

Table of Contents

Tables, Maps and Photographs	2
Abbreviations	3
Summary	4
<u>1 Introduction</u>	<u>5</u>
<u>2 History and Importance of Lake Burullus</u>	<u>6</u>
2.1 Development History of Lake Burullus	6
2.2 Location and size of Lake Burullus	9
<u>3 Environmental Setting</u>	<u>11</u>
3.1 Climate	11
3.1.1 Temperature	11
3.1.2 Precipitation	12
3.1.3 Wind Movement	12
3.2 Water Resources	13
3.3 Physical Environment and Natural Land Cover (Soils and Geology)	14
3.4 The importance of Wetlands	17
<u>4 Land Use</u>	<u>19</u>
4.1. Agricultural activities	21
4.2 Fishery in Lake Burullus	22
<u>5 Land Use Planning</u>	<u>24</u>
5.1 The planning System and the planing process in Egypt	24
5.2 Zoning and Buffer Zones – Recommend Land Use Structure for the Protectorate	26
<u>6. Recommendations and Perspectives</u>	<u>28</u>
<u>7. References</u>	<u>32</u>

Tables, Maps and Photographs

Table 1: Changes in the Size at Lake Burullus	6
Map 1: The shrinking area of Lake Burullus between 1798 and 1934	7
Map 2: Precipitation in northern Egypt	12
Map 3: Wind movement on the northern coast of Egypt	13
Photography 1: Lake Burullus from the north to south, the Islands, Wetlands and the reed swamps are visible	16
Photography 2: Wetland on the northern shore of Lake Burullus	18
Photography 3: Land Use structure on the southern shore of Lake Burullus	20

Abbreviations

CAPMAS	Central Agency for Public Mobilization
EEAA	Egyptian Environmental Affairs Agency
GAFRD	General Authority for Fish Resource Development
GOPP	General Organization for Physical Planning
GPPC	Governorate Physical Planning Committee
IWRB	International Waterfowl and Wetlands Research
MALR	Ministry of Agriculture and Land Reclamation
MNPY	Mubarak National Project for Youth
MPWWR	Ministry of Public Works and Water Resources Bureau
ORDV	Organization for Reconstruction and Development of Egyptian Villages
WLUC	World Land Use Commission

Summary

Principal Features Lake Burullus is a shallow, saline lagoon, about 65km in length, varying in width from 6km to 16km, and containing about 50 islands and islets. Water depth ranges between 0.5m and 1.6m, the eastern part being the shallowest (average depth = 0.8m).

The lagoon is separated from the Mediterranean along most of its length by a long sand dune bar, but is connected with the open sea by a narrow channel (about 50m wide) near the village of *El Burge*, in the east. As a result, there is a strong salinity gradient from east to west, with the western part of the lagoon containing relatively fresh water.

Conservation Issues Fishing is regulated, but there is no closed season. There are proposals for protecting a number of the islands for nature conservation. In an attempt to control the spread of the *Phragmites* beds, the local fishermen graze domestic buffalo on the more accessible areas, although this has been largely unsuccessful as a management measure.

The active coastal sand dunes frequently block the channel connecting the lagoon with the sea, but the channel is kept open artificially through dredging. Substantial volumes of water laden with fertilizer and pesticide runoff enter the lagoon's southern side through a number of drainage channels. This has led to rapid eutrophication and pollution.

Water quality problems have combined with increasing levels of commercial fishing activity, resulting in major declines in fish production. 5km of coastal protection barriers have been erected between *Baltim* and *El Burge*. The surface area of the Lake Burullus has decreased by about 20% this century as a result of infill and conversion activities, with new reclamation projects currently being developed along the southern shore.

There are also plans for the construction of a major road over the northern coastal bar; this would include a 3km long bridge and excavation of a second channel linking the lagoon with the sea. There is also a proposal for diverting flood water from the River Nile into Lake Burullus, which would be developed as a water storage reservoir.

In view of information contained within the 1990 Egyptian National Report, Lake Burullus was added to the "Montreux Record" of sites likely to undergo change in ecological character. A preliminary application of the Ramsar Monitoring Procedure was carried out in 1991. The report of this preliminary mission recommended that the Government of Egypt should submit an application to the Ramsar Wetland Conservation Fund to facilitate the initiation of a number of urgently required surveys and management actions.

1 Introduction

Lake Burullus is located on the acoastal bulge of the northcentral Nile delta region and was declared and established as a Protected Area in the year 1998.

The Lake Burullus is a shallow, saline lagoon, about 65km long, varying in width from 6km to 16km, and containing about 50 islands and islets. Water depth ranges between 0.5m to 1.6m - the eastern part is the shallowest. The lagoon is separated from the Mediterranean Sea by a long sand dune bar. The only connection with the open sea is a narrow channel (about 50m wide) near the village of *El-Burge* in the east.

The reserve is a significant site for migrating birds featuring one of the forthcoming bird areas. That is the reason why the protected area is one of the important bird observatory sites in Egypt next to the Zaranik Protected Area in north Sinai.

The main aim of this study is to collect the data that is related to the land use structure of Lake BURULLUS PROTECTED AREA. The composed data should provide a first view of the local situation in order to develop strategies for the new Land Use Planning. The study approach follows a five-stage work program:

- a) Collecting available data as preparation of the first field visit in order to get a fundamental knowledge about that specific land use structure.
- b) Visiting the site and holding meetings with local experts and decision makers, e.g. the manager of the protected area.
- c) Searching for further nessesary data.
- d) Analysing the investigated data to conclude a modell for land use planning in BURULLUS PROTECTED AREA.
- e) Examining the development trend and supposing the first steps of the land use planning.

The main emphasis of the study lies in the demonstration of major differences between the land use and the environmental impact, to mitigate the loss of natural ambiance. This study yields to support the establishment of protection measures.

In this response the analysis has been concentrated directly on positive as well as negative side effects. About the protected area and the socio-economic development there is very little literature available, the main emphasis are about the

2 History and Importance of the Burullus Lake

2.1 Development History of Lake Burullus

The history of the Nile delta and the development of the lakes is a complex one and this development process is different from the one of other delta rivers.

The Nile delta expanded towards the Mediterranean Sea by the accumulation of small sediments along the two branches, called *Rosetta* and *Damietta* which have been formed over ages. Till 1964 (the beginning of the construction of the Aswan Dam) the Nile delta has been eroding along the Mediterranean Sea. Since then the sediments have been exposed in the Nile delta itself which related to a potentially serious impact for the ecology system of the shoreline of Lake Burullus which was formed between the mouths of the two branches *Rosetta* and *Damietta*.

This development process started in the pre-Nile time (400,000 years ago) but especially during the 16th and 19th Century the shore of the delta expanded into the sea as a result of the decrease of the Mediterranean sea level, so that the lakes in the delta expanded. (Al-Sodany:10:1998).

Until the middle of the 20th century Lake Burullus was one of the periphery habitats in Egypt. That changed after the government under Nasser has passed a new governmental reclamation program that begun to affect the ecological environment in and around the lake. Since 1953 one sixth of the area close to the Lake Burullus has been given to the land reclamation scheme.

Table 1: Changes in the Size at Lake Burullus

Year	Feddan
1953	136,190
1973	124,830
1981	114,520
1995	103,430
2000	101,350

The size of the lake in 1953 has been estimated around 136,190 feddan. The decrease of the lake size between 1973 and 2000 was due to the reclamation from the eastern shore - growth of reeds near the mouth of drains.

Map 1: The shrinking area of Lake Burullus between 1798 and 1934¹



Today the decreasing process is especially related to the formations of ponds for fish farms and small private land reclamation's on the southern shores of the lake. Already the first government reclamation project *El-Hamoul* scheme, which begun in 1956 in the southern and eastern regions of Lake Burullus showed that these areas are neither conducive to productive agriculture, nor are they easy to improve. This project revealed some important indicatives of the problems faced by development and reclamation projects in this area.

By 1960, the *El-Hamoul* scheme had reclaimed about 2,500 feddan in the *Helmea* zone which is situated next to the *Bahr El-Tira* and *Gharbia* drains. By mid 1972, a total of 70,000 feddan had been reclaimed, of which around 37,000 were farmed as a state farm and 33,000 were distributed to approximately 7,500 families, giving an average holding size of 4,2 feddan.

By 1980, 24 years after the project started, some 70,000 feddan have been distributed to more or less 13,000 settlers, some 9,000 feddan have been sold in auctions, and around 50,000 feddan have been leased to the Delta Sugar Company, an Egyptian-

¹ After El-Sodany 1998.

French joint venture. According to the development of the *El-Hamoul* scheme only 50% of the distributed land has achieved marginality in 1980.

The fishing today is regulated by GAFRD but there is no closed season so that a regeneration process is not guaranteed. Some proposals for protecting a number of the islands for nature conservation are existing but none of them have been implemented so far.

In an attempt to control the spread of the *Phragmites* beds, the local fishermen graze domestic buffalo on the more accessible areas, although this has been largely unsuccessful as a management measure.

The active coastal sand dunes frequently block the channel connecting the lagoon with the sea, but the channel is kept open artificially through dredging. Substantial volumes of water laden with fertilizer and pesticide run off and enter the lagoon's southern side through a number of drainage channels. This has led to rapid eutrophication and pollution. Water quality problems combined with an increasing of commercial fishing activity are the result of the major declines in the fish production. Around 5km of the coastal protection barriers have been erected between *Baltim* and *El-Burge*. The surface of Lake Burullus has decreased by about 20% in this century as a result of infiltrating and conversion activities, since new reclamation projects currently being implemented along the southern shore.

The construction of a major road over the northern coastal bar with a 3km long bridge and the excavation of a second channel linking the lagoon with the sea.

There is a proposal for diverting flood water from the river Nile into Lake Burullus, which would be developed as a water storage reservoir. In view of information contained within the 1990 Egyptian National Report, Lake Burullus was added to the "MONTREUX RECORD" of sites likely to undergo change in ecological character.

A preliminary application of the Ramsar Monitoring Procedure (important International Bird Area) was carried out in 1991. The report of this preliminary mission recommended that the Government of Egypt should submit an application to the Ramsar Wetland Conservation Fund to facilitate the initiation of a number of urgently required surveys and management actions.

The entire area of Lake Burullus and the majority of the surrounding marshland have been in recent times declared a the Prime Minister's degree number 1444 and was actually established in the year 1998. The protectorate covers all habitat types within the official co-ordinates, between 30° 33' 00'' east and 31° 09' 40'' east and 31° 21'08'' north and 31° 35' 27'' north. The degree especially disallow the subsequent proceedings and practices:

- a) Hunting of local and migrating birds.
- b) Endangering or destroying the natural environment and wildlife.
- c) Devastating, disturbing and removing of terrestrial and wetland plants and organisms as well as causing change in their genetic structure. (e.g. Plantations on the Islands)
- d) The introduction of exotic species of plants and animals.
- e) Pollution of air, water and soils within the borders of the protectorate.

2.2 Location and Size of Lake Burullus

The Lake Burullus is a large, shallow, fresh to brackish salt-water lagoon, located on the coastal bulge of the north central delta region between the *Rosetta* and *Damietta* branches of the Nile with a size of about 595 hectares.

The lake lies between longitudes 30° 35' 00'' east / 31° 8' 00'' east and latitudes 31° 22' 00'' north / 31° 37' 00'' north. It is about 65 km long and has a width between 6 and 21km. The depth ranges from 50-200cm with an estimated average depth of 0.75-1m (average depth = 0.8m). (Reid/Rowntree, 1982, 35).

The depth increases from the east to the west and from the south to the north. The eastern area near the town of *Baltim* has a depth from only 15-20 cm. The maximum water depth is during November and the minimum is during February. The coasts of Lake Burullus, particularly the southern shores are irregular. The eastern area (close to *Baltim*) is commonly free of water when the northwest winds blow; there is a concomitant increase in the lake water level in the west at this time. Therefore the level of the lake is affected by both the amount of drainage water and the water exchange with the Mediterranean Sea which depends of the wind direction.

As the second largest of the Nile delta coastal lagoons, Lake Burullus is connected to the Mediterranean Sea through one outlet known as *Boughaz Burullus*.

This outlet suffers from the situation, especially the shoaling of its channel has created difficulties for navigation of the inhabitants, mainly fishermen. All of the drains and canals that flow into Lake Burullus enter the lake on the southern shore. They flow out into the open Mediterranean Sea at the *Boughaz Burullus*.

The outlet lies on the northeast corner of the lake, close to the fisher port of *Burge El-Burullus*. The opening is 400-500 m wide, and during storms seawater rapidly invades this part of the lake.

The coast has always been unstable and at the present time it is in a critical situation. The narrow coastal strips, separating the sea from the lake on each side of the *Boughaz*, are a risk to the formation of branches, and the protective dunes on the eastern side have been rapidly eroding. (Reid/Rowntree, 1982, 37).

In comparison with the other lakes in the delta, the Lake Burullus with the wide opening to the sea remains the one with the most marine environment. Despite this, however, since the completion of the Aswan Dam in 1965, there has been a significant increase in the proportion of freshwater fish, caught in the lake.

As already mentioned the lagoon is separated from the Mediterranean Sea along most of its length by a long sand dune bar, but it is connected with the open sea by a narrow channel near the village of *El-Burge*, in the east. As a result, there is a strong salinity gradient from east to west, with the western part of the lagoon containing relatively fresh water.

The site is an important wintering and staging area for birds, including² *Ardea cinerea*, *Egretta alba* (58), *E. garzetta* (276), *Ardeola ralloides* (145), *Ixobrychus minutus* (14), *Anas penelope* (24,997), *A. crecca* (2,094), *A. clypeata* (13,928), *Aythya ferina* (7,358), *A. nyroca* (281), *Circus aeruginosus* (115), *Porphyrio porphyrio* (8), *Fulica atra* (15,790), *Recurvirostra avosetta* (2,818), *Vanellus spinosus* (48), *C. alexandrinus* (617), *Tringa totanus* (3,378), *T. stagnatilis* (66), *Calidris minuta* (784), *Larus cachinnans* (128), *L. minutus* (3,906), and *Chlidonias hybridus* (3,530). The extensive *Phragmites* beds in the southern and eastern parts of

² Figures refer to winter 1989/90; data provided by the Egyptian authorities (Jones: 1998: 7).

the lake, currently covering about 20,000 ha, provide an important breeding habitat for *Ixobrychus minutus* and *Porphyrio porphyrio*. (Jones: 1998: 7)

3 Environmental Setting

There is little information available about the physical and ecological aspects (climate, geology, geomorphology, hydrology soils, fauna and flora etc.) within the BURULLUS PROTECTED AREA. Most of the data that has been collected is in general about the Nile delta and around the northern region.

3.1 Climate

The climate is commonly known as the Mediterranean type, which is distinguished by decreased rainy and cool winters as well as dries and hot summers. The Lake Burullus is therefore situated according to the climate within the Mediterranean coastal region.³

3.1.1 Temperature

Lake Burullus is located within the warm temperate zone. During winters the region usually has the minimum temperatures with the annual average of 13.3° C (January). In the springtime (March-June) the temperature increases steadily. In summer the temperature reaches a maximum of 26.6° C (July). Until autumn the temperature follows a gradual decrease. The annual average temperature is therefore around 16.6° C. The water temperature of such a shallow lake usually follows similar procedures of change due to the annually circle, being at minimum in the month of January and at a maximum in July. (El-Gazzar, 1998, 71).

³ According to the map of the world distribution of climate Regions from UNESCO, the northern part of the Delta region belongs to the arid region.

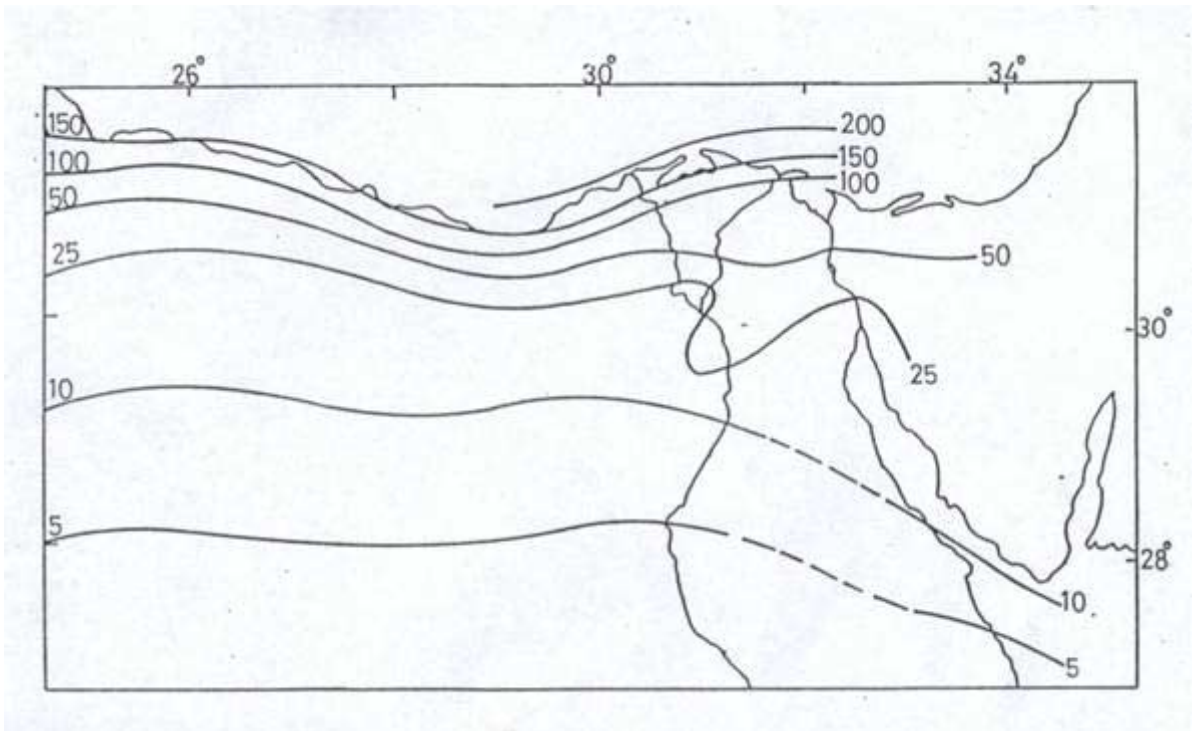
3.1.2 Precipitation

The Mediterranean coast of Egypt is considered as the rainiest region of the country (only *Rafah* in the north Sinai close to the eastern boarder has higher precipitation, around 300 mm per year).

The rainfalls at Lake Burullus start usually in the late autumn and during the winter period (December to February) while the other periods of the year (February to November) are mainly dry.

The average annual precipitation is around 200 mm per year, but varies from year to year, with an oscillation between 150 – 300 mm. (El-Gazzar, 1998, 72).

Map 2: Precipitation in northern Egypt

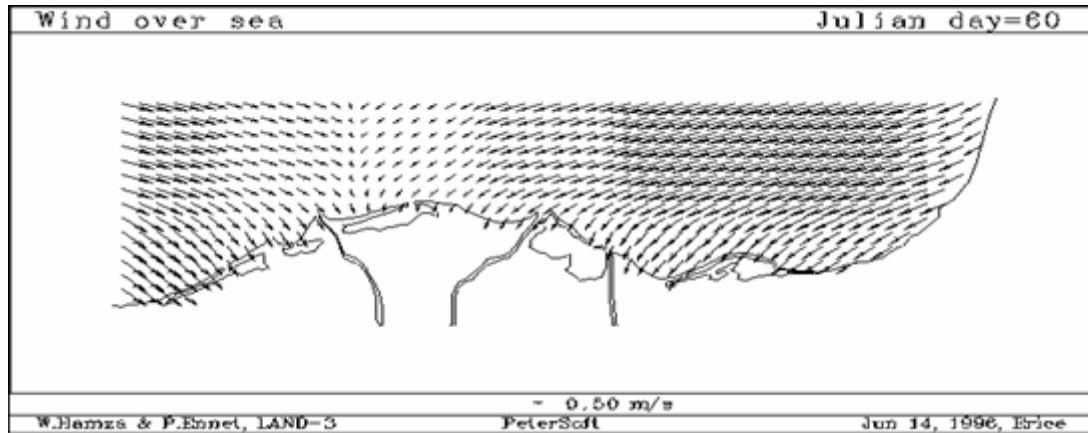


3.1.3 Wind Movement

The reason for the main wind direction in January and August (summer), where the wind blows predominantly from the north to the northwest, are the “Etesians”, a wind system formed in the western part of Turkey.

These air masses adsorb humidity from the Mediterranean Sea and carry it towards northeast Africa. The air stream heats up when it reaches the coastline, so the wind is able to increase the water holding capacity (the air is able to hold a certain amount of humidity depending on its temperature). As an effect the Delta region has a hot and dry summer period with the dominant wind that is blowing most of the time from western direction.

Map 3: Wind movement on the northern coast of Egypt



3.2 Water Resources

The lake receives water from two origins. The seawater enters the lake through the inlet at *Burge El-Burullus* and The Nile water enters through **six drains** and one fresh water channel. Listed from the west to the east, the drains and canals that enter Lake Burullus on the southern shore are the *Brimbal* canal (*Nashart* outfall), *Tira* pump station (from *Nasser* drains), *Ghabai* drain and *Burullus* drain. All are discharged water pours in the southern part of the lake.

The lake-sea connection (inlet) is sometimes closed in year - in springtime due to the movement and accumulation of sand along the coast (compared with the wind direction during this period).

Since the completion of the Aswan dam in 1967 the inflowing fresh water in the lake has increased. In 1967, the flow of four drains was 1,736 Million cubic meters. This inflow resulted in an average lake water level of 0.25m above the sea level. In 1970

the two new canals (Burullus and Nasser canal) have been opened, so that the water inflow increased up to 3.207 Million cubic meters. (Reid/Rowntree, 1982, 37).

This additional water was sufficient to raise the average level of the lake to 0.33m. As a reason the drainage water, which entered the lake, must have been partly lifted several meters by pumps. Today the water level has decreased again and there is no new information available about the amount.

The increased flow of fresh water in the lake since the construction of the Aswan dam has developed a reed bed around the shore of the lake with the greatest concentration in the southwest and southeast corner. The higher amount also increased the extension of reeds around the islands of the lake and in the area near the *Hamoul*⁴ reclamation in the east. (Reid/Rowntree, 1982, 40).

The climatological conditions in the Delta region play an important part in shaping the landscape and in controlling its ecology. They include extreme aridity, long hot rainless summer periods and mild winters in which storms rarely occur.

3.3 Physical Environment and Natural Land Cover (Soils and Geology)

The delta region covers 3 30' longitudinal degrees: 30 00' east / 33 30' east. This area consists of about 75% of the whole continental shelf of the Egyptian coast, which has an extension to a depth of about 350-400m.

The main features of the delta area are the following:

- a) A wide shelf area with a shallow coastal depth. That was mainly due to the river Nile deposition, when the Nile formatted the delta since immemorial time.
- b) A great amount of freshwater discharge through the main land-runoff along the identified area. These freshwater quantities are discharging annually not only due to the river Nile water, but also to the discharging quantities through the coastal lakes like Lake Burullus connected either directly or indirectly to the Mediterranean coastal area of Egypt.

The lake is separated from the Mediterranean Sea by a strip of terrain covered with coastal sandbars and sand dunes. The sandbar varies with a width from about 4.5km in the eastern boarder of the BURULLUS PROTECTED AREA to around 0.5km close to the *boughaz* Burullus. The are to the east of the *Boughaz* and going towards the town of *Baltim* is also covered with Mediterranean coastal sand.

The soils of the Nile delta are mainly alluvial. The soils in the eastern end of the lake are clays or clay looms of about 1m depth, overlying marine shells, sands, and silts. The soils along the southern boarder of the lake are very saline, silts and clays. (Reid/Rowntree, 1982, 38).

Four geomorphic divisions can be classified:

- a) Young deltaic plains
- b) Old deltaic plains
- c) Coastal plains
- d) Aeolian sands

In conclusion it can be said, that inhabitants influence all of the soils in the delta and the soils can be called man-made, except the soils in the northern part.

“The low layer of Delta flat is separated from open sea by narrow belt of SILIC SEMISTASTIC ERGOSOLS.

This sand dune bar grows in the littoral of the shallow sea and gradually separates closed lagoons, which consequently turn into salty lakes and then with gradual silting into MARSHY SOLONCHAKS.

Again we have the process of the gradual uplifting and consequent desalinization. All stages of this process may be observed in the northern part of the Delta.”⁵

Inside the lake there are about 50 uninhabited islands. Some of them are covered with water during high water periods and others are permanent homes for local and migrating birds. Due to the new decrease of the water level the number and size of islands have increased. The islands of Lake Burullus, primarily in the middle section where the lake is the widest, are not sufficiently large enough to compartmentalize

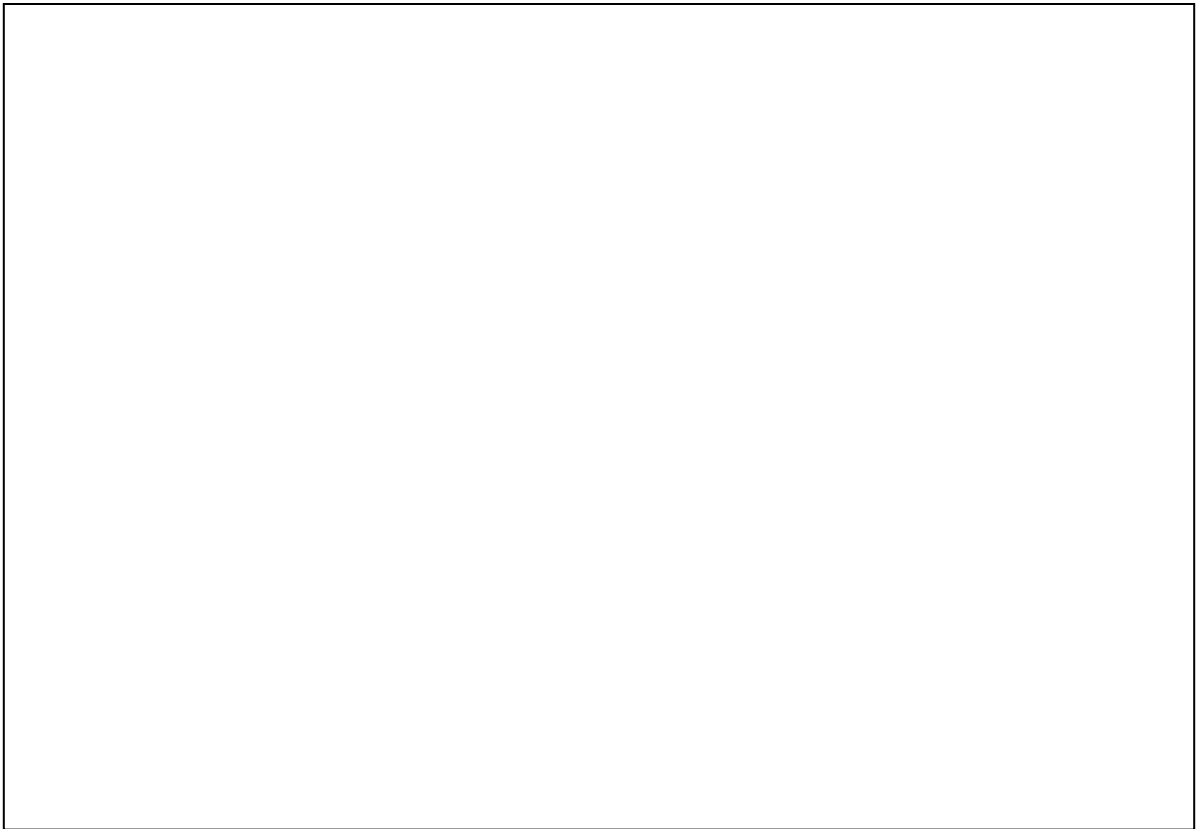
⁴ New reclamation land in the east of the lake Burullus, developed since 1956.

⁵ Quotation from Al-Sodany:21:1998.

the lake, but expanding beds around their margin increasingly restrict the free flow of water.

The islands near the lake-sea connection are of sandy nature while those far from the *El-Boughaz* inlet have a clayey bottom. Some of the islands are covered with water during high water periods.

Photography 1: Lake Burullus from the north to south (Island and Wetlands)⁶



The protected area includes a wide diversity of wetland environments. The habitat range from fresh water swamps the already mentioned reed beds on the southern boarder to the salt marches and mudflats in the northern part of the lake.

⁶ The picture has been taken out of a plan in July 2000.

3.4 The importance of Wetlands

Wetlands are among the most productive ecosystems on earth. Why are they so fruitful? Because they offer something for everyone: As hybrid environments—neither land nor water—wetlands provide living space and food to aquatic, amphibious, and terrestrial species alike. And because water levels in wetlands fluctuate over time, a great many different species will find conditions to their liking, each at a different time of the day or year.

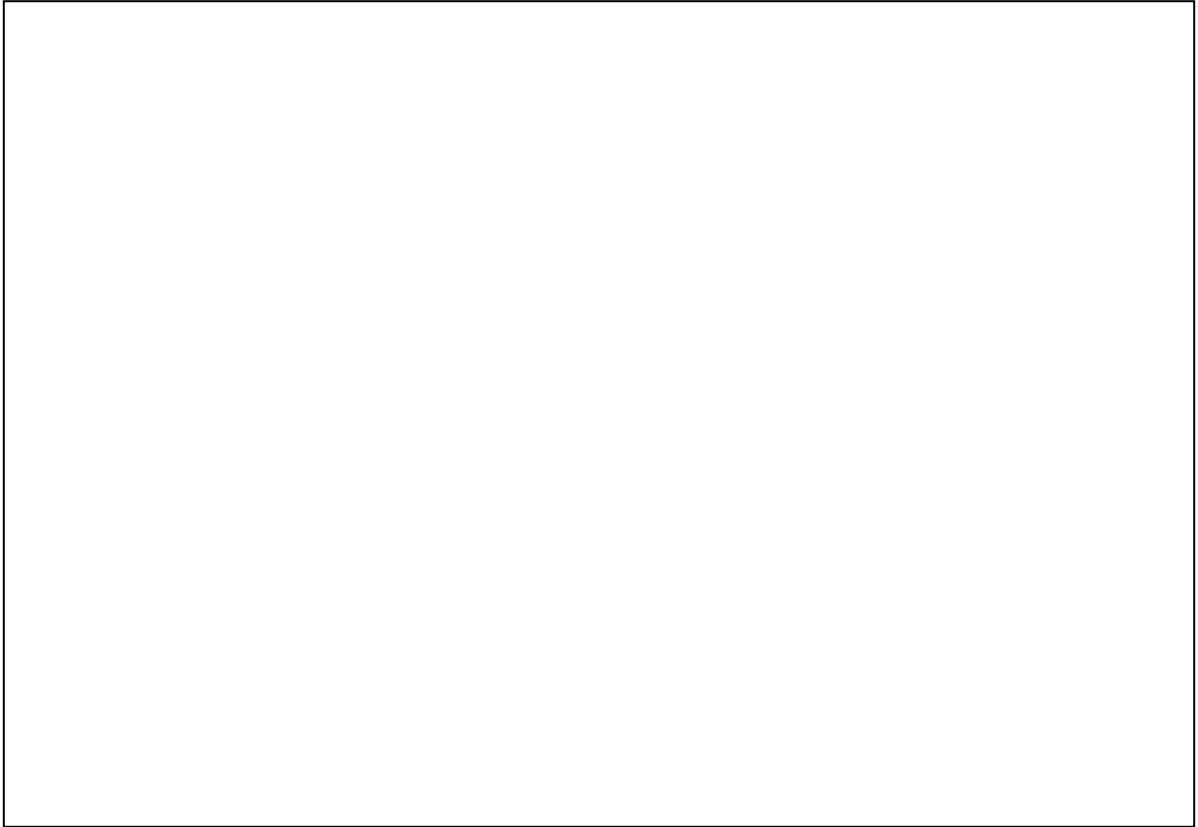
Despite their richness, marshes, swamps, bogs, and other wetlands have historically received bad press, often condemned as worthless and pestilential wastes. Many wetlands the world over have consequently been destroyed in the name of development. Only recently have scientists, land-use planners, policy makers, and the public at large begun to appreciate the inestimable value of wetlands and the critical role they play in ecological processes, the effects of which may be felt far beyond the borders of the wetlands themselves.

Wetlands serve as indispensable habitat for a wealth of creatures of every sort. Many of these—including species of shellfish, fish, waterfowl, and furbearers—support significant economic and recreational activities.

Regrettably, recognition of the benefits that wetlands confer has come too late, if at all, to many places. Wetlands today probably occupy only half the area they did in historical times. The rest was appropriated for use as farmland and construction sites or otherwise destroyed. Wetlands that have escaped being filled, diked, ditched, drained, dredged, drowned, or degraded now account for only about 6 percent of the land and shallow water on earth.

A major factor in the decline of wetlands is the concentration of human populations near water. About three-quarters of the world's people live by the coasts, shores, and banks of oceans, inland seas, lakes, and rivers. The relentless quest for additional land to farm and build upon has doomed many wetlands. Many others have served as dumping grounds for solid waste, or have been contaminated by sewage, runoff from farmlands and highways, and other by-products of civilization.

Photography 2: Wetland on the northern shore of lake Burullus (close to *El Burge*)



The desire to protect the housing, farms, and factories that have been built in floodplains has caused many rivers to be dammed, canalized, and hemmed in by levees. Dams are erected not just for flood control but also to impound water for agricultural and municipal use and to generate electricity.

Unfortunately these works of engineering usually alter the ecology of the rivers and their basins and exacerbate flooding problems upstream and down. Wetlands behind the dams drown. Wetlands below the dams dry out when their supply of water is bottled up in reservoirs or diverted to fields and towns, and actually this is happening with Lake Burullus.

4. Land Use activities

The land use and domestication of plants and animals started in the delta about 7,000 years ago. The history of land use in the delta should be always considered in a close association with the history of irrigation.

Many forms of land use, including construction, open-cast mining, agriculture, and forestry, involve disturbing or removing vegetation cover are existing. When this disturbance generates further environmental and economic problems, the land may reasonably be considered misused

In most countries, increasing pressure to use land for economic development is leading to conflict. Farmland, wetlands or other land close to cities may be sought by developers to convert into suburbs, roads, or tourism centers. Developing countries in particular are frequently faced with a dilemma. Their need for money leads them to liquidate their forests and modify their savannas to obtain cash crops for export, yet they must conserve these same ecosystems to guarantee resources for the future.

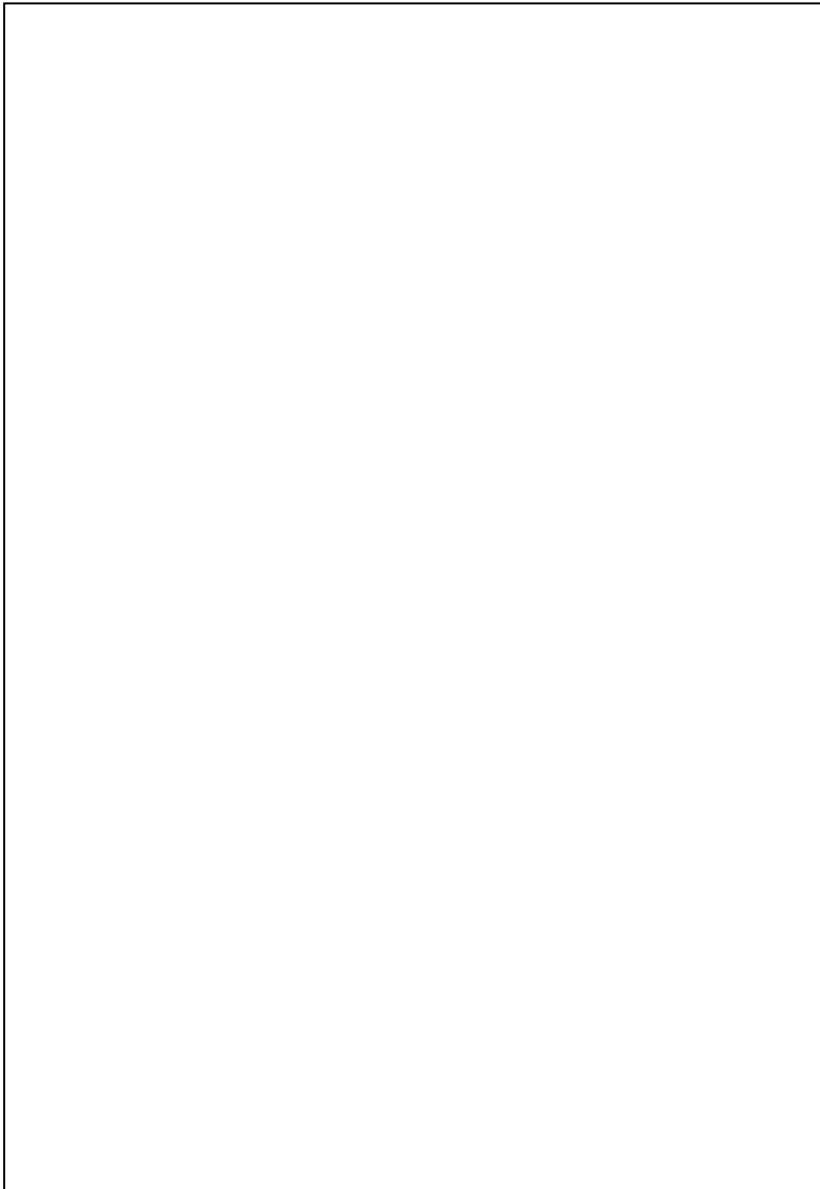
The diversity of human values both between and within societies guarantees that issues of land use will never be free from conflict. In most instances, the clash occurs between those who will be directly, and often adversely, affected by proposed developments and those who stand to gain economically from them. Since the amount of land is effectively finite, the rapidly growing global population ensures that competition for land must increase. Only a revolution in attitudes concerning the uses of land, and the long-term consequences of those uses, will optimize benefits for the greatest number of the vegetation inhabitants, including humans beings.

In accordance with the standard land use system implemented by the World Land Use Commission (WLUC) In Egypt several land use categories can be identified, especially in the delta. The different land use types can be summarized as the following:

- a) The settlements and the non-agricultural territories, this includes public land and urban areas like the land along the coastal sandbar and the communities of the two main towns *Burge El-Burullus* and *Baltim*.
- b) Horticulture (that covers about 1.1 % of the total crops area in the deltas) but this area is widely spread and diffused inside the BURULLUS PROTECTED AREA.

- c) Tree crops represented mainly by groves of palm trees. These groves are wide spread along the delta. There are mainly groves of palm trees along the eastern shore of the lake between *Burge El-Burullus* and *Baltim* which are standing close to the lake.
- d) Permanent cultivated cropland is the dominant land use type, in major parts of the delta, especially along the southern and southwestern boarder of the BURULLUS PROTECTED AREA. The crops are predominantly irrigated by Nile water. There are seasonal or yearly agricultural vegetation, e.g. the cotton bush is planted every year new.

Photography 3: Land Use structure on the southern shore of Lake Burullus⁷



“The *Barari* land, swamps and marches, around the lakes in the north delta, including some 631,500 ha, is unproductive, but are potential cropland, under reclamation. The northern tip of the delta is the sand dunes belt of grazing, fish farms and recently reclaimed areas.”⁸

4.1. Agricultural activities

There are apparently no agricultural activities in a zone of 1-2 km south of the southern shore of the lake and in the southwest. The demarcation between farming and bare land seems to be clear.

In the southeast is the distance between the lakeshore and agricultural activities even longer, although some scattered farms exist in this area. In the last decade there have been a development of fish farms especially on this shore of the lake and today the main activities consists of the construction of many ponds for various fish types.

The area near *Baltim* is intensively cultivated, mainly with date palms. There is a tendency to create further fish farms because their economic output per feddan is much higher than any agricultural productivity. It should be noted that a combination of the two products could rise the total economic output.

The absence of agricultural activity close to the lakeshore is due to several factors: poor soil types, high soil salinity, inadequate irrigation water and saline water in the water table. These circumstances are a reason for the tremendous development of fish farms close to the southern and especially south Eastern Shore of the Lake Burullus.

Because of new reclamation efforts on the wasteland area of the scheme the government decided to establish the model *El-Zawia* Fish Farm, in the beginning of the 1980's. Since then the fish farm is quite successful except for the fact that it has been operating at ½ of its capacity.

Due to the shortage of clean water in the mid delta it does not only affects the *El-Zawia* Fish Farm but also affects many of the private fish farmers in the area as well as the agricultural farmers.

⁷ The picture has been taken out of a plan in July 2000.

⁸ Quotation from Al-Sodany:10:1998.

4.2 Fishery in Lake Burullus

With about 31% of the delta lakes area, Burullus produced only about 21% of the landed fish tonnage in all the delta lakes between 1980 and 1990.

Lake Burullus has the most productive Mullet fishery of the delta lakes due to the wide lake sea connection, which allows high recurrent of Mullet from the sea each year. The Mullet is many times bigger the size than the Tilapia and their value per kilo at several times is higher the price than the more common species.

The warm, shallow waters with large amounts of organic materials offer ideal food possibilities for the growing Mullet fry, particularly the calm areas near the shore and around the islands. But due to the fact that the water of the lake is becoming increasingly fresh water, the amount of the Mullet has decreased in the last decades. Throughout the 1960's and 1970's the production of Mullet of Lake Burullus was higher than the other lakes. Today there are around 3,500 licensed boats on Burullus, entirely classed as third class boats. The boats on Burullus are larger than those of the other lakes. There are considerably numbers of large *markebs* and may intermediate sizes of *faloukas* as well as large size canoe-like boats. The often-turbulent water in this large and windy lake requires larger boats. Strings of smaller boats can often be seen for the use at the fishing site, being towed behind larger boats.

In the shallow areas the fishermen do wire trap fishing especially in the shallow areas near some islands and along the shoreline, for this method they use various types of fishing nets.

But the fishery performance of the Lake Burullus is weak and the reasons are several factors. The main one is the new hydrological regime caused by the construction of the Aswan High Dam, which has significantly affected the fertility of the lake.

On the one hand, the lake receives no longer the fertilizing Nile sediments, which were brought by the yearly seasonal floods. On the other hand, there has been an increase in the nutrient-poor drain water flowing to Burullus. An investigation of the impact of the new water regime on Lake Burullus concludes that a gradual decrease of fish products is expected. Furthermore the lake receives one of the highest nutrient-rich sewage which changes the water quality and leads to eutrophication. (Reid/Rowntree, 1982, 41).

While there are some feddan around the lake which have proven to be very productive (e.g. part of the *Hamoul* Scheme), the general experience in the region of Lake Burullus indicates that there are a number of limitations for a land use in agricultural development.

Highly variable soil conditions, many sandy soils, high salinity conditions, and inadequate irrigation water, are all conditions, which limit the profitability of reclamation efforts. Water availability limitations also constrain the further development of fish farming in the area. The main economic output is developed by the fishermen, which are using the lake the whole year.

The Lake Burullus is until today the least polluted of the northern Delta lakes, the increasing quantities of agricultural drainage water with heavy pesticide and fertilizers lead to significant change in the water quality. These increased drainage water and the combination of occasional siltation and the closure of the *Boughaz* lead to a continuous growth of reed swamps and e.g. reduce the fishing opportunities for the local fishermen. The fishermen therefore look for compensation and in many cases they start hunting birds which is prohibited since 1998. They cause continuous disturbance to local and migrating waterbirds, forcing them to use less favorable habitats or breeding areas. Especially in the wintertime the catching of waterbirds is widely spread e.g. the Quails nets of the coast that are spread over the whole coastal areas and many of the sand dunes in the east are covered with fence like nets along their summits.

With these method and additional with the hunting with shotguns and lime thousand of birds are cached every year. So the Anthropological stress toward the natural environment is increasing and since the construction of the national highway along the sandbar in the north increasing. It is important to compromise in cooperation with the local decision-maker and especially local land users. When the resources of local inhabitants and local environment are endanger than the participatory approach and therefore the planning begins to become seriously essential.

5 Land Use Planning

The aim of land use planning yields to create the preconditions to achieve a sustainable, environmentally, socially desirable and economically appropriate land use. Such requirements are best met by a decentralized approach. Consequently the key principals of decentralized land use planning “gestion de terroirs” are more likely suitable on local context, in a flexible and transparent participated approach.

Present day sources of conflicts in land use planning include traditional rights of local communities and the need of expanding urban and industrial centers. Many divergences developed out of the need for extension or intensification of the agricultural land use versus the biodiversity as well as the value of non-polluted “natural” landscapes.

People’s needs will drive the planning process. Local farmers and other land users like the fishermen in Lake Burullus whose existence is depend on the lake must accept the need for a change in the land use, if they want to live with good results. Land use planning must be seen as a positive activity to gain sustainable environment protection measurements.


The objectives of a further land use planning is influenced by the already mentioned land use types in the delta but it also has to take into account the social and political culture, that the inhabitants of this region follow.

The continuous reduction of the surface of Lake Burullus and its adjacent reed swamps and marshlands as a result of the substantial land reclamation poses the most serious threat to the wetland ecosystem. The growing eutrophication supported by the excess fertilizers and pesticides adds the danger of the shrinking area of the lake.

5.1 The planning System and the planing process in Egypt

The basic development for the Egyptian planing is the master plan. This document consists all the important data collected in a report and has additionally a map included. The local planing authorities produces these reports.

There are four levels of planning procedure in Egypt:

- a) The national level (national plans)
 - b) Regional level (Regional plans)
 - c) Local level (local plans)
 - d) And the level of development control
- 

The first two can be characterized as strategic and the local levels as well as the development control are concerned about the implementations. In the last decades many (about 4000) villages have been developed without a concrete physical planning process. According to the lack in physical planning the Egyptian Government tries to intensify the attendance to the development processes.

The establishment of the Organization for Reconstruction and Development of Egyptian Villages (ORDEV) and the law 3/1982 for physical planning demonstrate the change in the acknowledgement of the government. To change and improve the Egyptian Villages the law 3/1982 distinguishes between master and detailed plans In the first two levels of planning the master plan is prepared and later by the local authorities in detail work out.

The General Organization for Physical Planning (GOPP) is responsible for the setting of the national physical planning policy and work together with the Ministry of Housing and urban communities. Additionally the GOPP assists the local units with the detailed preparation and implementation of their master plans.

The principal organization in charge in the local level is the Governorate Physical Planning Committee (GPPC) which was established by a governments degree. They receive the master plans from the GOPP and include local officials, local experts (professionals e.g. Professors from local Universities), the popular council, members at the governorates level and selected citizen from the city or village, into the decision making process.

This system for physical planning is officially work out, but in many cases the are no veto rights for the popular council or for the participants from the communities (Villages or cities). Still is the detailed physical planning entirely left to the local administration. The involvement of all land users in planning is essential. Ultimately they have to put the plan into effect and must therefore believe in its potential benefits

as well as in the fairness of the planning process. Without the support of local leaders, a plan is not likely to succeed. Achieving effective public participation in the planning process is one of the main goals. Consequently is the detailed physical planning an instrument for social, economic, and urban development at the local level, the extension of the capacity of local development competence will be a major role in the process of a subsidiary local development.

Through the primary purposes of management will determine the category to which an area is assigned, management plans will often contain management zones for a variety of purposes, which take account of local conditions. However, in order to establish the appropriate category, a least three –quarters and preferably more than the area must be managed for a primary purpose, and the management of the remaining area must not be in conflict with the primary purpose.

The BURULLUS PROTECTED AREA is not an isolated unit. Ecologically, economically, politically and culturally, they are linked to the area around them. For that reason, the planning and management must be incorporated within regional planning and supported by the policies adopted for wider area. For the purpose of the application of the categories system, however, where one area is used to buffer or surround another, both their categories should be separately identified.

5.2 Zoning and Buffer Zones – Recommend Land Use Structure for the Protectorate

Zoning is increasingly considered as an essential management tool, because it allows the fine tuning of regulations to meet the particular requirements of the various types of areas included in the reserve. In addition, the protected area concept includes areas where some land uses may be kept. Therefore zoning becomes necessary to separate these zones from those in which stricter rules apply.

As a result, protected areas no longer appear as massive entities where all land was subject to the same prohibitions or restrictions, but rather are mixtures of individual smaller protected area each with a different legal regime. Theses regimes range from strict nature reserves or wilderness areas (Zone A), where almost all human activities

should be prohibited, to a buffer zone (Zone B) where only certain activities should be allowed by getting controlled.

- a) Zone A is a strict nature reserve with only exceptional and highly regulated human use. This area supposed to be closed for any economic activities as well as visitors and should remain for the migrating birds and for selected scientific use.
- b) Zone B should have no economic activities, except organized tourism or other forms of visiting the area, for example school trips. The land use needs to be compatible with the maintenance and preservation of wetland conditions.

It is suggested to create the first Buffer zone on the island, because they are not inhabited and the swamps and wetland with reeds on their shore are an important Bird breeding and resting area. Further proceeding should be a slow increase of the protected area in further coordination with the local landowners and especially the fishermen and their families.

The detailed separation of the zones in the land use map remained rough, due to the shortage of time. It shows some suggestions only given through local decision-makers and the experts. Additionally to the zoning system it is recommended to start the project by a pilot area. The further propositions are accomplished in the map for “LAND USE AND LAND USE PLANNING ON THE BURULLUS PROTECTED AREA”.

The map shows the current significance of natural environmental settings and points out the main local development activities. Additionally it shows the recommended zoning with the special Pilot Area and concludes first local differences.

The Pilot area is supposed to comprise a visitor center, a guesthouse for scientists and natural Vegetation where the habits of wildlife can easily be observed. The area located between the two different landscapes with the coastal Sandbar to the north and the mainly saline part of Lake Burullus in the south. Further it close to the main local settlement so e.g. school classes are able to visit the location. The location in suggested in an open area there are currently no inhabitants nor other land users who occupy the tertiary on the northern shore of the lake, an immediate a fast further detailed Analysis of the local circumstances would be necessary.

Because of the high eutrophication of the lake and the fact that the current inlet is sometimes closed because of sand movements (continuous dredging is needed to keep the inlet open to the Mediterranean sea) an additionally Inlet is recommended in the

handout. Furthermore the construction of piers on the existing inlet is important to maintain an adequate low salinity level in the lake.

The Mubarak National Project for Youth (MNPY) under the slogan “working for a piece of land” lies on the western boarder of the Protectorate. The Agricultural development on 8.000 Fed., 25 Feddan per family unfortunately without environmental obligations this project will lead to more sweet water inflow into the lake. The two recreation Project MNPY and the 25.000 Feddan on the northern Sandbar that are proposed for Tourism development will change the land use in the Northwest of the BURULLUS PROTECTED AREA fundamentally.

The use of land for recreation poses many challenges. In this built-up area, the competition for land for buildings and transportation is intense rising, and land values are high as a result (even to high trough land speculations). Land for recreation rarely generates the same income for its owners as agricultural plots. Nevertheless, the provision of amenities for recreation is central to modern urban planning.

6. Recommendations and Perspectives

The BURULLUS PROTECTED AREA is currently used by several groups of people. The activities of these local actors, so as fishermen, farmers, pastoralists, military personal, hunters and visitors (like Egyptians and foreign ornithologists) are mainly incompatible with the wildlife conservation. The most significant primary impacts related to the projects locations are:

- a) The loss of natural habitats and increased pressure on remaining wild animals and wetlands. The desert reclamation scheme will lead to the loss of important habitats for flora and fauna and by the same time there will be a negative impact on populations of flora and fauna elements, which have a limited distribution range in the region.
- b) Displacement of existing natural population and of land use activities.

A supplementary participation of local people in conservation efforts is needed. To achieve this goal the participation must be more than encouraging local people to sell

their labor in return for food, cash or materials. The affected should make effort to build up local skills, interests and capacity.

To meet an appropriate process for participation and to achieve the sustainability and biodiversity goals the following recommendations should be taken into consideration. A further detailed management plan that investigates the human and wildlife land use of the reserve over a long period should be prepared.

It is essential for the preparation of the plan that it includes the interests of governmental as well as other national agencies so as North Sinai Government, Egyptian Wildlife Service, Ministry of Interior, Ministry of public works, Ministry of Tourism, General Authority for Fish Resources Development and the Egyptian Environmental Affairs Agency. Furthermore the local fishing cooperatives operating in the Lake Burullus, the villages around the BURULLUS PROTECTED AREA and the inhabitants living permanent inside the reserve should be incorporated in this process. The real threats to the reserve originate far away from the area's boundaries. The activities around the borders are reflecting this pressure.

It should be noted that developing activities, trying to diminish pressure on the protected area, has to be coupled to regional and national development programs. This means that good cooperation between conservation organizations, development agencies and governmental institutes are necessary. The data collected will support the proposed conservation measures and they indicate that the management plan should consider the conservation plan for the entire BURULLUS PROTECTED AREA.

It has been noticed that villagers of *El-Burge* and other communities (e.g. *Baltim*) on the eastern and southern shore of the lake are collecting huge piles of reed stems to use them - after they have been dried in the sun - to weave mats for selling. The growing of reeds provides not only a new breeding area for the local birds, also a new resource of income for the inhabitants.⁹ This has developed out of the changing ecological system. Since these reeds are the habitat for a large number of nesting birds and the spawning territories of fish, their cutting is leading to a serious implication for these species. Such a massive scale will lead to a critical circumstance

⁹“These mats are used in thatching roof tops of small houses of limestone bricks, and as wind breakers for fencing plantations of tomatoes and other vegetable on the sand bar separating the lake from the sea. Broken reed stems are also used for mulching the soil in the newly reclaimed land around the Lake.” (El-Gazzar, 1998, 107)

for the fauna of the lake and it is not compatible with the goal to protect local and migrating birds, fish resources and the wetland regions.

The establishment of a functional sustainable BURULLUS PROTECTED AREA where the local decision-makers and the local land users are totally fulfilling the environmental assessments is in the current stadium of development very difficult. Little steps are been taken into the direction of public awareness and towards the understanding of the protection of natural habitats. But still too many inhabitants depend on the lakes resources e.g. the hunting of Simon birds in the east of *El Burge*.

Regarding to the demographic development and the future public pressure on the resources of Lake Burullus a deeper and intensive participatory approach is necessary. Now that the current and main land use problems are clear a Masterplan is needed to be developed in very close cooperation with the local authorities, local inhabitants and the project participants and consultants. It is essential that this plan includes long term sustainable goal that are reachable and not far beyond.

The Lake is nowadays in a good condition for the current use, but in the near future the rising amount of pesticide and fertilizers, that are entering through the canal the lake, will extent the level of eutrophication. The water becomes polluted and the fish population will not be able to survive (lack of oxygen). So unfortunately it is indispensable to predict this now growing and dangerous circumstance and attempt to reach in the next year a planing process that incorporates all local actors and technical requirements.

For the needs of the current land users e.g. Fishermen and agriculturist, there should be a plan for compensation and integration in the short-term process. And in the long term it is important to create other employment opportunities. If this will not be the case inhabitants will continue using the resources of the lake and in some situations e.g. inhabitants could leave the Region because of the polluted lake or national protection laws in the area and rise demographic pressure in other rural or urban districts. Therefore a new attraction and productive industry e.g. cotton or fish factories that keep the people in the area and draw them to change their way of living is desirable.

This process can only be changed over Generations and here lies the precarious development. For the natural Vegetation and for the local and migrating birds it could be to not on time. For these reasons the local needs are the most essential to be

satisfied too maintain a sustainable protection for the environment. These changes could start by the pilot area. It should create a magnetic pole for local communities, schools, universities, and other person or family that can be interested in animal wildlife. This is one of the main reasons for the pilot area. With an open visitor center, which should be build close to the city *El-Burge El-Burullus*, the interest and the environmental awareness could be increased. Furthermore to create more attention and interest the inhabitants should be directly involved in the planing and constructing of the pilot area.

The participation of them is very important and will change their attitudes and opens a new way of thinking, we as planners should be the participants on their project. It is important that they identify themselves in the planing and implementing process. When the local inhabitants feel part of development and progression than the EEAA can be sure that the protection of the remaining wetlands, and of the local fauna and flora, as well as the migrating bird is guaranteed.

6. References

AL-SODANY, Yassin Mohamed: Vegetation Analysis of the Canals, Drains and Lakes of the Northern Part of Nile Delta. Botany Department, Faculty of Science, Tanta University, Tanta, 1998.

EL-GAZZAR, A.: Wetlands of the Mediterranean Coast of Egypt. Department of Biological and Geological Sciences Faculty of Education at El-Arish, North Sinai, El-Arish, March, 2000.

HAMSA, Waleed: The Phenomenology of the Mediterranean Egyptian Coastal Area. Mediterranean Forecasting System Pilot Project, ECOC (Ecosystem Model Validation and Hindcasting) Participant (n. 28, UALEX), Alexandria University, Alexandria, 1999.

JONES, Tim: A Directory of Wetlands of International Importance (Ramsar, 1993), 4th edition, Volume I: Africa, *The Ramsar Library*, File 2: Algeria to Guinea, Gland, Switzerland, 1998.

LOTFY, Morad/RASHED, Mohammed and FRIHY, Omran: Sediment Drift pattern in the vicinity of Lake Burullus Mediterranean Sea communication outlet; relationship to channel siltation. Coastal Research Institute, Geology Department, Faculty of Science, Alexandria University, Alexandria, 1995. (http://www.imbc.gr/biblio_serv/medcst/X0125_088.html)

REID, Turid and ROWNTREE, John: The Northern Nile Delta Lakes and their Fisheries. Agricultural Development Systems Project ARE Ministry of Agriculture – University of California, Economics working paper No. 90, USAID, Cairo, September, 1982.

REID, Turid/ROWNTREE, John/KHOLI, Osman and ABOU-AUF, Abbas: Fisheries Management in the Northern Nile Delta Lakes of Egypt; The Case of Hoshha. Agricultural Development Systems Project ARE Ministry of Agriculture – University of California, Economics working paper No. 179, USAID, Cairo, July 1983.

ROWNTREE, John/REID, Turid and ABOU-AUF, Abbas: Fish Yields in the Northern Nile Delta Lakes. Agricultural Development Systems Project ARE Ministry of Agriculture – University of California, Economics Working paper no. 155., USAID, Cairo, May, 1983.

SHEHADEH, Ziad and FEIDI, Izzat: Aquaculture Development and Resource Limitations in Egypt. Fisheries Department Newsletter, Aquaculture Newsletter No. 14, Based on an unpublished FAO mission report, Cairo 1994.