

# 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:

The Director, Department of Environmental Affairs  
Ministry of Environment, Wildlife and Tourism,  
Private Bag 0068,  
Gaborone, Botswana.  
Telephone (+267) 3902050 Telefax (+267) 3902051

FOR OFFICE USE ONLY.

DD MM YY

--	--	--

Designation date

--	--	--	--	--	--

Site Reference Number

Email: [envirobotswana@gov.bw](mailto:envirobotswana@gov.bw)  
Web: [www.envirobotswana.gov.bw](http://www.envirobotswana.gov.bw)

---

2. Date this sheet was completed/updated:  
20. 12. 2006

---

3. Country:  
Botswana

---

4. Name of the Ramsar site:  
The Okavango Delta System

---

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

---

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.

**Justification for restrictions in the site boundary and area:**

The Okavango Delta Ramsar site boundary and area have changed. The boundary has been delineated more accurately and therefore this led to more accurate measurement of the area. This led to a reduction in the site area which was a result of rationalisation of the site rather than deliberate reduction of the site as per **Ramsar COP8 Resolution VIII.21, article 9 (a)**.

The site was originally proposed to the Ramsar Bureau by the Government of Botswana's Ramsar coordinator, the Department of Environmental Affairs. The original area submitted to the Ramsar Bureau was a simple rectangular area around the Delta itself and lay between coordinates 021° 45' & 23° 53' east and 18° 15' & 20°45' south making it the largest declared Ramsar site in the world.

The government of Botswana recently concluded the development of an integrated management plan for the Okavango Delta, called the Okavango Delta Management Plan (ODMP), which has a six year planning horizon commencing in November 2006 and aims at sustainable use and management of the Okavango Delta resources. During the development of the ODMP, the boundary was revised through a process of consultation with a number of stakeholders, including communities, fishermen, the tourism business and most especially its project partners, to rationalise the existing Ramsar boundary in relation to ecological, geological, geographical, hydrological and socio-economic factors. In response to the comments received and discussions held, a revised boundary has been developed and agreed upon and is being used as the official site boundary. The area of the surface enclosed by the new boundary is 5,537,400 ha, some 1,326,600 ha smaller than the original site surface area which was 6,864,000 ha.

**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:**

There have been no major ecological changes to the Okavango Delta system.

**7. Map of site:**

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

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

- i) **hard copy** (required for inclusion of site in the Ramsar List): *yes*
- ii) **digital (electronic) format** (optional): *yes*  -or- *no*
- iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables**

**b) Describe briefly the type of boundary delineation applied:**

The site boundary follows administrative boundaries of Controlled Hunting Areas (CHAs). Ngamiland District where the Okavango Delta Ramsar site (ODRS) falls has been divided into numerous CHAs which are used for management of wildlife, the boundaries of these areas have been used to form part of the site boundary. In the north the site follows the international boundary between Botswana and Namibia while the boundary in the east follows the District boundary with Chobe District and Central District. In the south it follows the boundary of cattle ranches called Hyena Veldt.

**8. Geographical coordinates (latitude/longitude):**

The Okavango Delta Ramsar site is irregularly shaped and the following coordinates approximate the site coordinates. The coordinates are numbered in the following order: NE, E, S, SW, W, NW, N. The approximate center of this site lies at **19° 17' S 22° 54' E**, within the Moremi Game Reserve.

**Table 1: Geographical coordinates of some points showing the location of the Okavango Delta**

POINTS	NAME	COORDINATES	
1	Selinda Spilway	23° 36' E	18° 30" S
2	Linyanti tip	23° 52' E	18° 16' S
3	Mababe 1	23° 53' E	19° 00' S
4	Mababe 2	24° 31' E	19° 00' S
5	Mababe 3	24° 31' E	19° 19' S
6	Mababe 4	23° 52' E	19° 19' S
7	Makalamabedi south corner	23° 49' E	20° 25' S
8	Makalamabedi south west corner	23° 45' E	20° 15' S
9	Komana 1	23° 18' E	20° 15' S
10	Komana 2	23° 09' E	20° 20' S
11	Komana 3	23° 04' E	20° 25' S
12	Toteng/Bothatogo corner	22° 55' E	20° 27' S
13	Bodibeng area corner	22° 45' E	20° 38' S
14	South West corner down 1	22° 00' E	20° 41' S
15	South west corner up 2	22° 00' E	20° 28' S
16	West in-curve	22° 01' E	19° 11' S
17	Tsodilo 1	21° 58' E	18° 48' S
18	Tsodilo 2	21° 42' E	18° 47' S
19	Tsodilo 3	21° 39' E	18° 40' S
20	Tsodilo 4	21° 42' E	18° 38' S
21	Shakawe corner	21° 45' E	18° 22' S
22	Mohembo corner	21° 42' E	18° 16' S
23	Caprivi	23° 05' E	18° 00' S
24	Kwando 1	23° 18' E	18° 00' S
25	Kwando 2	23° 24' E	18° 12' S
26	Ramsar Site Centre	22° 54' E	19° 17' S

**9. General location:**

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

The Okavango Delta Ramsar site is situated in the north western part of Botswana in the Ngamiland District (annex 1). It encompasses the Okavango Delta, Tsodilo Hills, the Kwando-Linyanti River system and Lake Ngami. The Okavango System enters Botswana from Angola and Namibia through the Okavango River and the Kwando/Linyanti River Systems (see map for the location of the Ramsar site within the Country). The town of Maun which has a population of about 44000 people is the major town in the area and is considered the tourist capital of Botswana. Gaborone, the capital city of the country, lies 960 kilometres south east of the Delta.

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

Generally between a minimum of 930 m and maximum of 1000m above sea level

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

Approximately 55 374 km<sup>2</sup> (5 537 400 hectares)

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

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

Three main features characterise the region, the Okavango, the Kwando and Linyanti River System connected to the Okavango through the Selinda spillway and the intervening and surrounding dry land areas. These features are located within the Okavango rift, a geological structure subject to tectonics control and infilled with Kalahari Group sediments, primarily sand, up to 300 metres thick. The Delta is the most important of the above-mentioned features. It is an inland delta in a semi – arid region in which inflow fluctuations result in large fluctuations in flooded area (10,000 – 16,000 km<sup>2</sup>), which is comprised of permanent swamp, seasonal swamp and intermittently flooded areas. Similar flooding takes place in the Kwando/Linyanti river system. This leads to high seasonal concentrations of birdlife and wildlife, giving the area very high tourism potential.

**13. 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 • 9

**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**

The area described is a unique inland wetland providing a haven for many endangered species of flora and fauna. The multiplicity of habitats between the extremes of perennial swamp and semi–arid scrubland allows a substantial biodiversity among all life forms to compensate for the vagaries of a mainly dry, low–rainfall, drought–prone and very variable

climate. It is this juxtaposition of these contrasting landscapes and waterscapes, with their attendant biota in a wilderness setting, which provides the appeal for tourism as well as the rationale for the inclusion in the Ramsar List.

**Criterion 2:**

A total of 20 plant species occurring within the ODRS have been selected for Red List status using recognized IUCN Red Data List criteria (ODMP – Assessment of occurrence and distribution of threatened and endangered plant species in the Okavango Delta, 2006. Of these 20 species, 7 are listed as THREATENED, i.e. at ‘very high’ to ‘extremely’ high risk of going extinct in the wild at local level in the Southern African Plants Red Data List. For example:

- *Zeuxine Africana* is considered CRITICALLY ENDANGERED.
- *Eulophia angolensis* and *Habenaria pasmithii* are thought to be ENDANGERED
- *Acacia hebeclada subsp. chobiensis*, *Aldrovanda vesiculosa*, *Eragrostis subglandulosa* and *Erlangea remifolia* qualify for VULNERABLE status,

In addition the following species are present: *Ansellia africana* (CITES App. II), wild dog (*Lycaon pictus*, EN) Sitatunga (*Tragelaphus spekeii*, CITES App. III), elephant (*Loxodonta africana*, VU), red lechwe (*Kobus leche*, CITES App. II), Hippopotamus (*Hippopotamus amphibius*, VU), lion (*Panthera leo*, VU), leopard (*Panthera pardus*, CITES App. I), cheetah (*Acinonyx jubatus*, VU) and *Damaliscus lunatus* (CITES App. III).

Some globally threatened water bird species resident in the Okavango Delta include: the Wattled Crane (*Grus carunculatus*, VU) and the Slaty Egret (*Egretta vinaceigula*, VU), the endangered Lesser Kestrel (*Falco naumanni*), Corncrake (*Crex crex*) and the Black-winged Pratincole (*Glareola nordmanni*), (Fishpool and Evans, 2001).

The permanent swamps or areas of perennial water provide habitats for three species of aquatic or semi-aquatic large mammals all of which fall under the IUCN Red List:

Hippopotamus     *Hippopotamus amphibius* (VU)  
 Sitatunga         *Tragelaphus spekeii*  
 Red lechwe        *Kobus leche*

**Criterion 3:**

The Okavango Delta is located in the Zambesian Phytochoria which is one of 16 such areas in Africa defined as having more than 50% endemic plant species and more than 1000 such species in total. This area predominantly includes the Okavango and Zambezi river basins.

The Okavango Delta and the Kwando-Linyanti River systems sustain a wide variety of mammalian fauna with perhaps the exception of small mammals in the Okavango largely due to the shortage of certain niches that occurs as a result of seasonal flooding. A broad spectrum of interlocking habitat types within the wetland systems of Northern Botswana contribute to the diversity of mammalian species ranging from those that are almost or completely aquatic to animals that are by and large independent of surface water. For details on the species present, please refer to sections 21 and 22 on flora and fauna.

Of the total number of taxa present in the Okavango Delta, a significant proportion of about 60% occur in dry land settings on islands or sandveld tongues. However, despite their terrestrial character many of these taxa are absent in the surrounding savannah habitats as they require a different air humidity or soil moisture regime or higher ground water table. Thus they are intimately associated with the wetland environments of the Okavango Delta (Ellery and Tacheba 2003).

Thirteen out of the 17 water bird species of the Zambezi biome that occur in Botswana have been recorded in this site. These include:

The dicksons's Kestrel (*Falco dickinsoni*), the coppery-tailed coucal (*Centropus cupreicaudus*), the Racket-tailed Roller (*Coracias spatulata*), the Bradfield's Hornbill, (*Tockus bradfieldi*), the Black-lored Babbler (*Turdoides melanops*), the Angola Babbler (*Turdoides hartlaubii*), the Kurrichane Thrush (*Turdus libonyana*), the white-headed black chat (*Thamnolaea arnoti*), the Chirping Cisticola (*Cisticola pipiens*), the Sharp-tailed Glossy-Starling (*Lamprotornis acuticaudus*), the White-breasted Sunbird (*Nectarinia talatala*) and the Brown Firefinch (*Lagonosticta nitidula*).

Four of the six bird species of the Kalahari-Highveld biome that occur in Botswana have been recorded in this site as well and these include: the Burchell's Sandgrouse (*Pterocles burchelli*), the Kalahari Scrub-robin (*Cercotrichas paena*), the Barred Wren Warbler (*Calamonastes fasciolata*) and the Burchell's Glossy-starling (*Lamprotornis australis*).

#### **Criterion 4:**

Many terrestrial herbivores that require regular access to surface water inhabit the seasonally inundated areas whose extent is largely determined in the case of the Okavango by magnitude of the annual flood from the Angolan highlands and local rainfall. The higher dry land masses found within the Okavango Delta and the riverfronts of the Linyanti and Kwando are important refuges particularly when flooding renders the above areas inaccessible. Large herbivores that utilize these areas include the African Buffalo (*Syncerus caffer*), Plains Zebra (*Equus burchelli*), African Elephant (*Loxodonta africana*), blue wildebeest (*Connochaetes taurinus*), Tsessebe (*Damaliscus lunatus*), Southern Reedbucks (*Redunca arundinum*), Bushbuck (*Tragelaphus scriptus*), Puku Antelope (*Kobus vardoni*), Impala (*Aepyceros melampus*), Waterbuck (*Kobus ellipsiprymnus*).

Less water dependent herbivores that utilize surface water to varying degrees include the grey duiker (*Sylvicapra grimmia*), the steenbok (*Raphicerus campestris*), the gemsbok (*Oryx gazelle*), the giraffe (*Giraffa camelopardalis*), the greater kudu (*Tragelaphus strepsiceros*), the sable antelope (*Hippotragus nigeri*), the roan antelope (*Hippotragus equines*), the ostrich (*Struthio camelus*), the desert warthog (*Phacochoerus aethiopicus*) and the eland (*Taurotragus oryx*).

Several of the above species including the elephant, zebra and wildebeest migrate on a seasonal basis between temporal wetlands that are scattered throughout Northern Botswana and the permanent wetland systems making this site an important refuge for these species during their migration cycle.

Wattled Crane, *Grus carunculatus* breeds in the Okavango (several hundred pairs). The Delta also serves as a major breeding site for the Slaty Egret (*Egretta vinaceigula*) and other species of herons and storks. The Delta is the most important breeding site for the Slaty Egret which is a very restricted species: a breeding colony of hundreds has been reported there and there was a colony of 50 to 60 pairs mixed with the Rufous-bellied Heron (*Ardeola rufiventris*) in reed beds north of Xaxaba on the Boro river during the early 1990's (Fishpool and Evans, 2001)

**Criterion 5:**

The Okavango, Kwando and Linyanti wetland systems also support a variety of water birds and terrestrial bird species. More than 650 species of birds have been identified in the Okavango delta alone despite the paucity of anatidae, which tend to occur in the few areas with soils richer in nutrients

According to Fishpool and Evans (2001) more than 20,000 water birds occur at the site.

**Criterion 6:**

The Okavango site holds  $\geq 1\%$  of the biogeographic population of the following:

This site is known to hold on a regular basis at least 1% of the biogeographic population of the following species: the near threatened African Skimmer, *Rynchops flavirostris* (with up to 100 breeding pairs and 200 non-breeding individuals representing 2% of the biogeographic population), the vulnerable Wattled crane, *Grus carunculatus* (100 to 500 breeding pairs and 1000 to 2000 individual birds representing 2.5% to 12.5% of the biogeographic population), the Black-winged pratincole, *Glareola nordmanni* (an average of 2000 birds, representing 5.4% of the biogeographic population), the Green pygmy-goose, *Nettapus auritus* (with 6200 to 15 000 breeding pairs and up to 40 000 individual birds, representing between 7% to 22.9% of the biogeographic population), the white-backed duck, *Thalassornis leuconotus* (with 200 breeding pairs and 350 individual birds, representing between 1.9 to 2.2 % of the biogeographic population), the Fulvous whistling duck, *Dendrocygna bicolor* (with an average of 4500 individual birds, representing about 1.8% of the biogeographic population), the African spoonbill, *Platalea alba* (with an average of 500 breeding pairs, giving 1% of the biogeographic population), the Marabou, *Leptoptilos crumeniferus* (which has 300 to 400 breeding pairs and up to 5000 individual birds, giving up to 2.5% of the biogeographic population), the Saddle-billed Stork, *Ephippiorhynchus senegalensis* (with 1500 to 2000 individual birds, representing 6 to 8% of the biogeographic population), the Squacco Heron, *Ardeola ralloides* (up to 10 000 breeding pairs, representing 6.7% of the biogeographic population), the black heron, *Egretta ardesiaca* (with 100 to 1000 breeding pairs and 2000 individual birds, representing up to 2% of the biogeographic population), the little egret, *Egretta garzetta* (with up to 4000 breeding pairs, representing 2.3% of the biogeographic population) and 10% of the great white pelican, *Pelecanus onocrotalus* (with up to 2000 individual birds, representing 10% of the biogeographic population).

**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:**

The Okavango Delta falls under the Zambezi Bioregion, which contains the Okavango flood plains and which is classified under inland deltas and flooded grasslands fresh water eco-regions of Africa (ERSI, 2001).

The Okavango Delta System falls under the Afrotropical Region (AT) as per the World's Major Biogeographic Regions.

**b) Biogeographic regionalisation scheme (include reference citation):**

The World's Major Biogeographic Regions is the one used to classify the biogeographic region where the Okavango Delta system is found

(<http://entweb.clemson.edu/database/trichopt/biomap.htm>). This is the same classification system used by The World Conservation Union (IUCN) 2004 Red List of Threatened Species which is a global species assessment. The Afrotropical Region consists of Africa east of the Fernando de Noronha, Trindade, and South Sandwich Islands; south of Spanish Sahara, Algeria, Libya, Egypt, Saudi Arabia, and the United Arab Emirates; east of the Maldiv Islands and Chagos Archipelago; and north of Antarctica

---

**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 Okavango River rises in Angola, flows through Namibia and enters Botswana where it flows in a broad, well-defined channel with a clearly defined floodplain for a distance of about 90 kilometres. This broad well-defined channel is known as the panhandle. It then spreads out to form the delta. The Okavango Delta has developed in a depression in the Kalahari bedrock. The system slopes from an elevation of 1000m above sea level at Mohembo at the beginning of the panhandle to 980 m at the apex of the delta and to 930m at Maun, at the base of the delta. There is very little suspended matter in the incoming water, but a considerable bed load. The bed consists of sand with a median grain diameter of 0.2-0.4 mm. The continuous deposition of sand has given rise to the present complex of islands, ridges, pools and permanent and seasonal swamps. The total drop in altitude between Mohembo and Maun, a distance of 440 km, is only 62 metres, giving a gradient of approximately 1:7,000 only. Thus anastomosing and braiding channels distribute the sediment, while most of the water moves through flood plains. Maximum local relief, between island crest and channel thalwegs is around 6 metres. The permanent swamp covers approximately 6000 km<sup>2</sup>, while the seasonal swamp varies between 4000 and 10,000 km<sup>2</sup> in size. The variations in inflow have profound effects on the processes of river flow, water distribution and sediment distribution. All ecological dynamics are directly controlled by these processes, which are critical in understanding water balance processes in (semi) arid environments. The annual inflow ranges between 7,000 and 15,000 million cubic meters. Of this almost 97% is lost to evapotranspiration and seepage leaving only 3% to exit past Maun.

**Climate**

The climate of the ODRS is semi-arid with rainfall (in Maun) ranging between 195 and 940 mm per annum. Rainfall occurs in the summer months (November to March), with a mean annual amount of 455 in Maun and 480 mm over the Delta. Characteristic of a semi-arid



environment, the rainfall is highly variable, with a coefficient of variation of annual rainfall of 35%. The monthly mean temperature ranges from 16 to 26°C in June and October respectively. The winds are generally light easterlies. Annual potential evapotranspiration, (class A pan with appropriate, seasonally varying pan coefficient), is high at nearly 1850 mm.

### **Geomorphology**

The Okavango alluvial fan is situated among dune sediments within the down faulted MOZ (Makgadikgadi-Okavango-Zambezi) basin of north-west Botswana. The Okavango fan has developed on flat terrain within a south-western extension of the East African rift (EAR) which was re-activated approximately 2.4-5.0 Ma along NE-SW trends. The surface of the down-faulted area comprises washed longitudinal dunes, present day and relict alluvial fan deposits and salt pans which overlie up to 300 m of predominantly sandy sediment. Catchment headstreams include the Okavango River which flows through Namibia to the Panhandle. The Okavango Delta is in reality the wetter part of an alluvial fan – fan shaped and slightly conical - which discharges south of the Panhandle after flowing over 1000 km through Angola, Namibia and Botswana.

In terms of gross fluvial sub-environments, the quasi level Okavango alluvial fan comprises a mosaic of meandering watercourses, floodplains and islands, and is subject to low velocity flooding (ca.2-3 m/s) with significant lateral groundwater discharge under the islands. The present Delta consists of seven active (slowing diffusing) and intermittently active distributaries floodplain systems with a total east-west extent of c. 140 km. The distribution of flow through the 1-500 m wide floodplains varies with decadal or biannual frequency

Recent geomorphologic work has shown that the Delta (possibly as slowing diffusing multiple streams) was much more widespread at least 200 000 years ago and flowed extensively southwards to around Deception Valley in the northern Kalahari (Ringrose et al., 2005). Re-activation of the fault lines to the north (around Gumare) and south (the Thamalakane and Kunyere) lead to the confinement of the present fan, likely around 40 000 years ago. More movement along the faults may be anticipated in this earthquake prone rift zone.

### **Soils**

The soils of the Okavango Delta are mainly arenosols (i.e. sand based) as a result of the sediment infill into the east African Rift basin (see geomorphology section). However the local geomorphology and the effects of weathering, change the nature of the sands' surface conditions such that the original arenosols are modified. A major characteristic of the sands is the lack of any real diagnostic horizons other than a surface organic rich layer which may extend from 30-100 cm.

Typically the arenosols have very low water-holding capacities because the sand in the soil is not graded so that sands of varying coarseness are constantly mixed right through the soil. Because most sands are highly siliceous and are also extremely low in all essential nutrients, especially phosphorus, and are mostly acidic. Most arenosols are difficult to farm and productivity tends to be low partly because of the uncertainty of rainfall. In the Delta dryland farming takes place on haplic arenosols while the more productive flood recession agriculture takes place on gleyic arenosols. In areas where intermittent clay has been deposited as a result of former water ponding or vegetation induced surface processes (e.g. under tall

mopane) some clay like structures are found in the soil leading to the development of luvic arenosols. Some ferralic arenosols occur in the dune areas, peripheral to the Delta. Certain floodplains retain their peat surface cover (histols) for a period prior to spontaneous burning.

### **Geology**

The Okavango Delta overlies solid basement bedrock, which occurs under 20-300m of Kalahari sediments. The older basement rocks are referred to as:

1. Palaeoproterozoic (approx 2.05 thousand million years old) comprising gneiss, granites and amphibolites exposed in the Qangwa area and granulites exposed in the Gweta area
2. Mesoproterozoic (approx 1.2-1.1 thousand million years old) gabbros, granites and meta-rhyolites and meta-basalts
3. Karoo supergroup comprises (approx 180 million years old) silica rich sedimentary rocks with mafic lava and dolerites

These are covered by the Kalahari Group sediments comprising silica rich sands and carbonates such as calcretes and occasionally silcretes.

---

### **17. 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).

The Okavango is an endorheic basin (that is, with no outlet to the sea) in central southern Africa. The basin includes parts of three countries: Angola, Botswana and Namibia. The main source is the highlands of Angola where the Cubango and Cuito rivers rise at an altitude of around 1,600m. The surface area of the Okavango River basin is estimated at 191,550 km<sup>2</sup> comprised of 111,250 of active catchment, 45,000 of inactive drainage area and 35300 of the catchment in the Botswana part (Mndelson, J and el Obeid S. 2004). The climate is tropical with summer rainfall (mostly from November to March). It varies from relatively humid in the north of the basin, to semi-arid in the south. Annual rainfall averages in the range 1,100 to 1,200mm in the Angolan highlands, gradually declining southwards. The basin is characterised by warm temperatures for most part of the year with annual average temperatures being about 20<sup>0</sup> C increasing by about three degrees from north to south (Mndelson, J and el Obeid S. 2004). This temperature gradient is due to higher solar radiation in the southern areas. Cold winter nights are experienced throughout the basin especially in low lying areas.

Approximately 95% of the basin's runoff is generated by the headwater catchments in Angola. The river flows along the border between Angola and Namibia, and then crosses the Caprivi Strip into Botswana and the Okavango Delta. The two main contributing rivers in Angola, the Cubango in the west and the Cuito to the east, have different hydrological responses. The Cubango reacts rapidly to rainfall, with an earlier and higher peak, and also has a low base flow. Flow in the Cuito is attenuated in extensive floodplains and swamps; the peak arrives later at the confluence and is lower, but the river sustains a higher base flow. Downstream of the confluence, the main Okavango River tends to produce two major peaks,

in February and in April, reflecting the different contributions of these two tributaries; the lowest flow tends to occur between the middle and the end of October.

A substantial part of the catchment is in Namibia. The streams flow northwest to join the lower reaches of the Cubango and directly into the delta. They are highly ephemeral, any surface water is exploited locally, and no runoff reaches the main stream.

The distribution of soils reflects the major differences in geology between the upper western and eastern sides of the basin. The eastern and lower parts of the basin are dominated by Kalahari sands, while the upper western region is dominated by sandstones and mudstones.

---

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

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

The area is one of the two inland deltas in sub-Saharan Africa (Okavango and the Niger). It is hydrologically unique.

### **Inflows**

The variations in inflow have profound effects on the processes of river flow, water distribution and sediment distribution. For example the main Okavango River tends to produce two major peaks, in February and in April, reflecting the different contributions of the Cubango and Cuito tributaries; the lowest flow tends to occur between the middle and the end of October. Most ecological dynamics are directly controlled by these processes, which are critical in understanding water balance processes in (semi) arid environments.

The annual inflow ranges between 7,000 and 15,000 million cubic meters. Of this almost 97% is lost to evapotranspiration and seepage leaving only 3% to exit past Maun.

### **Sediment transport**

The majority of sediments or bed load in to the Delta is imported during the flooding season and is deposited mainly into the panhandle. During periods of extreme flood events the sediments are deposited further downstream. The sediments accumulate in a non-uniform pattern over the Delta. It is worth noting that the variability of sediment deposition due to flood variation results in what is referred to as waves of sediment propagation downstream. This phenomenon is due to the fact that some depositional areas during low flow conditions may turn into erosion areas during areas of high floods. Channel choking/blockage, channel avulsion as well as extreme flood events will induce new waves of sandy sediment in the channel system.

### **Infiltration**

The water balance within the Delta reveals that the infiltration to groundwater is very large. The infiltrating water contributes to shallow groundwater storage directly under the flooded area. Groundwater table that before flood arrival is typically 3–5 meters below ground rises with arrival of the water within a few days up to the surface. Additionally, a large part of infiltrating water flows laterally underground from beneath the flooded area towards drylands: islands or larger land bodies. In the floodplain studied by HOORC, at least 60% of the infiltrating water flew towards the dryland (Wolski & Savenije, 2006). This process

causes rise of dryland groundwater table, observed at distances of 500 and even 1200 m away from the water body. Importantly, a ubiquitous feature of the floodplain-dryland fringe in the Okavango Delta is the presence of riverine woodland. This woodland is strongly dependent on the mechanism of flooding – infiltration – lateral flow. Additionally, there is a feedback mechanism as the lateral flow appears to be driven by transpiration from the riverine woodland

### **Island growth and salinity**

In the Okavango Delta, about 94% of inflowing solutes are retained within the Delta ecosystems. This could lead to an entirely saline (salt pan) environment, but in fact the surface waters have very low salinity levels and sustain typical freshwater biota. It has been deduced that the salts are concentrating (as a result of the lateral flow process, described above) under the numerous islands in the Delta. Some islands have been formed through the evapotranspirative concentration of infiltrating solutes followed by precipitation and volume increase. Evidence of this stems from calcrete concentrations in island soils.

Island growth is therefore believed to be augmented by the concentration of salts at depth where both calcrete and amorphous silica are precipitated. The island centre groundwater is dominated by sodium carbonate and has a high dissolved organic carbon content. The gradual increase of salinity takes place as the islands groundwater passes under the riparian woodlands (Wolski et al., 2005). At a critical level the woodland vegetation can no longer tolerate the salinity of the groundwater, hence an area depleted of vegetation occurs at the centre of islands. Rainwater collects in this central zone leading to the formation of a depression and saline rich surface water resulting mainly from evaporation. In this zone halophytic grasses may be the only vegetation type prevalent and often a bare trona (sodium bicarbonate-carbonate) precipitate is formed. The salts may provide essential trace minerals for the Delta herbivores. The increasingly saline central island groundwater becomes unstable relative to under-laying deeper groundwater with lower salinity and periodically some of this high-saline water permeates through by a fingering process to the deeper layers (Bauer et al., 2002). Island growth through precipitation of solutes and salinity-density fingering to deep groundwater are the two major sink processes of inflowing solutes and together explain how the Okavango Delta remains as a freshwater system. The processes also underscore the delicate balance attained between the surface and groundwater, and the groundwater and island/dryland vegetation cover and sustainability of herbivore populations.

The flooding duration, flood extent and depth maintains the open floodplain grassland by preventing woody encroachment. Most vegetation communities in the flooded areas consist of sedges, grasses and aquatic plants which serve as important resources for human activities in the site. Fluctuations in flooded areas are very important for productivity, both primary and secondary. For example, maximum flooding occurs in the winter (dry) months and thus provides important dry season forage and water for wildlife while the dryland areas form important grazing areas in the rainy season.

The river is laterally confined by geological faults and sand ridges to a flood plain up to 15km wide. The river channel meanders across the flood plain, varying in width from around 50 to 100m wide, and 5 to 6m deep. The length of the Panhandle valley is around 100 km, while the length of the meandering river is around 200km. The flood wave that results from

the upstream rainfall has a duration from January to July, with its peak in early April. The flooded area ranges from 10,000 – 16,000 km<sup>2</sup>

## 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: I • 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.

#### Inland Wetlands

- L. Inland delta (permanent)
- M. Permanent rivers/streams/channels
- P. Seasonal freshwater lakes
- Tp. Permanent freshwater marshes/pools; ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season
- Ts. Seasonal/intermittent freshwater marshes/pools on inorganic soils; includes sloughs, potholes, seasonally flooded meadows, sedge marshes
- N. Seasonal/intermittent/irregular rivers/streams/channels

## 20. General ecological features:

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

The primary ecological determinant is flooding duration, flood extent and depth. This maintains the open floodplain grassland by preventing woody encroachment. Most vegetation communities in the flooded areas consist of sedges, grasses and aquatic plants. Woody species are restricted to the dryland areas and the islands, with the exception of the water fig. Permanent and seasonal floodplains form critical habitats for many species of wildlife and birdlife that are at their southern limits of distribution in the region. The maximum flooding occurs in the winter (dry) months and thus provides important dry season forage and water for wildlife. Conversely, the dryland areas form important grazing areas in the rainy season. Fluctuations in flooded areas are very important for productivity, both primary and secondary.

The interactions between plants, birds and insects operate to keep the Delta a freshwater system. Even though the Okavango River is a very low salt and nutrient system, very large amounts of salts have been brought into the area over thousands of years and with high evaporation of surface water being a major factor in “outflow”, one might logically expect the area to be a salt, rather than a freshwater, marsh system. It is generally considered to be the actions of termites, birds and trees combined that help maintain the freshwater nature of

the area. Termites build up termite mounds, rich in nutrients, in the floodplains and then birds and the wind bring seeds to these mounds thereby colonising them with trees and other vegetation. As they transpire, trees draw water into these islands, concentrating the salts in the island themselves and keeping the water in the channels and floodplains fresh. This process is clearly demonstrated by the white salty patches, devoid of vegetation, visible in the middle of most islands; signifying that salts have indeed concentrated to high levels in the islands, so high that no vegetation can survive them. Termites, birds and trees are thus also important “ecological engineers” in the Delta’s structure and function.

## 21. 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.*

The currently known flora of the Okavango Delta comprises about 1300 taxa on the species and lower levels, of which 1260 taxa are on the species level. They belong to 530 genera and 134 families. The most diverse families are the grasses Poaceae, sedges Cyperaceae, followed by the Asteraceae and Fabaceae, each of which have more than 20 genera and 50 taxa of species and lower ranks. Most genera (73%) are represented by one or two species only, whereas a small number of genera (7%) are represented by 10 or more taxa of species and lower ranks.

While the area as a whole has a high plant species/area ratio when compared with other parts of the subcontinent, this situation arises more from the wide spectrum of habitats rather than any greater, inherent within-habitat diversity. The Okavango ecosystem is oligotrophic with a low supply of nutrients and low in productivity..

Ellery and Tacheba (2003) list 1259 species for the Okavango Delta for an area of 25 000 km<sup>2</sup>. Calculations of species density following Rosenzweig (1995) shows that the Okavango Delta has a species density of 210 species per km<sup>2</sup> similar to the dryer and colder southern and western biomes in Southern Africa, while the species densities are more than twice as high for the better watered and warmer grasslands and savannas in the eastern and northern parts of the sub-continent (Ramberg et al., 2006).

A large number of species occur in the permanent swamps (about 220 taxa), and many are connected to the flooded grasslands (about 90 taxa) or to the combination of flooded grasslands and dryland settings (80 taxa). A small number of species are parasitic (18) or insectivorous (12).

Of the 147 plants classified as aquatic and semi-aquatic only 10 are woody of which only three (3) are trees. The palm *Phoenix reclinata* and *Syzygium guineense* are fully grown trees that occur in patches fringing islands or termitaria, while the shrubby *Ficus verruculosa* lines the lower reaches of river channels in the perennial swamp (op. cit.).

There are no known endemic plant species in the Okavango Delta and the species composition has similarities with the large wetlands in mid and upper Zambezi river basin such as Kafue and Barotse (Liuwa). Due to very small gradients in this whole area it is likely

that these wetlands during wet periods have been united into one huge complex of several 100 000 km<sup>2</sup> (Ramberg et al. 2006).

### Rare and Endangered Plant Species

A total of 20 plant species occurring within the ODRS have been selected for Red Data List status using recognized IUCN Red Data List criteria. Among the less threatened species one finds:

- *Ansellia africana*, *Eulophia latilabris* and *Harpagophytum zeyheri* subsp. *sublobatum* are thought to be NEAR THREATENED.
- *Aristida stipitata* subsp. *spicata*, *Boscia matabelensis*, *Harpagophytum procumbens* subsp. *procumbens*, *Harpagophytum zeyheri* subsp. *sublobatum*, *Orbea knobelii*, *Oryzidium barnardii* and *Panicum gilvum* are thought to be of LEAST CONCERN.
- The grass *Eragrostis leptotricha* is still DATA DEFICIENT, but potentially an ENDANGERED species.

### 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.*

There are some 32 large mammal species in this region ranging from the relatively rare and shy sitatunga (*Tragelaphus spekei*) to the ubiquitous elephant (*Loxodonta africana*). The area boasts the largest populations of sitatunga and red lechwe (*Kobus leche*) in the world. The Okavango is regarded as the major surviving stronghold of the sitatunga and is therefore of paramount importance. The area also contains one of the largest remaining populations of wild dog (*Lycaon pictus*) and some 72 small mammal species occur in the area. The majority is represented by three orders, Carnivores (23 spp), Rodents (24 spp) and Bats (12 spp). Some 95 species of reptiles and amphibians occur in the region some of them endemic. The total number of insect species in the Delta is unknown. At least 84 species belonging to the Odonata have been recorded, while some 117 species of belonging to the Lepidoptera have been recorded from the Moremi Game Reserve alone.

Of particular note, however, is the tsetse fly, which occurred in the central parts of the area. Tsetse fly has since been eradicated from the Okavango Delta. This fly has had the most influence on the environmental history of the Okavango through preventing the spread of domestic livestock and arable agriculture from the periphery to the interior of the Delta. An equally large but for more serious gap in knowledge exists with regard to very small organisms, the lower forms of life such as algae plankton and bacteria, which are important to an understanding of ecosystem processes and functioning of the Okavango ecosystem.

The high concentration of herbivores near permanent water bodies attract numerous predators such as:

Lion *Panthera leo*, Hyena *Crocuta crocuta*, Wild Dog *Lycaon pictus*, Cheetah *Acinonyx jubatus*, Leopard *Panthera pardus*.

Baboons (*Papio ursinus*) are conspicuous residents of the ecotonal areas of these wetland systems. Several protected small mammals also occur within the wetland systems. These include several species of civet and otter.

The Okavango, Kwando and Linyanti wetland systems also support a variety of water birds and terrestrial bird species. More than 650 species of birds have been identified in the Okavango delta alone despite the paucity of anatidae, which tend to occur in the few areas with soils richer in nutrients. The Pygmy Goose (*Nettapus auritus*) however is one anatid, which occurs, in significant numbers in the delta.

The permanent swamps and rivers of Northern Botswana provide important habitats for the following species:

Little Grebe *Tachybaptus ruficollis*, White Pelican *Pelecanus onocrotalus*, African Darter *Anhinga melanogaster*; Great White Egret *Egretta alba*; Slaty Egret *Egretta vinaceigula*; Saddle-billed Stork *Ephippiorynchus senegalensis*, Wattled Crane *Grus carunculatus*, Comb Duck *Sarkidiornis melanotus*, Red-billed Teal *Anas erythrorhyncha*, White-backed Duck *Thalassornis leuconotus*, Southern Pochard *Netta erythrophthalma*, Black-winged Stilt *Himantopus himantopus*, Whiskered Tern *Chlidonias hybridus* and African Skimmer *Rynchops flavirostris*. Cattle Egret *Bubulcus ibis*, Squacco Heron *Ardeola ralloides*, African Openbill *Anastomus lamelligerus*, Woolly-necked Stork *Ciconia episcopus*, Fulvous Duck *Dendrocygna bicolor*, Hottentot Teal *Anas hottentota*, Blacksmith Lapwing *Vanellus armatus* and Collared Pratincole *Glareola pratincola*. Additional species that occur in significant numbers in the Okavango system include Goliath Heron *Ardea goliath*, Purple Heron *A. purpurea*, Rufous-bellied Heron *Butorides rufiventris*, Black-crowned Night Heron *Nycticorax nycticorax* and Pygmy Goose *Nettapus auritus*. Populations of two localised species, Pel's Fishing Owl *Scotopelia peli* and White-backed Night Heron *Gorsachius leuconotus* are also of note.

An estimated 71 species of fish occur in the Okavango ecosystem, with the species diversity decreasing in a downstream direction.

### 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.

Households of Ngamiland have diverse livelihood activities which are natural resource and non natural resource-based. Natural resource-based activities include livestock rearing, arable farming, collection of veld products, basket-making, fishing and community-based tourism. Non-natural resource-based activities include formal employment, remittances, rural trade and social protection programmes. Livelihood activities are strongly associated with ethnicity in Ngamiland. The WaYei and HaMbukushu are particularly known for their involvement in fishing. On the other hand, Baherero and Batawana are associated with pastoral farming. Traditionally, Batawana are known to engage in both pastoral and arable farming. Dryland arable farming is also common among the communities of the Etsha settlements who are mainly the HaMbukushu, whereas molapo farming is more associated with the WaYei (Kgathi etal, 2004). The San communities are also generally known for their hunting,



gathering, and fishing. The different sources of livelihoods have significant implications to the development options available to the district's population.

Reeds and thatching grass are used for houses, palm fronds for baskets and fish and plant products for food. The latter include not only the fruit of trees but also the several water based plants like bulrushes and water lilies. Most people living in the area depend on the tourist industry for cash income, either directly or through remittances. Because the tourist season fits neatly between the harvest time and the next ploughing season, it has not disrupted subsistence farming. Instead it allows households to remain economically active throughout the year.

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?

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 ethnic groups have considerable traditional knowledge of the flora and fauna in the Delta region, including plants used for medicinal purposes. This ethno-botanical knowledge provides an important resource base for cultural tourism and possible genetic extraction for pharmaceutical and other causes.

ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:

The Bayei, the Tawana, the Hambukushu, the Herero and the Banoka (River Bushmen) ethnic groups are of notable significance as traditionally their lifestyles are based on rivers and wetlands. They are ethnically distinct from other groups in Botswana, having different languages, social structures and relationships. The Bayei are responsible for bringing to the Delta the "mokoro" (dug-out canoe), which has become symbolic of travel in the Delta. The Hambukushu, who are also concentrated in the Delta region, are the original makers of the baskets that have made Botswana famous for the craft. All these people rely on the goods and services of the Delta for much of their livelihood.

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:

There are a few cultural sites within the Okavango Delta which are significant for the various tribal groups found within the ODRS. The various islands and lagoons have

been over millennia of years been used for settlements, fishing and harvesting of resources by inhabitants of the Delta. The cultural and spiritual attachment to these areas by the local communities cannot be over-emphasized.

---

#### **24. Land tenure/ownership:**

##### **a) Within the Ramsar site**

The ownership of the land within which the Okavango Delta Ramsar Site (ODRS) falls is defined by the land tenure system in Botswana. Botswana has three land tenure systems, namely, Tribal (Communal) Land; State Land (includes most of the Protected Areas (PAs) and Forest Reserves) and Freehold Land. It is important to note that the only state land in the ODRS is Controlled Hunting Area NG 41 within which Mababe settlement is located.

Of the total 55 374km<sup>2</sup> of land which makes up the Okavango Delta Ramsar Site (ODRS), 52 827 km<sup>2</sup> or 95.4% fall under Tribal Land Tenure system, while 2 547 km<sup>2</sup> or 4.6% constitute State Land Tenure system (NDSS, 2003). Noteworthy is the fact that there is no Freehold Land in the ODRS.

##### **Legal Rights**

Tribal land which is communally owned is held in trust for communities by the Tswana Land Board (TLB), which performs land management functions in accordance with the provisions of the Tribal Land Act of 1968.

Usage rights to land under the Tribal Land Tenure systems are either granted communally or to individuals. Land under tribal ownership is never sold and as such land transactions are only used in exchange for improvements or development on the land. Allocations of tribal land in the project area are made by TLB on customary law grant or common law grant basis. Under customary law grant, land allocations are made only to citizens of Botswana for residential, arable and borehole purposes. Though allottees cannot assume perpetual rights to such land, most often, they assume such rights, and pass on their titles to their children. Residential plots are issued a lease period of 99 years. Common law grants on the other hand, can be made to citizens and non-citizens alike, for commercial, tourism and industrial developments on a 50 year lease basis.

With regards to State Land, the Department of Lands holds and administers the land on behalf of the Government. State land allocation is on Fixed Period State Grant (FPSG) and Certificate of Rights (CoR) basis. FPSG is granted on a lease basis with the period of grant varying according to the land use, with industrial and commercial land being leased for a period of 50 years, while residential land use is leased for 99 years.

##### **b) in the surrounding areas**

The land ownership in the surrounding areas is the same as the land use dispositions within the ODRS. The land ownership is all tribal.

---

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

**(a) Within the Ramsar Site:**

Existing land uses and land use activities in the Okavango Ramsar Site are largely a reflection of the area's natural endowment which gravitates around the attributes of the Okavango Delta. The soils, vegetation, the general climatic conditions and the existence of vector-borne diseases associated with Tsetse-Fly, largely contribute to the distribution of the human population and related activities within the ODRS.

The land uses within the ODRS are discussed in terms of broad land use zones. These zones comprise Communal areas, Game Reserves and National Parks and Wildlife Management Areas (Tawana Land Board, 2005). These broad categories, particularly communal areas are further subdivided into smaller and more specific categories which include settlements, arable lands and grazing areas.

Tawana Board leases a number of concession areas to safari operators for hunting and photographic purposes. Further camp/lodge sites are leased to operators for photographic purposes only. The area is subdivided into administrative units named Controlled Hunting Areas (CHAs). Nine Controlled Hunting Areas are zoned for community management, while a further twelve are zoned for commercial management. The Moremi Game Reserve is a part of the Delta System and in this area all wildlife is protected. This game reserve is unique in that it was founded by the local tribe.

Current land use has several facets. The Moremi Game Reserve is wholly utilized for non-consumptive (photographic) tourism. The Reserve is zoned into a medium density tourism zone, a low-density tourism zone and a wilderness zone, in which there is a progressively decreasing amount of human activity. Traditional resource use e.g. grasses and reed cutting takes place on the fringes of the Reserve. The surrounding Wildlife Management Areas are subdivided into areas for commercial and community management and are either zoned for non-consumptive utilization (the areas immediately bordering the Reserve) or as multi-purpose areas in which both non-consumptive utilization and consumptive utilization (trophy hunting, citizen hunting, subsistence hunting, capture, culling and cropping) are allowed. In the community managed areas limited subsistence cropping takes place, while some small stock and donkeys are kept as well. All commercial and most community areas are managed under resource use leases given out by the Tawana Land Board. Most of the region has been declared a stock-free zone under the Diseases of Animals Act of 1977.

Most of the area covered by the Delta has been afflicted by a cattle disease known as cattle lung disease (Contagious Bovine Pleura Pneumonia), which forced Government to kill all cattle in the area in 1996 which were later re-stocked in 1997 though the cattle population has not yet reached the pre-culling population levels.. The area has been re-stocked and the livestock population is increasing towards the pre-CBPP outbreak. The area had over 300.000 cattle before the outbreak of CBPP.

**Water use**

Being close to water dry land farming is practiced in the region mainly at a subsistence level. Fishing is also undertaken. The reeds and papyrus and palms are used for building homes, making mats and basketry the latter being for local consumption as well as for sale to tourists.

Botswana currently abstracts water at several points throughout the Okavango Delta system and is preparing infrastructure to abstract more.

**(b) In the surrounding area**

The land use in the surrounding areas is mainly agriculture (arable farming and livestock rearing). The main source of water in these areas is ground water though the quality is not that good. The aquifers are characterised by high salinity.

---

**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 Okavango River basin is jointly managed through a tri-partite agreement between Botswana, Namibia and Angola known as the Permanent Okavango River Basin Commission (OKACOM). OKACOM was established to oversee the management and use of the system on a sustainable basis. There is however the ever-present possibility that one or other of the states may decide to extract water for one reason or the other in pursuant of their developmental needs beyond sustainable levels.

Under the proposed Maun Groundwater Development Project (MGDP) and Maun Water Supply and Sanitation Rehabilitation and Upgrade Project (MWSSRUP) the amount of water supplied to the village will be increased (DWA, 2004). The existing abstraction site would be decommissioned. The total quantity of water currently abstracted by DWA Botswana in the Delta is therefore circa 3.84MCM per annum (0.04% mean annual flow) although this is predicted to rise to circa 11.04MCM per annum (0.1% mean annual inflow) by 2020-25.

**(b) in the surrounding area:**

The main threat may come from possible water abstraction from the Okavango and Kwando Rivers and their subsidiaries by the riparian fringe states (Botswana, Namibia, Angola and Zambia). Namibia is looking into the possibility of extracting water from the Okavango River and they have instituted a study to look into the possible implications of such extraction. Botswana asked that the study also include the Botswana side and the Namibians have expanded the scope of study. In addition hydro-power developments have also been proposed by the Namibia Government at the Popa Falls just upstream of Botswana. The hydropower developments will greatly reduce the amount of sediments which are transported to the delta. The sediments are an important component of the system in that it contributes to the dynamic nature of the system. Water developments such as dams will also affect the quantity of water flowing into the delta and the timing of floods. This has the potential to disrupt the ecological functioning of the system.

---

**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.

The Tsodilo Hills landscape falls within the Okavango Delta Ramsar site. The Tsodilo Hills is a very important site in terms of Basarwa culture and was declared a World Heritage Site in 2001, as per the World Heritage Convention.

The Moremi Game Reserve and the Wildlife Management Areas enjoy protection under the Wildlife Conservation and National Parks Act of 1992. The wildlife areas consist of the Moremi Game Reserve (4,865 km<sup>2</sup>) and the Kwando (12,530 km<sup>2</sup>) and the Okavango (8,655 km<sup>2</sup>) Wildlife Management Areas.

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?:

The Okavango Delta Management Plan (ODMP) just concluded by the Government of Botswana, has a 6-year planning horizon and sets out strategic goals, objectives and operational objectives which will contribute to the sustainability of the Okavango system when it will be implemented.

In addition to the ODMP, the Permanent Okavango River Basin Commission (OKACOM) jointly managed through a tri-partite agreement between Botswana, Namibia and Angola was established to oversee the management and use of the system on a sustainable basis and thus contributes towards conservation.

d) Describe any other current management practices:

In the Game Reserve only non-consumptive utilization is allowed. In the Wildlife Management Areas wildlife utilization (both consumptive and non-consumptive) is the primary form of land use. Appropriate land use and management plans have been or are being prepared for the region.

The part of the Delta outside the wildlife areas does not enjoy any particular conservation status. However, land use in the area, like elsewhere in the country, is regulated. Land is zoned for a specific use and an institution called the Tribal Land Board allocates land for given uses to specific users, be they individuals, companies or communities. A land use map is drawn up by the appropriate authorities in the district and submitted to central government in this case the Ministry of Local Government Lands and Housing, for approval. Any local threats to the Delta will therefore be monitored through the various authorities responsible for land use and water extraction. The main users, however, for the area outside wildlife areas are the communities.

---

28. Conservation measures proposed but not yet implemented:

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

The move by Government to designate the entire area as a Ramsar site means that all concerned with allowing any form of land use in the area will have to take into account the guidelines and limitations implied by the area becoming a Ramsar site.

The Government of Botswana has just concluded the development of an integrated management plan for the Okavango Delta. The plan will provide a framework for sustainable use through which all sector plans and programmes will operate. The plan is known as the Okavango Delta Management Plan (ODMP). The plan sets out strategic goals, objectives and operational objectives which when realised will contribute to the sustainability of the Okavango system. The ODMP emphasizes the sustainable utilization of resources and as such encourages the management and use of the system to be on a sustainable basis for all concerned. The ODMP is has a six year planning horizon commencing in November 2006.

Water developments should not be entirely discounted, however the OKACOM agreement between the three riparian states calls for sustainable management of the Okavango River Basin. The use levels or development programmes that may be undertaken would be guided by wise-use principles and the spirit and object of the tri-partite agreement.

---

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

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

Considerable research efforts have always been directed at the region under discussion, in particular at the Okavango Delta itself. This ranges from the Government annual aerial surveys of wildlife in Botswana to private researchers investigating certain aspects of the ecosystems in the region. Research has been done on elephant, buffalo, zebra, wildebeest, baboon, lion, wild dog, and a variety of fish. Recently detailed studies on aquatic and terrestrial invertebrates have been undertaken by the University of Botswana as part of the environmental monitoring component of the Tsetse fly eradication project from the Delta and Kwando Linyanti rivers. The vegetation-wildlife interaction of the region has also been studied by a number of researchers and the Ministry of Agriculture has routine range studies that cover the entire country. University groups and private researchers have studied the underlying processes shaping the region, its geomorphology and other physical aspects. The Okavango Research Centre of the University of Botswana was established by the government specifically to undertake research in the Delta that will inform management about its proper management.

---

**30. Current conservation education:**

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

As part of the development of the management plan the office of the Department of Environmental Affairs was established within the Okavango Ramsar site. The office covers environmental education functions and particularly the communication component which has developed a full-scale communications strategy covering the basin-wide elements for communication. The department through the communication component is responsible for coordinating all environmental education in the district. The other departments in the district have environmental education and awareness programmes that they are implementing such as schools programmes (clubs) from all over the country which are assisted by the Department of Wildlife and National Parks to visit the Moremi Game Reserve and the Botswana Wildlife

Training Institute, which also engages in environmental education activities with the region as an example. Other conservation activities take place on an ad hoc basis.

---

**31. Current recreation and tourism:**

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

The Okavango delta is a showpiece for Botswana's tourism and is known worldwide as a tourist attraction not to be missed. It and the nearby Chobe National Park are the country's draw cards as far as international tourism is concerned. Tourism is the main economic activity within the Okavango Delta Ramsar site.

---

**32. Jurisdiction:**

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

Jurisdiction over the area is divided amongst a number of organizations.

- i. The Tawana Land Board has jurisdiction over the allocation and management of tribal land in the area;
  - ii. The North West District Council is the political authority responsible for all developments within the district;
  - iii. There is the Ministry of Local Government under which the North West District Council falls;
  - iv. The Ministry of Lands manages the state land NG41 and Tawana Land Board falls under this ministry.
  - v. The National Environmental Affairs Council and its Secretariat, the Department of Environmental Affairs, are charged with coordinating all issues relating to the environment including the implementation of the Environmental Impact Assessment Act of 2005;
  - vi. The Ministry of Mineral Resources and Water Affairs which is responsible for managing water issues;
  - vii. The Ministry of Environment, Wildlife and Tourism which, through its, Departments of Environmental Affairs, Wildlife and National Parks, Forestry and Range Resources, Department of Tourism and Fisheries Division is responsible for managing the natural resources within the Ramsar site including Moremi Game Reserve and the Wildlife Management Areas, as well as promoting the Okavango as a tourist destination;
  - viii. The Ministry of Agriculture which is responsible for managing livestock and arable agriculture including *molapo* farming which is an important form of land use in the district.
- 

**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.

Director  
The Department of Environmental Affairs  
Private Bag 0068  
Gaborone. Botswana.

Telephone: (+267) 3902050    Telefax (+267) 3902051.

Email: [envirobotswana@gov.bw](mailto:envirobotswana@gov.bw)

Web: [www.envirobotswana.gov.bw](http://www.envirobotswana.gov.bw)

The Department of Environmental Affairs is present within the site and is coordinating the implementation of the ODMF which is intended to ensure the sustainable management of the ODRS.

---

### 34. Bibliographical references:

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

There is much literature about the Delta and its environs, both popular and scientific. A full reference list is found in the Draft Management Plan for the site. Below is a selection of documents that have a direct bearing on the management and conservation of this proposed Ramsar site.

Ellery, W. N. and B. Tacheba, 2003. Floristic Diversity of Okavango Delta, Botswana. In: Alonso, L.E. and L.-A. Nordin (eds). A Rapid Biological Assessment of the Aquatic Ecosystems of the Okavango Delta, Botswana: High Water Survey. RAP-Bulletin of Biological Assessment 25: 69-96.

ESRI, 2001. Digital Chart of the World. Environmental Systems Research Institute, Redlands, CA. United States Geological Survey. Prepared by Michele Thieme, Robin Abell, Ken Kassem, Emma Underwood, David Olsen, Eric Dinerstein, of WWF US Conservation Science Program, with the support of Hewlett Packard and ERSI, January 2001.

Field, D.J. 1976 A Handbook of common grasses in Botswana, Ministry of Agriculture, Private Bag 003, Gaborone, Botswana

Fishpool and Evans (2001) Important Bird Areas in Africa and associated islands: Priority sites for conservation. Newbury and Cambridge, UK : Pisces Publications and BirdLife International (BirdLife Conservation Series No. 11)

Hughes, R.H. and Hughes, J.S. 1992 A Directory of African Wetlands, IUCN/UNEP/WCMC. 820 pp

IUCN 2006. 2006 IUCN Red List of Threatened Species. <[www.iucnredlist.org](http://www.iucnredlist.org)>. Downloaded on **07 February 2007**.

IUCN, 1992 The IUCN Review of the Southern Okavango Integrated Water Development Project Final Report.

Kalahari Game Services, 1991 Moremi Game Reserve Management Plan, DWNP, Gaborone, Botswana

McCarthy, T. et al, 1986/1994 Okavango Research Group Papers Published ( 3vols): (1) 1986-1990 (2) 1990- 1993 (3) 1993-1994, University of Witwatersrand, Johannesburg.

Mendelsson J. and el Obeid S. 2004 Okavango River Flow of a Lifeline. Struik Publishers, South Africa.



- ODMP 2006 Assessment of occurrence and distribution of threatened and endangered plant species in the Okavango Delta, 2006
- Ramberg L, et al 2006 Species diversity of the Okavango Delta, Botswana. *Aquat. Sci.* 68 (2006) 310 - 337
- Roodt, V. Undated The shell Field Guide to the common Trees of the Okavango Delta and Moremi Game Reserve, Printed by Dando and Van Wyk. South Africa
- Skelton, Paul 1993 A Complete Guide to the Freshwater Fishes of Southern Africa.
- SMEC, 1989 Ecological Zoning – Okavango Delta. Kalahari Conservation Society, Gaborone.
- Golding J. (editor) 2002 Southern African Plants Red Data List. Southern African Botanical Network
- Wolski, P., Murray-Hudson, M., Fernkvist, P., Liden, A., Huntsman-Mapila, P., Ramberg, L., (2005) Islands in the Okavango Delta as sinks of water-borne nutrients. *Botswana Notes and Records*, V.37, pp. 253-263.
- Biogeographic Regions of the World  
<http://entweb.clemson.edu/database/trichopt/biomap.htm>
- 

Please return to: **Ramsar Convention Bureau, Rue Mauverney 28, CH-1196 Gland, Switzerland**  
Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • e-mail: [ramsar@ramsar.org](mailto:ramsar@ramsar.org)