

# Information Sheet on Ramsar Wetlands (RIS) – 2006-2008 version

Available for download from [http://www.ramsar.org/ris/key\\_ris\\_index.htm](http://www.ramsar.org/ris/key_ris_index.htm).

*Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8<sup>th</sup> Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9<sup>th</sup> Conference of the Contracting Parties (2005).*

## Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 7, 2<sup>nd</sup> edition, as amended by COP9 Resolution IX.1 Annex B). A 3<sup>rd</sup> edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.
3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

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### 1. Name and address of the compiler of this form:

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Designation date

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Site Reference Number

2. Tabe Ebanga-Orock TANJONG, WWF-Cameroon Programme Office, BP 6776, Yaounde Cameroon. Tel: +237 221 70 84 or +237 950 36 21 Fax. +237 21 70 85  
[ttanjong@wwfcarpo.org](mailto:ttanjong@wwfcarpo.org)

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### 2. Date this sheet was completed/updated:

10<sup>th</sup> of May 2006

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### 3. Country:

Republic of Cameroon

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### 4. Name of the Ramsar site:

The precise name of the designated site in one of the three official languages (English, French or Spanish) of the Convention. Alternative names, including in local language(s), should be given in parentheses after the precise name.

Barombi Mbo Crater Lake

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### 5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only):

- a) Designation of a new Ramsar site ; or  
b) Updated information on an existing Ramsar site

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6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area

The Ramsar site boundary and site area are unchanged:

or

If the site boundary has changed:

- i) the boundary has been delineated more accurately ; or  
ii) the boundary has been extended ; or  
iii) the boundary has been restricted\*\*

and/or

If the site area has changed:

- i) the area has been measured more accurately ; or  
ii) the area has been extended ; or  
iii) the area has been reduced\*\*

\*\* **Important note:** If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

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7. Map of site:

Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

- i) a hard copy (required for inclusion of site in the Ramsar List): ;  
ii) an electronic format (e.g. a JPEG or ArcView image) ;  
iii) a GIS file providing geo-referenced site boundary vectors and attribute tables .

b) Describe briefly the type of boundary delineation applied:

e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The Barombi Mbo lake boundaries are physical ones. They are constituted by the 110 m high walls above the lake surface.

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8. 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.

Forest Reserve and lake approx. 04° 40' N - 09° 23' E

Latitude (lake). 04° 39'10" to 04° 40'14" N  
Longitude (lake). 09° 23'53" E to 09° 25'11" E

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**9. 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.

Lake Barombi Mbo is located in the volcanic range of the Southwest Province of the Republic of Cameroon. This lake is a continuity to the forest reserve of Barombi Mbo.

It is directly adjacent to the "Station" neighbourhood of the metropolis of Kumba, Meme Division, Kumba Subdivision, in the SouthWest Province of Cameroon. Hydrologically, the Barombi Mbo drainage is connected to the Mungo River drainage.

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

301 m above sea level (lake surface), highest point of crater rim approximately 400 m above sea level

**11. Area:** (in hectares)

415 ha (lake-area).

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**12. General overview of the site:**

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

Deep volcanic Crater Lake, which is surrounded by partially degraded evergreen rainforest (the latest is not a part of the site). Famous among biologists for the occurrence of 12 endemic fish-species rendering Barombi Mbo one of the areas with the highest densities of endemic species per area in the world. It is an important sacred site to the Barombi tribe; an important fishing ground; as well as a source for pipe-borne water for the metropolis of Kumba and its environs.

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**13. Ramsar 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.

1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9

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**14. Justification for the application of each Criterion listed in 13 above:**

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

Barombi Mbo "is a particularly good representative example of a natural or near natural wetland, characteristic of the appropriate biogeographical region". The site forms with three other crater lakes in the Southwest Province of Cameroon (Lake Bermin and Dissoni) the so-called "afrotropical Cameroon crater lakes" (Ecoregion 186 according to the WWF Global Classification ([www.panda.org](http://www.panda.org) - List of ecoregions)). The lake harbours one of the few examples of habitats for endemic crater-lake fish species-flocks in the world.

### Criterion 7

Barombi Mbo is important in that it harbours 12 endemic vertebrate (fish) species, which have evolved within the lake and are endemic to the lake basin. No other lake in the world, except probably Lake Bermin (a Crater Lake in Cameroon) has such high endemic species per ha ratio. Lake Barombi Mbo is also important due to the presence of freshwater sponges, one of which (*Corvospongilla thysi*) is also endemic. Although the site forms with three other crater lakes in the Southwest Province of Cameroon the so-called "Afrotropical Cameroon Crater Lakes Ecoregion", almost all other fish-species of the other lakes are endemic to their respective lake basin and are mutually exclusive in their distribution within the ecoregion. For evolutionary biologists, the lake represents one of the few examples where new species have evolved within the confines of a small area by "sympatric speciation ". It is considered as equally important for evolutionary biology as are the Galapagos Islands (Ecuador).

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**15. 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:** Afrotropical Cameroon Crater Lakes Ecoregion (Ecoregion 186)

b) **biogeographic regionalisation scheme** (include reference citation):WWF. WWF-List of ecoregions

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### **16. 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.

The caldera, which forms the lake basin, is a remnant of an explosive volcanic crater, which was formed approximately 1.000.000 years ago. With a surface area of 415 ha and a depth of 111 m, it is the largest, and the deepest crater-lake in Cameroon. To the north, east and south, the lake basin is surrounded by a steep crater wall, which summits at more than 400 m above sea level. To the west, the catchment includes - in contrast to many other crater lakes - a small inlet system of streams, which is located in a shallow and boxed-in crater. The inlet-system (Sofu, and its tributary Toh Mbok) is located within the secondary crater and covers an area of approximately 8 km<sup>2</sup> of flat terrain. It has produced a small sediment cone at the junctions with the lake, where the lake's shore is comparatively shallow. The shores descend sharply, spilling into the central plateau of the lake bottom giving the lake a saucer-shaped silhouette. After the formation of the maar, it is believed that the maximum depth of the lake was around 400 m before it was filled with sediments from the lake. At the north-eastern shore, a recent lava flow crops out of the bottom of the inner wall with a submerged distal arm. The single outlet, Kaké, flows through a deep gorge in the crater rim located in the south-eastern corner of the lake. Since the gorge is according to estimates recent, it is hypothesised that the lake formerly drained through the Sofu to the River Mémé system, and not to the River Mungo system as is the case today.

Several sediment cores have been taken from the lake bottom in order to investigate the recent (25.000 years) history of the lake by means of radio-carbon dating and pollen-analysis. The results indicate that the lake's environs were partly densely forested during its Quaternary age. Then, about 20.000 years ago, a major disturbance in the lake occasioned the inversion of the upper sediment layers. However, pollen from aquatic plants is present in sediment cores and it is estimated to have been there 20.000 years ago, indicating that conditions favouring aquatic life have always been present.

The water of Barombi Mbo emanates solely from rainwater falling within the confines of the small inlet-drainage system in the inner crater wall and the lake surface. The lake level fluctuates by approximately 1 m through the seasons, as there is very little water flowing in one of the streams of the inlet system, Toh Mbok, during the dry season with almost no rainfall from December to February. However, there is abundant water during the rainy season peaking around August and September.

The lake is comparatively poor in nutrients (oligotrophic), but nutrient content is increasing slightly with increasing depth. At the surface the mineral content measured in Mikrosiemens is 46, while this value increases to 110 in deeper layers. Additionally, there is a slight increase in dissolved solids in the dry season. The water is near neutral to slightly alkaline at the surface (pH 7.14 to 7.52) and becomes slightly alcalic at greater depths (pH 6.42 to 6.6 at 100 m depth). Typical of deep, stratified lakes, the deep waters are devoid of oxygen (no detectable oxygen below 40 m) and a drastic decrease of 20 to 40 m depths. Although the lake is normally considered to be oligotrophic with a Secchi-depth (transparency) of up to 11 m, periodic and infrequent events cause a massive decrease of transparency and increase in turbidity, which may result in transparencies below 1 m and a change of the water colour from turquoise-blue to brown. The death of large quantities of fish, especially those from the deeper water layers, during the rainy season of 2001 is the cause of the decrease in transparency and increase in turbidity. During this period, all fish (except perhaps *Konia dikume* and *Clarias maclareni*) move into the upper water layers. The Barombi people have recorded this event for centuries, and it is known in the Barombi language as the *Nkum*. The people have recorded this event to occur between every seven to fifteen years. The exact causes are unknown; however, they seem to occur mainly in years with a very heavy rainy season.

The climate of the site is of equatorial type with a long rainy season (March to November) and a short dry season (December to February). The mean annual temperature approximates 18° C or even less as the altitude increases. The annual humidity ranges from 70-84 %. The precipitations range from 1,825 mm to 3,000mm.

The site consists of three successive volcanic series: a basaltic “lower black series” of tertiary age, a trachy-phonolitic “medium white series”, probably of Neogene age and a basaltic “upper black series” of quaternary age to very recent age.

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#### **17. Physical features of the catchment area:**

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

The catchment area comprises a large area of partially degraded evergreen rainforest (880 ha). Agriculture is gaining more and more importance in the area at the expense of the forest and may result in the pollution of the Lake by the accumulation of fertilizers if nothing is done to protect the area. There's also a 8 km<sup>2</sup> flat bottom second crater which forms a part of the Barombi Mbo Lake catchment area. The crater walls are entirely volcanic and show two similar series of basaltic tuff lapilli. The rest of the catchment area is composed of basalts of the upper black series which blanket the granite-gneissic substratum (Giresse et al., 1991).

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#### **18. Hydrological values:**

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

The lake serves as an important reservoir for clean drinking water, which is exploited as the single major source of drinking water by SNEC (National Water Company) for the town of Kumba and its environs.

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## 19. 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 -- Permanent freshwater lakes

M -- Permanent streams.

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## 20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

The bottom of the lake in the deeper areas consists of fine sand and fine organic debris. Around the shore of the lake, plant material falling into the water and sunken trunks of trees from the surrounding forest make an important organic input to the lake. Inshore, the sandy bottom is thickly covered with fallen leaves in most undisturbed places, but mostly sandy around the outlet. The shoreline, as well as some deeper areas are characterised by huge boulders, stones and gravel.

The nutrient balance of the small isolated ecosystem of Barombi Mbo is intimately linked to the fringing rainforest of the inner crater walls, which on the one hand supplies allochthonous organic matter through leaf-litter and fallen trees. The rainforest serves as a stabiliser against soil-erosion by preventing unduly high inputs of soil and subsequent siltation. The ecosystem is further linked to seasonally changing water input through the inlet stream system and rainfall, which provides additional organic matter and nutrients into the lake's water. Finally, naturally occurring fish-eating birds may substantially prey upon the fish community.

The aquatic food web is complex due to the number of ecologically specialised fishes (see "Noteworthy fauna")

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## 21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

The phytoplankton of the lake is sparse and has not been investigated yet. However, "aufwuchs" (epilithic algae cover and associated micro-invertebrates) grows on all hard surfaces and on rooted aquatic plants, which thrive in some more shallow areas. Species so far

identified include representatives of the genera *Gloetricha* (blue-green algae), *Gomphonema* (diatom), *Spirogyra*, *Bulbochaete* and *Mougeotia* (green algae). Higher plants occur mainly in parts of the shore that are not shaded. The dominant species is *Najas pectinata*, which grows from the very shallow areas (at least 4.5 m depth). Another important species is *Potamogeton octandrus*, as well as *Nymphaea* species. Aquatic plant life is most prominent in the western shallow section of the lake.

In historical times, the inner and outer crater rim was once completely covered with evergreen lowland rainforest of the Guinean and Biafran type with the main plant species being *Polystachya bipoda* Stévant, *P. lejolyana* Stévant, *P. riomuniensis* Stévant & Nguema, and *Pauridiantha coalescens*, which are mainly endemic species. This forest is partially degraded.

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## 22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

**Invertebrates:** Zooplankton: Copepoda: *Thermocyclops sp. aff. hyalinus*; Rotifera: *Anuraeopsis fissa*, *Brachionus falcatus*, *Trichocerca similis*, *Hexarthra mira* and *Polyarthra dolichoptera*. Interestingly, Cladocera are missing. Mosquito-larvae of the genus *Chaoborus* mosquito-larvae are present, and migrate during night-time to the upper oxygenated layer to feed on Rotifera. During the daytime, they occur at least down to 70 m, but avoid the shallow water. No detailed studies exist about the microbenthos of the lake. Insect larvae (mosquito-larvae of the family Chironomidae) and benthic crustaceans (ostracods) are abundant inshore, where they hide among leaves and sticks, or burrow in old branches or logs (mayfly *Povilla adusta*). One of the most striking features of Barombi Mbo (and some other oligotrophic crater lakes in Cameroon) is the occurrence of freshwater sponges of the genus *Corvospongilla* from the shallows down to at least 20 m depth. One, *C. thysi*, is endemic to the lake and lives on the outer surfaces of rocks and logs, while the other, *C. bohmi*, prefers crevices and hollows.

Two large decapod crustaceans inhabit both shallow and deeper waters: The prawn *Macrobrachium cf. vollenhovenii* and the freshwater crab *Sudanonautes africanus*. In addition, at least two shrimp species of the genus *Caridina* are present especially among *Najas*-leaves.

**Fishes:** The lake is world famous among scientists as home for 12 endemic fish species, 11 of them belonging to the percomorph family Cichlidae and one to the siluriform family Clariidae. According to recent molecular genetic results, the 11 cichlid species derived from a single invasion of an extant riverine species, *Sarotherodon galilaeus*, which after colonisation split up into the present day 11 endemic species by the process of sympatric speciation. All eleven species are highly specialised ecologically: The three species of the endemic genus *Stomatepia* are macro-invertebrate and fish predators (*S. mariae*, *S. pindu*, *S. mongo*). The only representative of the genus *Pungu*, *P. maclareni*, feeds predominantly on sponges and macro-invertebrates from hard surfaces (rock, wood). The two species of the endemic genus *Konia* are macro-invertebrate feeders in the deep low-oxygen water layers (*K. dikume*) or in the shallows (*K. eisentrauti*). The latter species shows a specialised behaviour of egg-stealing from spawning of other cichlid fishes in the lake. The remaining five species are fine-particle feeders either feeding on phytoplankton in the open water column (*Sarotherodon linnellii*, *Sarotherodon caroli*, *Myaka myaka*), over sandy and muddy habitats (*Sarotherodon steinbachi*), or from hard surfaces (*Sarotherodon lohbergeri*). All eleven species are mouth brooders, which take up their eggs during or directly after spawning and breed the eggs, larvae and juveniles for several weeks. Female, male or both sexes may breed depending on species. The only other endemic species, *Clarias maclareni*, a mudfish, lives in the deep

waters of the lake and is voracious, predated on large cichlids. Other than its closest relatives in the nearby streams, *Clarias camerunensis*, this species may prey freely swimming in the pelagic and represents until now the only *Clarias* exhibiting parental care. Non-endemic fishes found in the lake basin proper are the aplocheilid *Epiplatys sexfasciatus rathkei*, the cyprinid *Barbus batesii* and the goby *Awaous lateristriga*. Additionally, there are several species found in the inflowing stream, Toh Mbock: The aplocheilichthid *Procatopus similis*, the aplocheilid *Aphyosemion calliurum*, and the clariid catfish *Clarias camerunensis*. Crustaceans: The large and common freshwater crab *Sudanonautes africanus* is found in shallow waters down to approximately 10 m around the whole shoreline. In addition there occur two species of freshwater shrimp, *Caridina nilotica* and a possibly endemic second *Caridina* species (Roth, pers. comm). Sponges: The freshwater *Corvospongilla thysi* occurs at all depths.

Birds and mammals. In addition to the lacustrine fauna, several species of kingfishers, cormorants and birds of prey can be observed regularly, especially in the dry season. A small troop of monkeys (*Cercopithecus* sp) was observed inside the crater rim repeatedly in the rainy season 2001. Historically, elephants as well as chimpanzees were common at the lake.

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### 23. Social and cultural values:

a) Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values:

The social and cultural life of the Barombi Mbo People is intimately linked to the use of the resources of the lake through fishing, mythology and transport, and to the surrounding land through farming.

The close relationship to the lake is reflected by the many names, which are given to different points and areas around the lake-shore. These names: Lusa (outlet area), sometimes called Kongand, Kaka, Ngoma, Makor ("where there are raphias"), Fium, Dibung, Njibapind ("deep area"), Sese, Koh, Mpendja, Sarr, are prime proofs that the lake and its environs are part of the peoples history and everyday life. Equally, most of the macro-organisms of the lake have specific Barombi-names: nsess (*Stomatepia pindu*), mongo (*Stomatepia mongo*), pindu (*Stomatepia pindu*), fissi (single black male *Sarotherodon caroli*), wussi (many black male *Sarotherodon caroli*) lumpé (golden male *Sarotherodon linnellii*), bipé (many golden male *S. linnellii*, or many female *S. linnellii* or *S. caroli*), kippé (silvery *S. caroli* and *S. linnellii*), mwapé (female *Sarotherodon linnellii* or *S. caroli*), makepé (all small cichlid fishes from the lake except *Sarotherodon linnellii* and *S. caroli*), unga (small silvery *S. linnellii* or *S. caroli*), kululu (*Sarotherodon steinbachi*), leka keppé (*Sarotherodon lohbergeri*), myakamyaka (*Myaka myaka*), pungu (*Pungu maclareni*), konyé (*Konia eisentrauti*), Dikume (*Konia dikume*), nyongo (*Clarias maclareni* and *C. camerunensis*), longo katta (*Epiplatys sexfasciatus rathkei*), katta (*Procatopus similis*, *Aphyosemion calliurum*), suu (*Barbus batesii*), kibeke (crabs), ngossina (small *Caridina* shrimps), moss (*Macrobrachium* shrimp). In case of bad fishing results, traditional rites are performed in order to restore good fishing results. During these rites, men and women, fishermen of the village have different roles.

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

No



If Yes, tick the box  and describe this importance under one or more of the following categories:

- i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:

The area around the lake and around the village, as well as "Station" on the Kumba side of the lake is considered to be traditional Barombi land. Equally, the right to fish in the lake is controlled and attributed only to Barombi people, who have to practice fishing according to traditional guidelines. It appears from preliminary observation that each family or clan of the village appears to "own" certain areas and fishing rights, which are under their control, and which in many cases, may be rented to non-villagers for farming.

The traditional ties to the lake and land resources and the accompanied control of the land towards non-villagers surely have maintained the overall integrity of the ecosystem in the face of threats from the ever-growing Kumba metropolis.

- ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:
- iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:
- iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

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#### 24. Land tenure/ownership:

- a) within the Ramsar site:

The Barombi Mbo Crater Lake falls within the Barombi Mbo Forest which is a Forest Reserve under Cameroon Law. Forest Reserves under Cameroon Law (Law No. 94-01 of 1994 to lay down Forestry and Wildlife Regulations) are permanent forests under the national forest estate and shall be used solely for forestry and or as wildlife habitat. Forest Reserves are state forests and as such, private property of the state. As is the case with all land in Cameroon, the Barombi Mbo Forest Reserve and the Lake is property of the Republic of Cameroon who may classify it for use in a manner it deems fit (Land Ordinance 1974)

- b) in the surrounding area:

The surrounding area of the site is occupied by the mountain evergreen forest and a bit far by another small crater lake. All these areas are permanent state's property although some local people do cultivate the land; thus destroying the forest.

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#### 25. Current land (including water) use:

- a) within the Ramsar site:

Currently, the land is mainly used by the Barombi People, who live in Barombi Mbo village or in the "Station" neighbourhood of Kumba. The use of the natural resources in and around Barombi Mbo is manifold.

Fishing is the major activity of many men of Barombi Village, who use gillnets, hooks and basket traps to catch mostly the two larger pelagic cichlids *Sarotherodon linnellii* and *S. caroli*, as well as the endemic catfish *Clarias maclareni*. Fishing intensity and methods vary

through seasons: In the rainy season, which is the prominent breeding season for the two target *Sarotherodon* species, fishing is more intense using both gill-nets (in the open water), as well as basket traps in the close inshore area. The unbaited basket traps catch mostly breeding *Sarotherodon*, which move inshore from the pelagic when breeding. The gillnets catch mostly non-breeding individuals of the same species. Baited hooks positioned in the deep water are used to catch *Clarias*, which, however, are found in the gillnet-catches, too. During the dry season, fewer people catch fish, since this is the major farming-season. However, several villagers maintain a high fishing activity. The main fishing methods in the dry season are gillnets in the open water, as well as unbaited small hooks set above the water surface in the inshore to catch *Barbus batesii*. The use of gillnets was reported during the 1950s or 1960's. The sustainability of the gillnet-fishing needs to be evaluated, since there are no reliable data on catches.

b) in the surroundings/catchment:

Farming for food- and cash-crops (mainly cocoa) is intense around the village, but is not neglected inside the crater rim, where it is often conducted by non-villagers, who are said to pay a certain amount of money to the villagers as rent.

Water is extracted in large quantities by SNEC (The National Water Company), who have constructed a water extracting pipe. With the ever growing population of Kumba, fears as to the sustainability of the lake as the source for pipe-borne water is getting worrisome.

Hunting inside the crater-rim appears to be low due to limited wildlife. Occasionally, traps are seen in the forest, as well as around the lake on stone or large fallen trees to hunt for fish-eagles.

The landing side ("Lusa") is used as a small market place for crops from Barombi village twice a week. In addition, incoming fishermen sell fresh fish from the lake daily at Lusa in the morning throughout the year.

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**26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:**

a) within the Ramsar site:

The Barombi Mbo crater lake system is affected by the following activities:

Over-fishing within the lake basin with the use of gill nets, hooks and basket traps. This activity may really reduce the fish diversity and species richness in the site, for no evaluation of the sustainability of especially gill-net fishing has been done.

b) in the surrounding area:

- Tree-extraction within the crater rim is carried out in an unsustainable manner, the same as tree-burning for clearing farm-land within the crater rim as well as within the catchment of the inflow.
- Pesticide spraying of cocoa-trees within the catchment area of the inflowing stream and within the crater rim, which may harm water quality as well as the health and consequently the health of fishes.
- Potential of introduction of foreign fish to the ecosystem. Alarmingly, a common non-indigenous aquaculture fish-species, *Oreochromis niloticus*, as well as an introduced ornamental fish-species, *Xiphophorus hellerii*, have been found recently in the Kumba-water inside Kumba town.

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**27. Conservation measures taken:**

a) List national and/or international category and legal status of protected areas, including boundary relationships with the Ramsar site:

In particular, if the site is partly or wholly a World Heritage Site and/or a UNESCO Biosphere Reserve, please give the names of the site under these designations.

NA

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate):

Ia ; Ib ; II ; III ; IV ; V ; VI

c) Does an officially approved management plan exist; and is it being implemented?:

No

d) Describe any other current management practices:

Apart from the fact that the Forest Reserve has maintained its legal status as an area, which legally prohibits felling of trees, no practical measures have been undertaken. However, reserving access to people of Barombi origin has reduced pressure on resources of the lake.

No management practice is applied to the site; thus the need for its protection.

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**28. Conservation measures proposed but not yet implemented:**

e.g. management plan in preparation; official proposal as a legally protected area, etc.

Schliewen (1996) and WWF-Cameroon Programme Office (1999 and 2002) suggested the following measures:

(1) Enforcement of the Forest Reserve Status of Barombi Mbo including enforcement of all laws already applicable to the Forest Reserve. Although the forest around the lake is officially protected, the enforcement of the law is apparently insufficient. In addition, a reclassification of the protection status may be considered.

(2) Enlargement of the protected area in order to manage negative influence of potential negative influx through the Toh Mbock catchment. Currently, the forest reserve boundaries do not take into account the protection of the watershed in the affluent.

(3) Environmental education for Barombi and Kumba People. Since both Kumba and Barombi People use the lake, and since there is (especially among the people from Kumba town) ignorance about the uniqueness of the lake, as well as about its value as a source of drinking water, environmental education may greatly raise this awareness.

(4) Regulation of fishing, since no data exists about the potential overexploitation due to a potentially increasing number of fishing people and fishing nets, as well as due to the use of low mesh-sizes.

(5) Regulation of water extraction, since Kumba is strongly dependent on the water quality of Barombi Mbo.

(6) Amendment of the Water Law of 1998 to protect important inland sources such as Lake Barombi Mbo.

(7) Imbibe the catchment approach in water management in the development of a national policy on water.

(8) Creation of a Barombi Mbo Lake and Forest Management Committee that is representative of all stakeholders.

An important step towards the conservation of the Barombi Mbo ecosystem would be a rapid assessment of adverse effects on the lake ecosystem, and an establishment of a management plan based on this rapid assessment. This management plan should be elaborated with a community participation component, and mechanisms to involve the private sector (SNEC has now been privatised) into sustainable financing of Lake management activities.

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**29. Current scientific research and facilities:**

e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

One scientific research project exists on the diversity, sympatric speciation, phylogeny and ecology of the endemic cichlid fishes of the lake. The project is conducted by U. Schliewen (Zoologische Staatssammlung München ZSM, Germany) and funded by the German Research Foundation (DFG) under the SCHL567/1-1. Based on a Memorandum of Understanding with WWF-Cameroon Programme Office, all results of this project shall be made available to WWF-Cameroon Programme Office for establishing a management plan for the lake. No research facilities are in place around the Lake.

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**30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:**

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

Apparently none apart from ongoing consultations among villagers and scientist working at the lake. As stated under section 28 it is envisaged to have environmental education for Barombi and Kumba People on the uniqueness of the lake and its value as a source of drinking water.

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**31. Current recreation and tourism:**

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

Visits by tourists are sporadic. These are usually people passing through Kumba. Local schools organise education tours for their students. No tourist infrastructure exists around the lake and plans to open a small refreshment structure have since been abandoned. Development of tourist infrastructure, which takes into account the potential of a daytime-tourism from Douala or Limbe, where more tourists pass through than through Kumba is envisaged.

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**32. Jurisdiction:**

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

Territorial Jurisdiction: The Ministry of the Environment and Forestry (MINEF), Yaounde, Cameroon

Functional Jurisdiction: The Directorate of Wildlife and Protected Areas (DFAP), MINEF, Yaounde, Republic of Cameroon

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**33. Management authority:**

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

The Divisional Delegation of the Environment and Forestry for Meme Division, Kumba,  
Meme Division, South West Province, Republic of Cameroon. Tel. +237 335 42 17

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#### 34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

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Schliwen UK (1996) Barombi Mbo: Summary of the background knowledge of the natural history of the lake and recommendations for conservation. Unpublished report to „Gesellschaft für technische Zusammenarbeit“ (gtz), 15 pages

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[WWW.WWF-List](#) of Ecoregions

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