernmost of the Western Rift Valley lakes (Twombly, 1983, Konings, 1995, Ribbink, 2001). It is home to more than 600 fish species, 90% of which are endemic to the lake. The highest number of fish species makes this lake unique in the world. Lake Niassa constitutes the largest portion of inland waters in Mozambique. The Lake plays an important role in the livelihoods of the people living in its surrounding. Fishing is the most relevant activity all along the coast. Most of the population depends on this activity to provide for their food needs and to generate income. Together with agriculture, forestry, mining and the ever increasing tourism industry, the Lake contributes substantially to the local and national economies. This makes it very relevant from the point of view of management and conservation of micro and macro ecological regions, as is the case with the Eco-Region of the Lake Malawi/Niassa/Nyasa Catchment Area altogether.

Criteria:

Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Criterion 1:

Lake Malawi-Niassa-Nyssa is a large, long and narrow freshwater lake in southern Africa covering the territories of Tanzania, Malawi and Mozambique. It is the southernmost of the Western Rift Valley lakes located between 9o 30' – 14o 40'S, 33o50' – 33o36'E. The lake is the ninth largest in the world, the third deepest, and has a surface area of 31,000 km2. The lake depression consists of a series of grabens and half grabens, and this pattern of rift faulting results in the boundary of the lake varying from extensive plains, particularly in the south, to steep-sided mountains in the north. The lake's catchment covers about 130,000 km2 and includes much of Malawi, the south-western corner of Tanzania and the north-western corner of Mozambique. Lake Malawi was formed millions of years ago as a part of the development of the Great Rift Valley system of Africa. It is termed an 'ancient' lake in global terms, and has a high biological importance (Chafota *et al*. 2005)

Criterion 2:

A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

Although no exact number of the status of the mammal population in the Lake region is known, the following highly endangered to vulnerable are known to occur in the area such as Wilddog (*Lycaon Pictus*) (IUCN:endangered), Leopard (*Panthera pardus)* (CITES Appendix 1*),* Lion

(*Panthera leo*) (IUCN: vulnerable), Elephant (*Loxodonta africana*) (CITES Appendix 1), Sable antelope (*Hippotragus niger variani*) (CITES appendix 1).

Criterion 3:

A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

The most outstanding biological feature of Lake Malawi/Niassa/Nyasa is the presence of large number of endemic fish species, with the lake having the highest number of endemics of any of the Rift Valley Lakes. Although fourteen families of fish are represented in the lake's catchment, the family Cichlidae dominates in terms of species richness. Formal scientific description and naming of many cichlids remains to be completed as professional systematists cannot keep pace with the rate at which new species are being discovered. It is certain that further new species of fish will be discovered as research continues. Lake Malawi also supports populations of mammals, birds, amphibians, reptiles and plants. None of these groups contain high rates of endemism in the lake, although there are also some endemic aquatic invertebrates (Chafota *et al*. 2005).

The principal focus of attention with regard to scientific exploration, management and conservation has always been the spectacular lake and its remarkable endemic species flocks, principally the cichlids and catfish of the genus *Bathyclarias*. The lake basin ecosystem and hence ecoregion, also has an exceedingly important riverine component with its own unique, but largely overlooked biodiversity. Included among these are fishes that spend their entire life history in rivers (riverine or potamicolous species), swamps and temporary waters and others that spend part of their life history in the lake and the other part in rivers (potamodromous species). Most of the latter group spend the adult part of their lives in the lake and migrate up river to spawn, usually in the rainy season. As a group it is these fishes that spend all or part of their life history in rivers that are most threatened, perhaps facing extinction. A fair proportion of these fishes are endemic and their extinction would therefore constitute a total and irreversible loss. Others have a broader distribution in southern and central Africa, but do nevertheless constitute valuable components of the lake basin ecosystem and biodiversity (Ribbink, 2001).The continental area of the lake is predominantly covred by Miombo woodland that covers about 2.8 mill km2 of the southern subhumid tropical zone from Tanzania and Zaire in the north, through Zambia, Malawi and eastern Angola to Zimbabwe and Mozambique in the south. The vegetation types in the proposed Ramsar area include: Forest vegetation that benefits from added humidity of the soil, Riverine forest, Deciduous Forests, Wetlands with short tree's, inselbergs, and outcrops with soil little able to absorb humidity. This includes evergreen vegetation, deciduous as well as inundated. Tree species include *Brachystegia spp., Julbarnardia globiflora, Pterocarpus rotundiflolius, Pterocarpus angolensis, Vitex payos, Albizia Dombeya rotunidfolia*, amongst many others. The soils are predominantly infertile, most of the nutrient richness lies within the vegetation and is recycled through the nutrient cycles that passes through the soil. Woody plants make up more then 95% of plant biomass. Miombo woodlands do not only provide an immensely large range of goods and services to the human population that depend on it but is also home to a highly diverse fauna community, including antelopes (bushbuck, buffalo, sable, kudu, Nyala, dikers, etc), carnivores (Leopard, Lion, medium and small cats) as well as many reptiles, amphibians, birds and insects characteristic for this extensive habitat type in Southern Africa.

The main habitats and zones of the Lake Niassa and its immediate coastal zone are Riverine, sandy areas (Beaches), Sand and rocky mixture, rocks and stony areas, Grasslands, Reeds, Rocky areas with tree cover and small islands, reef's and aquatic habitat.

The reefs of the Niassa Lake can be divided in various habitats, most of them home to specific cichlid populations. These reef's are located between 10 to 90 meters with highly diverse biodiversity. The most common species found at around 70 m depth of the Cichlids: *Copadichromis lomomae*, The Minos Reef presents mainly rocky habitats with cichlid species that feed on the plankton and occur in various habitats. However some variations in coloring exist between populations in different habitats. In habitats with more then 6 meters depth but rocky surfaces, slightly other compositions can be found . The Minos Reef, about 1.5 miles from the continent, between 16 and 23 m depth. Minos reef is one the areas especialliy rich in fish species, particularly small ornamental fish, including the zebra fish (*Pseudotrpheus (Metriaclima)* sp.. , in other areas of the same reef species such as *Copadichromis chrysonotus and C. jacksoni*, both feed on Plankton, *Labeotropheus fuelleborni, L. vellicans, Petrotilapia sp, Protomelas spilonotus, Tropheops marcophthalamus*.

Criterion 4:

The Lake also lies within flyways of migratory birds that use the lake margins for feeding on their way between Africa and Europe (Chafota *et al.* 2005).

However bird records for the eastern shores are poor and reliance has been placed on those obtained through studies on the Malawian portion of the shared waters. Benson & Benson (1977), and Newman, et al. (1992) give the bird count for Malawi at precisely 620 species. The most recent checklist (Dowsett-Lemaire and Dowsett, in press; from Duthie pers. comm.) gives 648 species from 78 families, comprising 456 residents, 94 intra-African migrants of regular occurrence, most of which probably breed in Malawi, and 77 regular and 12 vagrant Palaearctic species. Over one third of all bird species in Malawi are considered to be uncommon or rare, and of long-term conservation concern (Newman et al. 1992), although for many of these species, little is known of their exact population status. As with the fishes, naturally rare species may not necessarily be threatened unless activities such as harvesting are making inroads into their population size. The species richness of the birds is only slightly lower than that of the fishes of the region. However, the fishes are represented by only 14 families, whereas 78 families represent the birds, indicating a broader diversity of birds at the higher taxonomic level. Ninetyfour birds in Malawi are restricted-range species, found in only one or a few biomes as used by the Endemic Bird Areas project of Birdlife International (Stattersfield et al. 1998). Nine species of bird that are listed in the 1996 Red List of Threatened Animals are known to occur in Malawi.

However, many of the biome-restricted and endemic birds that are area-restricted may be considered to be under conservation threat since their distribution is now restricted to a small number of sites, and habitat degradation is leading to diminution of their habitat patches. Those species whose main distribution lies outside of existing large protected areas may be especially vulnerable to local extinction in the short term. Newman et al. (1992) show that a high proportion of the birds have strong affinities for aquatic habitats. Many of the birds associated with water are valuable ecological components and are attractive to ornithologists (Ribbink 2001a).

Criterion 5 :

Internationally, the main significance of Lake Malawi-Niassa-Nyassa is in terms of it values for the conservation of species narrowly restricted to that lake. Lake Malawi is home to 15% of the

world’s freshwater fish species, with more than 600 endemic species in total.
Fourteen families are represented in the rivers and lake within the catchment (see Table 1). The family Cichlidae dominates in terms of species richness, diversity and numerical abundance. The high degree of cichlid endemicity (99.5%) indicates that nearly all members of the family evolved in the lake.

Table 1. *The riverine and lacustrine fishes of the Lake Malawi/Niassa/Nyasa system, and the percentage endemicity. Endemicity is lower in rivers than in the lake. All families in the lake also have riverine representatives, but not all riverine families have representatives in the lake (Data from the systematics team of the SADC/GEF Project). R =present in rivers; L = present in lake.*

Family	**In rivers (R) or in lake (L)**	**Genera Total**	**Genera Endemic**	**Species**	**Species Endemic %**
1. Protopteridae	R	1	0	1	0
2. Anguillidae	R&L	1	0	1	0
3. Mormyridae	R&L	6	0	7	0
4. Salmonidae	R	1	0	1	0
5. Characidae	R&L	2	0	2	0
6. Cyprinidae	R&L	5	1	26	35
7. Bagridae	R&L	1	0	1	100
8. Amphilidae	R	1	0	6	40
9. Clariidae	R&L	2	1	17	71
10. Mochokidae	R&L	2	0	3	33
11. Cyprinodontidae	R&L	1	0	1	0
12. Aplocheilidae	R	1	0	2	50
13. Mastacembelidae	R&L	1	0	2	100
14. Cichlidae	R&L	56	51	Ca 750	99.5

(source: Ribbink, 2001)

Amongst the most common in the fisheries in Mozambique are the (locally named) *chambo*

(*Oreochromis* sp.), *usipa* (*Engraulicypris sardella*) and *utaka* (*Copadichromis* sp.) (Halafo, 2008). Others species include *Labeo mesops*, *Labeo cylindricus*, *Opsaridium microcephalus* and *Opsaridium microlepis*, *Barbus litamba* and *Engraulicypris sardella*. Potamodromous fishes (already referred as fish which spend part of its life cycle in rivers) from the Family Ciprinidae, such as *Opsaridium microlepis* are considered to be endangered (Halafo, 2008).

6. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

Eco-Region of the Lake Malawi/ Niassa/Nyasa Catchment Area

b) biogeographic regionalisation scheme (include reference citation):

For freshwater ecoregions such as Lake Malawi/Niassa/Nyasa, the catchment serves as a logical unit for delineating freshwater Ecoregions.

Accordingly, the lake, all inflowing streams and rivers, and the slopes from which land-based activities might impact on the lake would define the boundaries of the Lake Malawi/Niassa/Nyasa Ecoregion. Boundaries to the upstream components of the lake are defined by the catchment. It is more difficult to define the lower limits of the system. Water draining from Lake Malawi/Niassa/Nyasa flows via a single exit, the Upper Shire River, into Lake Malombe, then into the Middle Shire, the Lower Shire River, and ultimately to the Zambezi River and the Indian Ocean. The Ecoregion definition calls for systems to be linked as a collective entity unified by the sharing of a large majority of their species and ecological dynamics. Lake Malombe shares with Lake Malawi/Niassa/Nyasa the majority of its species, though the larger lake has many times the number of species that are found in Lake Malombe. The Upper Shire River, that links the two lakes, is the corridor through which exchanges and sharing take place. Therefore, Lake Malawi/Niassa/Nyasa, the Upper Shire River and Lake Malombe constitute the Ecoregion as they are 1) an integral part of the basin, 2) they contain geographically distinct assemblages of natural communities, sharing many species and ecological dynamics; 3) they share similar environmental conditions; and 4) they interact ecologically in ways that are critical for their long-term persistence. As Lake Malombe has occasionally dried up during its history, including an early part of the twentieth century, the last point applies to it rather than to Lake Malawi/Niassa/Nyasa, because the restocking of Lake Malombe depended upon the main lake and the middle Shire River (Chafota *et al*., 2005).

7. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Hydrology

The climate of the area where the lake is located is strongly influenced by altitude (ranging from less than 100 m in the lakeshore to 1500 m in the mountains of Maniamba-Amaramba) and winds accompanied by rains. Annual precipitation varies from 1000 mm to 1400 mm Niassa province. The lake area is characterized by a high surface drainage in February-March (summer), and insignificant runoff in September-October (winter). Coastal plains around the lake are subject to floods in the periods of high water levels.

Lake Niassa drains to the Indian Ocean through Chire River and Zambezi system. It is estimated that 16% of the annual losses of water from the lake is through Chire River, and the remaining (reaching up to 1.6 meters per year), through evaporation. A consequence of higher proportion of evaporation in a larger volume of water is that the lake is characterized by a longer flushing time (lake volume/annual outflow) estimated at 750 years. This lake is the world's third deepest lake with a depth just over 700 m. Its origin is natural.

The long flushing time has important implications in water quality management. Any nutrients or other chemicals that enter into the lake are practically retained within it and can only be removed through sedimentation to the bottom lake, loss to the atmosphere (if the chemical has a gaseous phase), or by the very slow process of outflow through Chire River. Therefore, the lake acts as a deposit of many pollutants, which have a long residual time, once within the lake system. Residence time taking in account the evaporation is estimated to be 140 years.

Another consequence of the dominance of precipitation and evaporation in the hydrological cycle of the lake is that it is susceptible to climate changes. A small increase in the ratio precipitation/evaporation can result in floods, as happened in 1979-80; while a decrease in that ration, can result in the closing of the lake basin, without any outflow, as was the case in the period 1915-35. The lake level varies normally ± 1 meter within a year.

Hydrographical Network

The hydrographical network of the lacustrine coast under consideration belongs to the Sub-Basin of the Niassa Lake, which in turn is part of the great Catchment Basin of the Zambezi River.

The Sub-Basin of the Niassa Lake is structurally conditioned by the nature and orientation of the relief, besides the climatic regime. There are a large number of rivers, rivulets and torrents, and in general they flow quickly, with East-West orientation; with small volumes and periodic regimes, they dry and disappear during the winter, except for river Lunho, which is the most important stream of the sub-basin. The lake is the depository of those water streams.

There is an infinity of rivers in this sub-basin, and besides the already mentioned Lunho, others that deserve reference are Chiwindi, Metumbe, Cóbuè, Unga, Wikihi, Fugue, Nalgo, Luile, Tumbucubire, Micala, Luchimange, Meluluca, Lusefa, Urunga, Timba, Latambe, Meponda, i.a..

Inflow

The total catchment area is small for a lake of this magnitude: 126 500km2, of which 97 750 km2 is land catchment. Consequently, the ionic composition of the river water reflects this and is dominated by calcium, magnesium and bicarbonate ions; together with sodium these form the main ions in the lake water. The inflows are mostly rather short from the escarpments and nearby mountains, and their volume depends directly on the rainfall in the catchment of each stream or river. The hydrology is delicately balanced. The existence of raised beaches at least 100m above the present lake level indicates that the level was once much higher than it is now, and has since subsided, probably in response to tectonic events, rather than climate change.

Outflow

The outlet via the Shire River to the Zambezi is intermittent, with seasonally dependent flow rates. The rise and fall of the lake is seasonal but also exhibits longer-term trends.

Outflow may increase or decrease quite substantially, depending on the annual rainfall. In a little more than a century there have been fluctuations of considerable magnitude. For example, from 1896 there was a progressive fall to a minimum in 1915, at which time the outflow ceased. From then on the level rose steadily to a maximum in 1935 when, in the wet season, it was about 6m above the maximum of 1915. At this point the outflow was resumed once the sand bar that had been built up during the low period was breached. The overall lake level continued to rise, reaching a peak in the 1979/80 wet season; thereafter, it began to fall with periodic rises in particularly wet seasons. Indeed, the level dropped so low in 1997, that the hydro-electric plant on the Shire River was threatened by the possibility of not having sufficient water to drive it. As Malawi is heavily dependent on this electricity source, great concern was engendered (Ribbink, 2001).

Lake level

With an elevation of 471m above sea level and a maximum depth of more than 700m it is clear that the deeper parts of the lake are about 230m below sea level.

Changes in surface area

The overall surface area of the lake is not greatly affected by the **annual** fluctuations in lake level despite the inundation and drying of adjacent floodplains in flat areas. Primary reasons for this are a) the steep slope of much of the lakeshore, sometimes almost vertical, means that overall the change in the surface area of inundation in response to seasonal changes in lake level is minimal, and b) relative to the permanent surface area of the lake, the area covered by the flood plains is minuscule.

Historical changes in level

Although annual changes in lake level are quite small, over historical periods, changes to lake level have both increased and decreased substantially the volume and area of the lake. There is evidence to suggest, for example, that the lake was almost 400m lower than present a mere 25000 years ago. As recently as several hundred years ago, much of the South Eastern and South Western Arm were dry as were the northern-most sandy-shores; the lake at that time is believed to have been 50m shallower than it has been for more than the last 150 years (records from Livingstone and other missionaries of about 1860 to the present suggest fairly high lake levels on average).

8. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

Geomorphology

According to the Geomorphological Map of Mozambique 1:1.000.000 (DNG, 1983, the coastal zone under study is part of the mountains that surround the Rift Valley, in an area of folded mountain which include geomorphological units known as Mountainous Region of Niassa; Region of the Sanga Mountain Range; Region of the Messinge Syncline Depression ("Depressão Sinclinar Entre-escarpas") and Tchissango Anticline Mountains. Structurally, the already mentioned document refers the occurrence of erosive massifs (from the south of Meponda to Metangula), in the form of Inselbergs, with heights that may reach 1,200 metres; gentle relief in the Karoo formations (extending from the valley of the river Lunho up to the Rovuma).

In fact, although some flat zones do occur, the area under study is characterized by very irregular relief, marked by mountains and valleys, within which three important parts may be distinguished: the strip of coastal lowlands, the sub-coastal high mountains and the zone of hills sloping to the East.

The strip of coastal lowlands, starting from the lake's continental platform, is located next to the shore, following its shape and bordering the slopes of the high mountains. The beaches are located on that part (Meponda, Chiuanga, Seli, Tungo, etc.), in extents of not more than four kilometres into the land, except for the valleys of rivers Lunho, Micala, Tumbucubire and Luchimange.

Altogether this area is slightly undulating, it is almost flat, without great variation in altitude, except for the peninsular part, which constitutes an actual hill, probably of consolidated lacustrine dunes, since the present sediments are mainly lacustrine alluvia. The vital activities of

the population are centred on this area.
The sub-coastal high mountains are located immediately to the East next to the strip of coastal lowlands, occupying most of the administrative surface of the village of Cóbue. They denote large gneisse-granitic mountainous elevations, with steep escarpments, where now and then circular granitic structures appear as the highest points. It is in this area that the highest point of the Province is located - Mount Txissongo, with 1,848 metres of altitude.
The hills sloping to the East constitute a kind of basis for the high mountains on the sunny part of the coastal zone and from them come the flow of mountain sediments, through numerous valleys.
Thus, as regards the outline of the coast, the topographic features and landscape vary in morphological terms along its shores, enabling the distinction of two basic forms at the points of contact between the lake and the continent: (1) low and sandy areas, associated to beaches and reedy marshes, the latter when close to river deltas or estuaries; (2) tracts of high, sloping, rocky, stony terrain, with little vegetation.

Geology

According to some studies by Afonso (1976) and the National Directorate of Geology (DNG), on the coastal zone of Lake Niassa there are two geological complexes, namely the gneissmigmatite complex and the Karroo sedimentary complex.
The gneiss-migmatite complex traces back to the Upper Precambrian and is composed of metamorphic rocks. It covers the whole coastal stretch from north to south and is only interrupted by the Lunho basin, where sedimentary rocks occur. The gneiss-migmatite complex is part of the so-called “ Mozambique Belt” and within this system it is integrated in the stratigraphic unit of the Niassa Province, where gneisses, migmatites, calcareous amphibolites, quartzites, gneisse nephelinites and gneisse pyroxenites prevail (Afonso, 1976: pp 9, 35 and 41).
The Karroo sedimentary complex is a formation of the post-Cambrian, which occupies the river Lunho basin and is composed of sediments of continental origin, which have filled a void caused by a structural fault. It stretches in the direction NE-SW, from Metangula to Mazoco. It has particular characteristics that have earned it the designation of "lake spot" amidst all the spots of the Karroo. The rocks are mainly composed of argillaceous sandstones of various textures, sandstone conglomerates and mudstones (idem, pp 75-77).
In tectonic and structural terms, the eastern coastal zone of Lake Niassa denotes many faults and

is said to be unstable, that is, prone to seismic activity.

In fact, this coast shows many faults on the graben of the lake and the horst of the eastern coastal mountains in the framework of the Rift Valley, with orientation North–South, and on the other hand the zone is prone to tectonic movements, as mentioned by Afonso (1976):

“The Rift zone of lakes Niassa and Chire must have been unstable since ancient geological times and there are signs that the area's instability still exists at present” (idem, p. 48).

From various mineral resources believed to exist in the area under study, it is at present known that red granite deposits and coal deposits exist in Meponda and in the basin of river Lunho, respectively (Afonso and Marques, 1993: pp. 103 e 122).

Climate

The coastal zone of Lake Niassa is known as the warmest area of the Niassa Province, and is classified in the Koppen system as tropical humid climate. It exhibits two distinct seasons: rainy and humid summers and dry winters.

Due to lack of updated meteorological records it was not possible to assess the dynamics of the essential climatic elements (temperature, rainfall and atmospheric humidity), neither of the influence of micro-climatic factors which are clear there, such as its continental character, general and micro-circulation of the atmosphere, relief, inter alia. However, it is known beforehand that Lake Niassa's coast constitutes the warmest and less rainy area of the Province of Niassa, and the indicated factors have great influence on that.

In spite of the lack of data, the Geographical Atlas (vol. I) states that the average annual temperature varies from 22 to 24ºC; the average annual rainfall fluctuates between 1,000 and 1,400 mm (MINED, 1986: pp. 16-17.)

On the other hand, the experience of residents in the area indicates that the rainy season takes place between the months of November and April, during which rains fall torrentially, associated to the Mwera and Lilinga winds. The dry season takes place from May to October and the weather is then generally good, although occasionally storms may occur.

Soils

The soils of the eastern coast of Lake Niassa originate from gneisse-granitic rocks of the Precambrian and sedimentary-alluvial rocks of the Quaternary. In general these are brown and reddish soils, deep, with medium to coarse texture, clay, of varied fertility from moderate to excellent, suitable for agricultural activities including irrigation. The main limitations, in some of the types, are related to their great exposure to erosion and crust formation, which hamper seed germination.

All along the coast and from the point of view of spatial distribution, three soil complexes occur, with the centre in the river Lunho catchment basin, central part of the area we are analysing

North of the river Lunho catchment basin: from the border area with Tanzania to the mouth of the river Lumbue (Ngoo), parallel to the coast, red soils may be found and in inner zones there are lithic soils, equally prevailing between the south of river Lumbue to the basin of the Lunho.

The reddish brown soils are deep over the altered parent material; with texture from loamy clay to clay loam, good drainage, good content of organic matter, they are neither salted nor sodic, they are excellent for agriculture, but very susceptible to erosion, they hamper seed germination due to the formation of superficial crusts. They resulted from Precambrian rocks.

Lithic soils are brown, formed over a Precambrian rock of granite and gneiss. Many of them are associated to steep slopes and inselbergs, eroded zones and rocky outcrops, where the depth does not go beyond 30 cm. These are soils of sandy texture, clay loams, moderately acid, with low content of organic matter, moderate fertility, not salted neither sodic. Their main limitation for agriculture is scarce depth.

Basin of the river Lunho: next to the river's basin and valley, soils are brown, composed of sediments from the Quaternary, subdivided into two groups: brown soils and greyish-brown, deep soils, in isolated areas.
Brown soils (whose spatial distribution has the form of a parabola facing the lake and cut at the centre by soils of the Lunho river valley) have low depth, moderate drainage; they are slightly acid, with low content of organic matter, suitable for agriculture, very sensitive to erosion.
The greyish brown soils that cover the valley of the Lunho river are composed of stratified alluvia, with medium texture, deep, with high content of organic matter and silt, good drainage, they are neither salted nor acid, they are slightly sodic, associated to riverine forest and thickets, and are suitable for agriculture. Fertility and sodicity are the typical limitations.
South of the Lunho basin: All over the coast to the south of the Lunho basin, up to the border benchmark 17 in the area of Meponda there are associations of reddish-brown and lithic soils.
The reddish-brown soils result from sediments over the Precambrian period. They exhibit depths of over 100 cm, excellent suitability for agriculture, good drainage, low content of organic matter, low fertility, they are neither salted nor sodic and are exposed to erosion and crust formation, thus limiting germination. Lithic soils conform to the above description.

10. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.
There is a distinct lack of quantifiable information on the hydrological values of Lake Niassa; however of course generally one can always say that all Lakes have these features of sediment

stabilization, erosion control, ground water replenishment, water purification and nutrient cycling.

Nutrients

Rivers bring a small proportion of nutrients and therefore, nutrients within the lake are primarily from internal mixture. Recent measurements indicate that the deposition of atmospheric nitrogen in the lake is similar, in terms of magnitude, to the inflow of nitrogen through the rivers. In the same way, the largest source of phosphorous is from the atmosphere. Although it is difficult to confirm the main source of this phosphorous, it seems that it is from combustion of vegetal biomass around the lake. Global analysis of biomass burnt indicates that East-Central Africa experiences the highest frequency of combustion of vegetal biomass on earth. The survey showed that during biomass burning more than 96% of nitrogen from the surface and 56% of phosphorous are lost from the soil. Therefore these fires have not only impact on the lake, but result also in the loss of soil fertility.

There is not enough historical data to confirm whether the influx of nutrients has increased, but analysis of sediments suggests that the influx of nutrients increased in the last 40 years. However, so far there are no signs of eutrophication in Lake Niassa, which in other lakes, like Victoria, are one of the main threats for maintenance of diversity of fish communities. Offshore waters are clear during the major part of the year. (Moved from 16)

11. Wetland Types

a) presence:

Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

Marine/coastal: A • B • C • D • E • F • G • H • I • J • K • Zk(a)

Inland: L • M • N • O • P • Q • R • Sp • Ss • Tp Ts • U • Va •

Vt • W • Xf • Xp • Y • Zg • Zk(b)

Human-made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

b) dominance:

List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

"O", as a permanent lake, with an area of around 577,000 ha (5,770 Km^2)

Biography:

I am Gelito Inacio Franco Sululu, a graduated in Fauna and Eco- tourism, Master in Rural Development,National Representative of Commonwealth Youth Climate Change ,Mentor at the Sustainable Ocean Alliance ,Mentor at CoalitionWild, Ambassador of Industry 5.0 Ambassador Network and CEO of Gato Preto LTD in Mozambique. We carrying out community awareness work on planting trees and mangroves in areas devastated by major tropical cyclones as a way of mitigating landslides or erosion, community awareness work on retreating from flood-prones and landslide-prone areas, raising community awareness of plastic bags collection in the aquatic and terrestrial environment, including gender in making-decision in the sustainable use of land and other natural resources, sensitizing communities to combat uncontrolled burning and intensifying the practice conservation agriculture to help reduce hunger , chronic malnutrition and poverty.