Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7, as amended by Resolution VIII.13 of the Conference of the Contracting Parties.

Note 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. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Bureau. Compilers are strongly urged to provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of maps.

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

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DD MM YY

Designation date | Site Reference Number

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2. Date this sheet was completed/updated:

5th September 2005

3. Country:

Republic of Kenya

4. Name of the Ramsar site:

Lake Elmenteita

5. Map of site included: Yes

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

a) Hard copy (required for inclusion of site in the Ramsar List): *yes* √ -or- *no* □

Topographic map, Sheet Series Y503 sheet SA-37-1 Edition 4 SK of 1981. The boundaries of the Ramsar site have been delineated and mapped.

b) Digital (electronic) format (optional): *yes* √

6. Geographical coordinates (latitude/longitude):

The Ramsar Site stretches over 0^0 38' to 0^0 54' S and 36^0 29' to 36^0 16' E

7. General location:

Include in which part of the country and which large administrative region(s), and the location of the nearest large town.

The site is in the Kenya's southern parts of Rift Valley. The nearest administrative town is Gilgil within Nakuru District in Rift Valley Province. It is approximately 32 km from Nakuru Town and about 130 km north of the capital city Nairobi.

8. Elevation: (average and/or max. & min.)

Altitude: 1,775 – 1950 m

9. Area: (in hectares):

The lake and a terrestrial buffer zone are of total area 108.8 km^2 or 10,880 Ha. The lake itself fluctuates between 19 and 22 km^2.

10. Overview:

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

Lake Elmenteita is a shallow alkaline lake lying on the floor of Kenya's southern Rift Valley. It is located in a closed basin whose water budget is maintained by recharge from hot springs located on the southern lakeshore, two inflowing rivers, surface runoff, direct rainfall and evapo-transpiration. The lake's surface area is variable, but on average it is about 22 km^2 with a depth of about 2 m. The Lake is a part of a wider catchment basin where human population has been increasing rapidly in recent years. The high alkalinity, conductivity and other physical-chemical parameters limit its capacity to host many aquatic species. But the few aquatic species that have adapted to the lake's limnological conditions show high productivity. The blue green algae *Spirulina plantensis* and benthic algae are the main primary producers that support the lakes' food chain. Over the years, a fish species, *Oreochromis alcalicus grahami* has been introduced to the lake from Lake Nakuru, about 23 km to the west. This to a great extent has enhanced the population of piscivorous birds at the Lake. High rate of evapo-transpiration leaves behind white pellets of soda ash (sodium bicarbonate), which is mined by the local community as livestock mineral supplement.

11. Ramsar Criteria:

Circle or underline 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).

1 • 2 • 3 • 4 • 5 • 6 • 7 • 8

12. Justification for the application of each Criterion listed in 11. 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).

Criteria 1: *A wetland should be considered internationally important if it contains a representative, rare or unique example of a natural or near natural wetland type found within the natural biogeographic region.*

Lake Elmenteita is a unique saline shallow lake in the Kenya's southern Rift Valley. The surrounding landscape is characterized by dramatic rocky faults, volcanic outcrops and cones. It is one of the major flamingo Lakes in Kenya.

Criteria 2: *A wetland is considered internationally important if it supports vulnerable, endangered or critically endangered species or threatened ecological communities:*

Lake Elmenteita supports several species falling into different conservation categories as threatened, vulnerable and endangered at local, national, regional and international levels. These include, Lesser Flamingo (*Phoenicopterus minor)* and Greater Flamingo (*Phoenicopterus ruber roseus)* are both regionally and globally threatened mainly due to their habitat specificity. Given the anthropogenic impacts around the Lake, there is need for serious conservation efforts and listing the Lake as a Ramsar site would attract the much needed attention as the Lake is a major refuge for flamingos in Kenya's southern Rift Valley. Other threatened species found in the Lake are: (i) Great Crested Grebe

(*Podiceps cristatus*): - critically threatened in the eastern Africa region; (ii) Great White Pelican *Pelecanus onocrotalus*: - global restricted range and on the CMS Appendix I.; (iii) Great Egret (*Casmerodius albus*): (CITES APP. III); Maccoa Duck (*Oxyura maccoa*):- Proposed for CMS Appendix I listing

Criteria 3: *A wetland is considered internationally important if it supports populations of plant and/ or animal species important for maintaining the biological diversity of a particular biogeographic region.*
Lake Elementeita supports over 450 bird species that include approximately 80 waterfowl species, which at times include up to half million Lesser flamingos. The lake has a variety of fast growing single celled algae, large populations of diatoms and supports variable densities of blue green algae (*Spirulina platensis*) which is the main food for Lesser Flamingo. *Spirulina platensis* is the characteristic dominant phytoplankton found in the Rift Valley saline lakes and is a major primary producer. In addition the marsh areas of this wetland are characterized by salt resistant sedge, dominated by *Cyperus laevigatus* and Typha spp.
The Southern part of the Lake is dominated by lava flow, which has unique scrubland vegetation type that is characterised by *Olea sp.* The other parts infringing the lake are dominated by *Tarchonanthus camphorates* and *Acacia xanthophlea.* The different species of fauna and flora found in the site are shown in the attached appendix 1, 2, 3 and 4.

Criteria 4: *A wetland is considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.*
The western part of the lake is dominated by numerous islands of black lava, mostly bare but occasionally invaded by the grasses *Sporobolus spicatus* and *Chloris gayana.* In dry years, these islands are connected to the shore by stretches of mud flats and have been found to provide the only suitable nesting and breeding grounds for Great White Pelicans (*Pelecanus onocrotalus*) in the Rift Valley region. The grasslands especially those found in the western shores of the lake are breeding site for Blacksmith plover (*Vanellus armatus*), and the Lake acts as an important dispersal area for Lesser Flamingo (*Phoenicopterus minor*) when environmental conditions especially food resource base is limiting in other saline lakes like Nakuru and Bogoria. The lake regularly supports migrant waders such as Pied avocet (*Recurvirostra avosetta*) and Little stint (*Calidris alba*) and other migratory birds such as the Eurasian Marsh Harrier etc. on their stopover during migration. The Lake is a major staging site for Palaearctic migrants and over the years, significant populations of different migrant species including other major waterbird species in Kenya have been recorded at the site. Generally, the Lake and its environs is a true representative of a natural or near natural saline wetland type.

Criteria 5: *A wetland should be considered internationally important if it regularly supports 20,000 or more water birds.*
Over 450 species of birds have been identified, and biannual bird count records show that Lake Elmenteita regularly supports thousands water birds (see appendix 1). The average number of birds present at the site over the past five year of counts (2000-2004) is over 610.000. The Lake regularly hosts over 20,000 Lesser and Greater Flamingos at any given time of the year. In addition, the Lake is a major breeding site for two species of Pelicans (Great White and Pink-backed). The populations of Pelicans have over the recent years increased at the sites.

Criteria 6*: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of water bird.*
Lake Elmenteita supports over 1% of the East African Flamingo population, a population that has been estimated at about 1.5 million. The lake is one of the key distribution and foraging sites in eastern Africa. As regards the Lesser Flamingo (*Phoenicopterus minor*), for the last five years of counts (2000-2004), the population has exceeded the 1% threshold (average of 570,150 birds; 28.5%), as well as for the Greater Flamingo (*Phoenicopterus ruber roseus*) (average of 2,245 birds; 6.41%).

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13. 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:

The lake is representative of a natural or near natural saline wetland type found within the rift valley region of Kenya.

b) Biogeographic regionalisation scheme (include reference citation):

Its representative of the dispersal lakes for the flamingos and other waterbird species in Kenya

14. 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.

Geomorphology

Origin: Lake Elmenteita is a natural lake formed by the Rift Valley tectonic movements and is part of the formation of the Great Gregory Rift Valley in Kenya. Documented information show that some million years ago, a large lake covered the present area occupied by lakes Nakuru Elmenteita and Naivasha, which drained southwards towards Lake Naivasha. This was followed by drier conditions that left the three lakes.

Geology: Lake Elmenteita is situated in a high altitude depression of the Eastern portion of the Great Rift Valley in Kenya. The upper Pleistocene **Gamblian** sediments of the Elmenteita area are indicative of a larger lake and a wet episode in the history of the region when Lakes Nakuru, Elmenteita and Naivasha were one lake. The shallow closed basin is dominated by Tertiary and Quaternary pyroclastic and lacustrine deposits. The geology of the area consists of young volcanic and sedimentary rocks. To the south lies the "badlands", an area of young volcanic rocks including cones and flows of Holocene age. To the North are a number of slightly older volcanic rocks predominantly basalt lava. On the eastern side of the lake are a number fault scarps. There is also an extensive faulted area further east forming the edge of the Rift valley. The lake lies between two areas of diatomite, Kariandusi to the east and Kockum to the west. This gives evidence of the area having been a much bigger lake in the past. Saline flats covered with trona surround the modern lake. In most parts the existence of the Gilgil trachyte is evident. These are particularly widespread along the Gilgil escarpment, Soysambu estate and some parts of Mbaruk. The trachyte might also overly the Mbaruk basalt at several places. **McCall (1967)** suggests that Pliocene fissure eruptions may have resulted in the emission of the basaltic lavas, trachytes and phonolites in many places across the catchment.

Much of the southern and western sides of the lake is covered by what McCall terms "Elmenteita badlands" which form into basalt-cinder cones at various places the most distinguishable being the cone at the southern shores of the lake. Some very recent tuff cones can also be identified south of the Lake. Around Kariandusi area, diatomite forms layers separating the Gilgil trachyte to form the Kariandusi lacustrine sediments formed during lower or middle Pleistocene. This deposition is believed to have occurred within a larger basin of the joint ancient Nakuru-Elmenteita Lake.

Hydrology: Lake Elmenteita has no surface outlet or underground seepage for releasing its water to other aquifers. The lake water levels are maintained through ground recharge by hot springs found in the southern part of the lake and seepage to its south-east, Meroronyi, Mbaruk and Kariandusi river flows, direct rainfall and evapo-transpiration. The drainage basin, which has a dendrite pattern, can be divided into four minor watersheds namely: Mbaruk, Chamuka, Kariandusi and Mbaruk-Chamuka. Mbaruk watershed is the largest and wettest while Kariandusi is the driest. Both Chamuka and Kariandusi manifest geothermal activities. The major tributaries of Mbaruk watershed include Bonde, Rutara, Gichure, Ndunduri and Weruini. Tributaries for Chamuka watershed include Ndiri-ini, Nyaituga, Kanjiuri and Kiringa. The Mbaruk-Chamuka watershed represents the main flow into the lake through both Mbaruk and Chamuka which converge about 1.5 km from the lakeshore. The Kariandusi watershed extends

from the upper areas of Gitare and Northern Gilgil, into the mid lowland and lowland zones of Kariandusi and Elmenteita. Major tributaries include Kabugi, Gitare, Kekopey and Mai-Mahiu. These are relatively small streams, which are ephemeral in nature.

Soil types and Chemistry: Primarily the soils are of volcanic origin and tend to be friable, well drained and in some instances shallow. Those on the central plains are mainly derived from lacustrine deposits and volcanic ashes. Having developed on sediments, the soils are grey, deep, poorly drained and slightly calcareous to saline in nature. On the more open grassland plains are soils derived from pumice beds and ashes from recent volcanoes and appear to be well drained friable loams to sandy clay loam that support the bulk of grazing land around the lake. Rocks that compose the cliffs and rock outcrops are of basaltic formation.

Stream basal materials in the area indicate higher proportions of fine sediments and silt except around Mbaruk railway station where clay is abundant. The middle watershed areas are relatively rocky, particularly across Kasambara and Kiringa where the proportion of sand and gravel in stream basal material is much higher. Upper catchment areas are relatively non-rocky and unlike the rest of the basin are characterized by more detritus silts with small quantities of clay. The Mbaruk-Chamuka watershed soils have sand, silt and gravel constituting the dominant stream basal materials. Stream basal material of the Kariandusi consists of sand, gravel and diatomaceous earth.

The lake bottom is filled with weathered material from the catchment area. The soil type is mainly sandy alluvial, of volcanic origin as evident by soda ash and fine sandy/loam soils on the lake bottom and its immediate surrounding areas. The soil in most areas is highly permeable and very little surface runoff is noticeable after rains; soils vary considerably within the basin from light grey dusty soils (Andosols) on the flat plains around lake Elmenteita, which have developed on the diatomaceous silts of this part to gravel at deposition sites.

Tidal variations: None- due to the shallow depth the lake. There are no tidal variations

Climate: There is considerable variation in climate within the Lake Elmenteita catchment basin depending on altitude and topography. The climate ranges from cold, hot and humid to arid and semi-arid climatic conditions characteristic of areas within the Rift Valley. Maximum and minimum recorded temperatures are 33^0C and 12^0C respectively.

The area falls under agro-climatic zone V. Records in the area indicate a mean annual precipitation of between 600 to 700mm (Soysambu, Nderit and Winston estate, Kekopey ranch, Lanet police station and Chokora farm near Mbaruk). Rainfall is bimodal with the long-rains in April to June and the short rains between October to November. The short rains are less pronounced and the area is reported to be under the influence of the Congo monsoons from the south which cause some light rains during the months of June and July (Ojany and Ogendo, 1973).

The lake ecosystem is situated on an extensive, dry semi arid belt of the Rift Valley extending from Mbaruk to the north and Kedong valley in the south (Agro ecological Zone V), with annual mean temperatures ranging between 18.5^0 and 19.8^0 C. Average evaporation records for Ol joro orok indicate a mean evaporation of about 1380 mm/yr.

Evaporation, Radiation and Temperature: Evaporation, radiation and temperature have annual means of 1,800 mm, 490 Langlays and 27^0C respectively. The three parameters have their peaks centered around January and September and minimum around April and July. Wind speeds are high especially in dry seasons in March and August causing whirlwinds in the low-lying areas.

Water quality, depth and permanence: The lake water balance is maintained by rainfall, stream flows, underground recharge, evaporation and evapo-transpiration. The lake pH ranges between 9.6 at the hot springs and 10.4 in the main lake. The lake experiences periodic fluctuations in size between 19 and 22 km^2. Lake Elmenteita is the third smallest Rift Valley Lake in Kenya in a chain of saline lakes lying on the floor of the Kenyan-Tanzanian Rift Valley. The Lake depth ranges between 3.7m and 0.9 m. Water temperature in the lake manifests remarkable monthly

variation generally ranging between 17^0 C and 22^o C and 40^0C in the southern hot springs. The western part of the lake is dominated by numerous islands of black lava, mostly bare but occasionally invaded by grasses *Sporobolus spicatus* and *Chloris gayana.* In dry years, these islands are connected to the shore by stretches of mud flat.

The lake manifests geothermal activity in the form of warm springs at the southern end. These lakebed springs have diameters ranging between 0.2 and 0.3 m and are continuously ejecting warm water at approximately 30-40^0 C. At high water levels, these springs are well covered by water.. The table below summarizes the lake water quality characteristics.

Parameter	**Value**
pH	10.3
Temperature	8^0C-32^0C
Conductivity at 20^0C	6,500 – 165,000*us*cm^{-1}
Secchi depth	0.4m
Dissolved Oxygen	5-28mgl^{-1}
Alkalinity	5,000 – 90,000 mgl^{-1} $CaCO_3$
Ionic composition	96.4%Na^+, 84% HCO_3- and CO_3^{--}
Water permanency & depth	Permanent, with varying water depth depending on season, Maximum depth 3.7m

PH remains constant at around 10.4 due to the buffering effect of sodium, carbonate and hydrogen carbonate (Na^+, $CO_3^{2-}$and HCO_3^-). The pH and conductivity values create the optimum conditions for blue green algal primary productivity and a consumer-producer biomass of about 500gm^{-2} dry weight. The Lake has a small thermocline, which is broken by strong winds in the afternoon leading to complete mixing of the water body almost on a daily basis. Water mixing causes nutrient cycling, which is important to the aquatic organisms.

15. Physical features of the catchment area:

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

Catchment: Lake Elmenteita catchment (area 500km^2) is defined by the Eburru range and forest to the South, plains to the west, Ndundori highlands to the north and the Aberdare escarpment to the East. The drainage basin, which has a largely dendrite pattern, can be divided into four minor watersheds Mbaruk, Chamuka, Kariandusi and Mbaruk-Chamuka. Mbaruk watershed is the largest and wettest while Kariandusi is the driest. Both Chamuka and Kariandusi manifest geothermal activities. The major tributaries of Mbaruk watershed include Bonde, Rutara, Gichure, Ndunduri and Weruini. Tributaries for Chamuka watershed include Ndiri-ini, Nyaituga, Kanjiuri and Kiringa. The Mbaruk-Chamuka watershed represents the flow into the lake of both Mbaruk and Chamuka after converging about 1.5 km from the lakeshore. The Kariandusi watershed extends from the upper areas of Gitare and Northern Gilgil, into the mid lowland and lowland zones of Kariandusi and Elmenteita. Major tributaries include Kabugi, Gitare, Kekopey and Mai-Mahiu. These are relatively small streams, which are ephemeral in nature. This catchment is under various land use practices which include mining, agriculture, ranching, forestry conservation, urbanization, transportation and settlement among others. Part of the lake's environs is protected and part is a private wildlife sanctuary. Private ranches, including the Soysambu Wildlife Sanctuary, cover about 75% of the shoreline. This portion is generally well protected. Overgrazing on the ranchland during periods of drought, particularly in the south-eastern sector accelerates erosion after heavy rains.

16. Hydrological values:

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

Lake Elmenteita is a closed basin with considerable underground water recharge; however sediments from the catchment accumulate in the lake. The lake does not recharge any underground aquifer nor stabilize any shore.

17. 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.

1. Q; 2. Sp; 3. R; 4. Y; 5. N; 6. Ss

18. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site.

The Lake is in an environment of extremes, with variations in humidity, water temperature, rainfall and water levels. The water chemistry makes the Lake habitable to very few organisms including diatoms, zooplanktons, phytoplankton and various waterbird species. Diatoms and other algae that bloom occasionally form substantial amount of total biomass. The main primary producer of the open water zone is the blue-green algae *Spirulina platensis* that constitutes 95% of the algal population. Primary consumers vary from microscopic zooplanktons to the flamingo. The most important zooplankton is the Copepod *Lavenula africana* though rotifers such as *Brachinous dimidiatus* and *B plicatilis* occasionally become dominant. The lesser flamingo is the major primary consumer of *Spirulina platensis*.

The Southern, southeastern and western shores are characterized by a swamp of deep, soft mud kept moist by springs and seepage along the lakeside. Sedges and rushes grow here and provide shelter for a variety of waterfowl. The rushes are mostly confined to areas of relatively fresh water while the sedges tolerate more soda. Various waders especially the migrants sift through the mud for small insects. The springs and their associated wetlands are important bottleneck habitats for waterfowl as source for fresh water. They are a source of drinking water for birds, bath place for soda-encrusted birds to wash their plumage and drinking place for livestock. Lake Elmenteita provides seasonal habitat to both the lesser and greater Flamingo, which exhibit high nomadism within the Rift Valley saline lakes in East Africa and elsewhere into central and southern Africa in search of lakes with the preferred ecological conditions for feeding, display and breeding. Grasslands surrounding the lake are dominated by *Cynodon dactylon, Themeda triandra, Chloris gayana,* among others, and scattered shrubs. The Yellow Fever Tree (*Acacia xanthophloea*) is the dominant terrestrial tree species and forms the woodland in some parts of the shoreline, an important habitat for birds. Most of the lake's riparian land is still intact with minimal human manipulation. Other forms of land use influencing the ecological character include livestock production and tourism.

19. Noteworthy flora:

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. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Vegetation in the Elmenteita drainage basin consists of upland forest, woodland, bush land and grassland, however in the recent years, much of the natural forest and woodlands has either been removed or modified into shrubs and bush land through cultivation, grazing and fires. Vegetation around the lake is sparse and can be categorized into five major vegetation zones as follows:

- **(i)** The woodlands are concentrated around the mouth of rivers with *Acacia xanthophloea*, as the dominant tree species rising up to 25 meters high with clear vertical stratification. Below the upper canopy are various climbers including *Senecio petitianus, Commicarpus pedunculosus* and *Ipomea cairica*. The herbaceous layer is dominated by *Acyranthus aspera, Hypoestes verticillaris, Conyza foribunda, Solanum incanum, Urtrica maasaica Gutenbergia cordifolia.* Grasses of the ground layer include *Cynodon dactylon, Pennisetum clandestinum* and *Panicum* spp. among others.
- **(ii)** Dry bush land covering parts of the eastern, southern and western of the lake where dominant tree species include *Acacia xanthophloea* and *Eurphobia candelabrum*. Bush species include *Rhus natalensis, Sesbania sesban, Lantana trifolia* and *Vernonia* spp. The grasses include *Cynodon dactylon, Chloris gayana* and Panicum spp.
- **(iii)** The grasslands can be categorized into two groups: (a) Lakeside grasslands dominated by *Sporobolus spicatus* and *Chloris gayana; (b)* Other grasslands, dominated by *Themeda triandra, Sporobolus fibriatus, Eragrostis spp., Punnisetum catabasis and Cynodon dactylon*
- **(iv)** The Marshes located in the southern part of the lake, dominated by *Cyperus laevigatus* and *Typha* spp. Otutu scrubland is located south of the lake is dominated by *Olea* sp. and *Tarchonanthus camphronatus*.
- **(v)** *Cyperus* dominates the plant-water ecotone, especially around areas of seepage and maintains the ecological character of the lake, through provision of non-saline water that is important for bird soda bathing. *Acacia xanthophloea*, the yellow-barked tree is the most characteristic feature of areas of high water table. It also forms an important habitat for the African fish eagle, the grey-crested helmet-shrike and other birds.

20. 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.*

The lake provides seasonal habitats for both lesser and greater flamingo characteristic of the saline lakes. The lake also harbours several other bird species, notably Marabou Storks *Leptoptilos crumeniferus* and the Grey-headed Gulls *Larus cirrhocephalus.* The lake ecosystem has small populations of migratory Zebras *Equus burchelli,* Thomson's Gazelles *Gazella thomsoni* and Giraffes *Giraffa camelopardalis*. Other animals common around the lake include hyenas and Dik dik *Rhynochotrogus kirkii.* Most of these animals are concentrated around the northern woodlands where human influence is minimal. Other noteworthy fauna include

i. African fish eagle (*Haliaeetus vocifer*) is another characteristic species of Lake Elmenteita, but its population is low.

ii. Pied kingfisher (*Ceryle rudis*). It is the only species of Kingfisher that feeds by fishing from the hover rather than always from a perch.

iii. Grey-crested helmet shrike (*Prionops poliolophus*). Globally threatened. Its habitat is almost exclusively the acacia woodland within the site.

21. Social and 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.

Lake Elmenteita site is very important for socio-cultural values. The Kariandusi prehistoric site and the early man caves found within the site are rich in archeology. These sites present a very comprehensive account of the early man's humanity, and today the area is rich in cultural values. These attributes form an important tourist attraction.

Biodiversity conservation and tourism: Most of the riparian land on the site is reserved for biodiversity conservation, and is an important feeding and breeding area for wildlife and birds. Tourism and recreational facilities in the site are an important foreign exchange earner and employer. There is a tourist class hotel, campsites, existing and proposed wildlife sanctuaries.

Water supply. People living in the proposed Ramsar site depend on the hot springs around Chamka for domestic freshwater supply, livestock watering and subsistence irrigation.

Education and scientific research: The lake and its catchment have continued to attract individuals and institutions for scientific research because of its rich biodiversity in a semi-arid area surrounding a saline lake. There are many local and foreign researchers and students who have studied various aspects of the lake and there is also an increasing interest in the Site by school and youth groups.

Pastoral livestock: For years the nomadic Maasai herdsmen have brought their livestock to the site for grazing and salt licking.

22. Land tenure/ownership:

(a) Within the Ramsar site:

The lake and the adjoining riparian land is state owned, but is under the custody of various landowners whose land is continuum with the lake.

(b) In the surrounding area:

The surrounding area is privately owned, with a few forest pockets that are state owned.

23. Current land (including water) use:

(a) Within the Ramsar site:

Principal human activities in the proposed Ramsar Site

Commercial and small-scale livestock production: Part of the site is used by the local community for small-scale and large-scale farmers for livestock watering and grazing.

Biodiversity conservation: Lake Elmenteita and the surrounding area are important for biodiversity conservation. Most of the riparian land around the lake is preserved for biodiversity conservation and is used as wildlife habitat. Two private landowners in the site have established wildlife sanctuaries.

Tourism: Tourism in the site at the moment is not well developed but is growing and tourism activities include bird watching, game viewing, horse riding, scenic viewing (Lake, Great Rift Valley and Prehistoric site), camping, guided tours and sale of handicrafts. The tourism facilities include Lake Elmenteita Lodge, Flamingo Camp, Delemare tented camp and the observation point managed by Lake Elmenteita Ecotourism Community Organization (LECCO). On development tourism is expected to bring benefits to the local community, who will in turn appreciate nature and become more involved in biodiversity and landscape conservation.

Mining: Mining activities in the plan area involve extraction of sand, salt and diatomite. There is minimal manual surface stone crushing. Sand for building is extracted at the old lakebed in the southern part of the lake for local use. The local community scoop salt from the lakeside evaporation pans along the lakeshore for both local and commercial use. The East African Diatomite Company undertakes diatomite mining at Kariandusi.

(b) In the surroundings/catchment:

Principal human activities in the surroundings and catchment

Small-scale agriculture: Subsistence agriculture is the main activity. Major crops grown include maize, beans, sweet and irish potatoes, peas, oranges, cassava, paw paws, bananas, ground nuts, millet, onions, vegetables and yams. Farm holdings vary in size, those at viewpoint, Kasarani and Kericho, ranging from 1 to 2 hectares and those at Kekopey area ranging between 5 to 15 hectares. Crop failure is frequent in the plan area due to unreliable rainfall. Much of the food is consumed locally and the surplus sold in the surrounding towns like Gilgil, Nakuru and Nairobi.

Livestock production: There are three forms of livestock husbandry in the area. These are:

- **(i)** Small-scale livestock husbandry involving keeping of a few cattle, sheep, goats, and sometimes donkey.
- **(ii)** Pastoralism practiced by neighbouring pastoral community who keep cattle, sheep, goats, and donkeys.
- **(iii)** Ranching is practiced in the large-scale farms where beef cattle for local consumption and export are reared.

Livestock rearing is a major occupation in the area. In most places, this is combined with small-scale cultivation. However, some farms across Ngorika notably Waiyaki, Mahihu and Kiringa specialize in large-scale dairy farming and maize is mainly grown as a fodder crop. Milk production is high around this area, much of which is sent for processing at the local dairy plants. Ranching is restricted to the drier belts around the lake (Soysambu, Kekopey and Nderit estates) where rearing of beef cattle is a prominent undertaking. Pastoralism is common around the southern fringes of Lake Elmenteita, which constitute dry season grazing for the Maasai who are assured of watering points along the Kariandusi quasi-delta zone.

Settlements: There are two forms of settlement in the plan area, rural and urban. Rural settlements are found moderately scattered within the individual land holdings. Urban settlements are found along the Nairobi-Nakuru highway and Nakuru-Elmenteita-Kiamboko road. The urban settlements are clustered, poorly planned with inadequate social amenities and are mainly trading centers. The urban centers are restricted to a few market points like Kekopey, Ndunduri, Ngorika, Kanjiuri and Lanet where a variety of commercial activities take place. Ndunduri, the largest of these, is traversed almost in the middle by Bonde River, a tributary of Mbaruk. The level of urban effluent disposal into the stream is noticeable, particularly in the absence of any kind of sewage treatment. The population of the center is increasing and a number of small-scale industries mostly involved with saw milling are emerging. Other industries include sand mining, salt mining (lake shore) and telecommunications industry (Gilgil), The diatomite mines at Kariandusi exploit ancient diatomaceous earths. Currently, the factory is bringing in its raw material from diatomite deposits located to the west of Lake Elmenteita within Soysambu estate. Gilgil is a major town and trading center and is the central administrative headquarters of the area.

Conservation: There is wildlife conservation at Delamere farm (game ranching), lake Elmenteita and the proposed Otutu community sanctuary. The Kariandusi pre-historic site is a cultural conservation area. However there is no formal conservation status for the site, which is also being proposed as man and biosphere site.

Forestry: In recent years, much of the natural forest and woodlands has either been removed or modified into shrubs and bush-land by cultivation, grazing and fires. However, there are remnant patches of forests at Otutu, Kariandusi hot springs and the Acacia stand at the southern end of the lake. Forest plantations are found in Eburru and Bahati. There are large tracts of state land preserved as both natural and plantation forests, particularly within the Aberdare Forest block and Bahati Forest. Farm forestry is practiced in the small-scale farms. Other forests in the catchment of

the lake are found on Eburru mountain range, Mau and Aberdare forest. These two areas form a very important water catchment area for the lake groundwater flows.

24. 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:

Principal human activities in the Ramsar Site

Tourism. It is expected that as the tourism industry grows there will be an increase in anthropogenic impacts on the lake, however land use plans are expected to regulate human activities. There is also a national land use policy being developed to regulate and control land use practices through zonation and other appropriate actions.

Mining: Sand and salt harvesting is a frequent activity among the residents of the area, who do not have any mining guidelines in place. Generally mining is on low scale with minimal impacts. The proposed integrated management plan will ensure sustainable mining activities within the area.

(b) In the surrounding area:

Principal human activities in the surroundings and catchment

Small-scale agriculture: In absence of land use plan, it is expected that farming activities in the area will impact negatively on the lake. Communication, education, public awareness and extension services on sustainable farming strategies will be enhanced.

Livestock production: This activity is compatible with biodiversity conservation and landscape management since the ecosystem is generally maintained in its natural form. Precaution must however be taken to avoid overstocking and the consequent overgrazing, soil erosion, siltation and sedimentation.

Urban developments and settlements: there are a number of townships (including Elmenteita, Gilgil and Kasarani) and other smaller trading/residential centers. At the moment no development plans exist for these centers and the potential is there for environmental degradation. It is expected that the Environmental Conservation and Management Act (EMCA, 2000) will regulate urban development in the area. The Physical Planning Act will be applied to ensure proper urban planning and development in these centres.

25. Conservation measures taken:

List national category and legal status of protected areas, including boundary relationships with the Ramsar site; management practices; whether an officially approved management plan exists and whether it is being implemented including any boundary changes which have been made: management practices; whether an officially approved management plan exists and whether it has been implemented)

Wetlands in Kenya including Lake Elmenteita are either on state lands or trust land vested in the local authorities on behalf of the local communities. The local community with support from Kenya Wildlife Service has been conserving and managing the site. The main stakeholders of the land continuum with the lake shore include Agricultural Holdings, Elmenteita Lodge and the Delemare Estates. These have mobilised the other local communities to establish a community wildlife sanctuary around the lake. The local community under an overall objective of environmental conservation has formed various conservation committees, and has established the Greater Lake Elmenteita Conservation Area as a community sanctuary and Lake Elmenteita Community Eco-tourism project. All these are in an effort to undertake conservation measures for sustainable socio-economic development around the site. The following are conservation measures taken-

(i) Preservation of the riparian (shoreline) strip as a critical habitat (ongoing)

(ii) Monitoring important environmental indicators (water quality, biodiversity, landuse and weather) by Kenya Wildlife Service, University of Nairobi, National Museums of Kenya and EarthWatch Projects.

(iii) Forest conservation (ongoing). Community vigil groups have been formed to ensure several forests within the Ramsar Site are protected and to undertake on farm forestry, where several tree nurseries have been established. Continued conservation of these forests will ensure sustainable ground recharge for the lake and water supply to the local community. Enforcement of the Forest Protection and Conservation Act, Water Conservation and development Act and Environmental Conservation and Management and Co-ordination Act (EMCA) in these forest areas is crucial for the maintenance of the hydrological regime that is essential for the lake's sustainability.

(iv) Implementation of the Environmental Conservation and Management and Co-ordination Act (EMCA 1999) within the site, in particular the requirement for community involvement in environmental conservation. This Act coordinates and harmonizes environmental conservation in the country.

(v) Communication, Public Education and Awareness (CEPA) programmes by several agencies including Kenya Wildlife Service, Delemere Estates and Friends of Lake Nakuru and Elmenteita.

(vi) Community proposals to establish a Community wildlife sanctuary, and dual listing of the site as a Ramsar and World Heritage sites.

26. Conservation measures proposed but not yet implemented: e.g. management plan in preparation; official proposal as a legally protected area, etc.

(i) Regulate upstream water abstraction by undertaking monitoring programme to establish how much can be abstracted from the lake Feeder Rivers and aquifers.

(ii) Promoting sustainable tourism (eco-tourism) development in the entire catchment

(iii) Linking conservation of the area to conservation practices in other conservation areas like the Rift Valley Saline lakes programme, Aberdare Forest and Eburru catchments.

(iv) Finalizing the integrated management plan for the area, where a draft IMP has already been developed.

(v) Gazetting the area under formal protection (Community conservation area)

(vi) Gazettement of the area conservation committee and supporting capacity building of the communities and other institutions responsible for the management of the site.

(vii) Implementation of the National Land use policy, Environmental standards, and Sustainable development principles in the area.

27. Current scientific research and facilities: e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

(i) Water quality monitoring to establish trends in water quality and phytoplankton dynamics

(ii) Biannual water fowl counts

(iii) Cause of Interlake flamingo movements

(iv) Ecological linkages between the lake and its catchment

(v) Ecological linkages between the lake and other water bodies in the region.

(vi) Land use practices within the catchment

A new field research station has been built at Delemere estate to complement the research stations in Lakes Nakuru National park and Lake Naivasha. There are also regular field research activities being conducted by other research institutions such as the University of Nairobi, Egerton University and EarthWatch Institute under Darwin Initiative.

28. Current conservation education: e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

(i) Visitor Center - The Karindusi pre-historic site is used for educating groups on the significance and archeological potential of the area. The facility is not well equipped for education purposes. In addition to this Delamare Estates have developed a research and an education center at Soysambu.

(ii) There are two education centers located at Naivasha i.e. Elsemare educational trust and Kenya Wildlife Training Institute (KWSTI).

(iii) Also nearby are two education centers located within Lake Nakuru national Park i.e. Lake Nakuru Education Center owned and managed by KWS and Education centre owned and managed by the Wildlife Clubs of Kenya.

(iv) Birds observation hides- few hides are in place on the Soysambu shores of the lake, which are used for bird watching.

(v) Lake Elmenteita lodge has accommodation facilities

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

The wetland is a very important recreation and tourism area and is popular for local tourists, though the frequency of visitation has not been documented and cannot be compared to other tourist destinations like Nakuru. It is popular with the bird watchers. The scenic beauty of the Site and its biodiversity, particularly waterfowls, are a big attraction to domestic and foreign tourists. Tourist facilities include:

Campsites.; Picnic sites; Hotels; Bird watching; Scenic beauty; Safari walks; Horse riding; Nature trail walking.

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

(i) **Territorial jurisdiction.** The Government of Kenya has overall jurisdiction over Lake Elmenteita and its riparian land. Regionally, the provincial administration (the District Commissioner, Nakuru District and his local representative, the Divisional Officer-Gilgil Sub-District) represents the government. Environmental issues in the country are under the Ministry of Environment and Natural Resources, the National Environment Management Authority (NEMA). KWS is responsible for the management of Ramsar sites in collaboration with the local communities and other stakeholders.

(ii) **Functional jurisdiction.** There is no one single government agency with overall jurisdiction over the area. A number of government departments are in charge of implementing their sectoral issues: Kenya Wildlife Service (Ramsar, wildlife), Water, Agriculture, and Forest Departments. The local authority- The Nakuru County Council also has some jurisdiction over the area. The local community who own land continuum with the lake shore manages the site with technical support from various Government Departments, particularly KWS.

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31. 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.

Secretariat
Anderson Koyo, Wetlands Advisor
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A local CBO has been formed and will be responsible for the day to day management of the site after appropriate capacity building.

32. Bibliographical references:

scientific/technical references only. If biogeographic regionalisation scheme applied (see 13 above), list full reference citation for the scheme.

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