Chapter 15
Management Plan

The National Working Group, established under the Project Development Fund (PDF) for the MedWetCoast Project, selected Burullus Wetland to prepare a management plan for many reasons. The first is the high value of the Lake as a breeding area for water birds, both on Egyptian and international scales. In addition, Lake Burullus is a less disturbed wetland in Nile Delta, and is the second largest lake. Moreover, the biodiversity of Lake Burullus is relatively high (more than 700 known species) including 9 endemic species and about 12 threatened species. The fourth reason is the declaring of Burullus Wetland as a Reserve under Law 102/1983 in May 1998, including the whole lake and the sandbar lies between the northern shores of the lake and Mediterranean coast. After a detailed description, the site has been evaluated along the environmental, social and economic scales (Kassas *et al*. 2002).

15.1. EVALUATION

15.1.1. Ecological Criteria

15.1.1.1. Fragility and threats

Burullus Wetland shares the ecological fragility of aridlands and the threats of unsustainable use of natural resources. Many species, and habitat types in Burullus are threatened by the impact of human activities. Drying parts of the Lake, removal of large quantities of sand from the dunes, uncontrolled reed cutting, bird hunting, the fast growth of fish farms around the southern fringes of the Lake, illegal fishing practices including fry catching near the Boughaz, the excessive inflow of drainage water from the catchment area, water

pollution, the construction of the international highway which cut the entire length of the sand bar, and the fast growing of new human settlements on either sides of the highway are among the serious threats to biodiversity in Burullus.

15.1.1.2. Rarity

A total of nearly 60 rare species are recorded in Burullus: 2 mammals, 24 birds, 2 reptiles and numerous flowering plants and phytoplankton. Rare and threatened habitat types include the sand dunes and salt marshes of the sand bar and the islets (especially Al-Kawm Al-Akhdar and Deshimi), which represent unique habitat types in the entire Mediterranean coast of Egypt. Reedbeds may not be unique for Burullus, but they are of vital importance for resident and migrant birds as well as providing food and shelter for many species of fish.

15.1.1.3. Naturalness

The Burullus Protected Area is endowed with impressive scenery along the seafront, especially on the sand bar west of El-Boughaz and on the sand dunes west of Baltim. The herds of cows and buffaloes left to graze in reed beds and on some of the islets in the Lake (e.g. Al-Kawm Al-Akhdar and Deshimi) have become almost wild. Although the impact of human activities in agriculture, reed grazing and harvesting, fishing, fish farming and urbanization of sizeable areas in some parts of the Protected Area has changed the naturalness of some habitat types, other parts have escaped the change and kept their original environmental status almost intact. Examples of such genuinely natural habitats are two islets (Al-Kawm Al-Akhdar and Deshimi) and the salt marshes on the sand bar which are characterized by relatively high species, community and habitat diversities, including some of the rare and endemic species of flora and fauna.

15.1.1.4. Typicality

The Burullus Protected Area is a mature eutrophic Mediterranean lagoon and a typical wetland ecosystem with a wide range of species and habitat diversities.

15.1.1.5. Special interest

Recorded history of Kafr El-Sheikh Governorate tells of the heroic deeds of the inhabitants of El-Burg and Baltim in defending the country against attempts of foreign invasion through Lake Burullus during the early nineteenth century. Relicts of fortresses on either side, of El-Boughaz are witnesses of such deeds. In more recent times, history repeated itself when on the 4th November 1956 the Egyptian Navy was helped by the local inhabitants to repel yet another attempt of foreign invasion. The 4th of November has since been celebrated as the national day of Kafr El-Sheikh Governorate.

15.1.1.6. Size

Burullus is one of the large wetlands along the Egyptian Mediterranean coast, which still retains considerable environmental value. It has numerous islands and some substantial reedbeds. The 65 km of coastal sand bar is still relatively intact, with little urban development and low key agriculture. Because of its size, there is scope to maintain key populations and habitats and, through management, to enhance or restore currently deteriorating ecosystems.

15.1.1.7. Diversity

Site diagnosis studies revealed the richness in species diversity of Burullus Protected Area (Anonymous 2002). This species richness is matched by richness in community and habitat types. It is worth pointing out that the coastal sand dunes west of Baltim town fall outside the official boundaries of the Protected Area. These dunes are rich in vegetation, both in number of species and in community types. They also harbour a number of rare reptile and mammal species. If these coastal sand dunes were to be incorporated into the Protected Area, its species, and habitat diversities would increase.

15.1.1.8. Stability

Reedbeds support a rich ecosystem and, with careful planning, have the potential to be a renewable resource for local people. However, the quality of this key habitat is currently in decline. The danger of this decrease may be fully appreciated in the light of the important ecological role played by these reedbeds. The submerged rhizomes and roots are excellent soil binders, which help prevent erosion and washouts and are reported to be effective in trapping pollutants. A GEF supported project experiments with " artificial wetland" that is reedbed built in the course of one of the principal agriculture drains pouring into Lake Manzala (east of the Delta). The objective is to phytoremediate the water. Reeds also provide shade, shelter and food for many species of fish. The aerial parts are home for numerous species of resident and migratory birds, and the grains are highly nutritive for many species of waterfowl.

15.1.1.9. Ecological position

The ecological role of phytoplankton in Lake Burullus is crucial for a variety of reasons. These organisms are among the major primary producers in the ecosystem through their photosynthetic activities. They are also a major component of the feed readily available for filter-feeding species of fish; fish productivity of the Lake is directly affected by the state of its phytoplankton community. Furthermore, they can be used as important ecological indicators of water pollution as well as in monitoring water quality.

The ecological role played by zooplankton is many-sided. It is food for juvenile and adult fish: the increase in standing crop of zooplankton is concurrent with the increase in annual fish production. It is also useful in

monitoring hydrographic events such as pollution, eutrophication, warming trends and long-term changes in salinity. For instance, the change of dominance from the large species (Copepoda) to smaller species (Rotifera) is a reliable indicator of eutrophication. Application of this principle means that Lake Burullus is eutrophic.

The total number of waterbirds wintering in Lake Burullus and the adjacent marshes may well exceed half a million (Meininger and Atta, 1994). The reed beds are home for the largest populations in the Western Palearctic of the Little Bittern and the Purple Gallinule. The only western Palearctic populations of Painted Snipe and Senegal Coucal are found in Egypt. The world's second largest known concentration of Ferruginous Duck is found in Lake Burullus.

15.1.1.10. Replaceability

The impact of human activities in the Protected Area and its catchment region (as represented by the removal of sand dunes from some parts of the sand bar, reclaiming parts of the water body for cultivation, rain-fed farming in sand formations with crops such as grapes, figs and watermelons, the increase of reed swamps and salt marshes, and the proliferation of fish farms along the southern shores of the Lake) has led to some major changes in the relative areas of various habitat types. Fortunately, sufficient remains of the complete range of Burullus habitats supporting a rich diversity of fauna and flora. However, restoration of areas already lost will be difficult or impossible, and further losses have the potential to severely damage the value of certain habitats.

15.1.2. Socio-economic Criteria

Lake Burullus is the only source of livelihood for part of the population in the Kafr El-Sheikh Governorate. Nearly all human activities in the area depend directly or indirectly on the Lake. Furthermore, the relatively high rate of population growth in some villages and towns (e.g. Baltim) adds to the reliance of the local inhabitants on the resources of the Lake and the adjacent farmlands and fish farms.

15.1.2.1. Agriculture and fish farms

The productivity of reclaimed lands is low and variable because of high soil salinity and unreliable water supply, hence the growing tendency to transform reclaimed lands from agriculture to the more profitable activity of fish farming. Land reclamation conflicts with nature conservation objectives by reducing the size of the lake. Stocking of fish fry taken illegally from the lake or El-Boughaz is another potential source of conflict, both with nature conservation and lake fishery interests. Fish farms also discharge nutrient enriched water which enters the lake.

15.1.2.2. Fishing

Fishing is the most important economic activity within the Protected Area. The total fish production of Lake Burullus increased gradually from 7349 ton in 1963 to 55283 ton in 1999. Mullets, fish of saline habitats, are the most economically valuable species. The percentage of mullets in the annual production decreased gradually from 44.7% in 1963 to only 17% in 2000. This was accompanied by a gradual increase in the production of the cheaper tilapia from 42% in 1963 to 62% in 2000. This reflects a change from availability of predominantly saline to freshwater fish. This is clearly manifest in increasing in production of the freshwater species *Clarias gariepinus* and *Bagras bajad* from 188 and 220 ton in 1963 to 2459 and 706 ton in 2000, respectively. Higher fishing effort and higher production of poorer quality fish is necessary to maintain incomes after the loss of the economically more valuable marine fish species.

15.1.2.3. Reed economics

Field studies of reed economics carried out on a sample of 100 families with an average size of 7 person family^{-1} and a working season of 120 day year^{-1} led to the following statistics: gross return = LE 101190 , net return family^{-1} season^{-1} = LE 832, expenditure = LE 18000, net return person^{-1} season^{-1} = LE 118.8, net return = LE 83190 and net return person^{-1} day^{-1} = LE 0.99 (Shaker *et al*. 2002). By Egyptian standards, the net return of just under LE 1.0 per person per day is quite low. Furthermore, the effect of the method of reed cutting (above or below the water surface) on the rate of regeneration of reeds, and consequently on the sustainable reed exploitation, is yet to be investigated. Reed cutting has both positive and negative values for nature conservation. Over-exploitation, or the disturbance or destruction of sites of known environmental importance, have negative effects. However, nature conservation benefits from reed cutting can be considerable. It limits the rate of expansion by reeds into new, open areas of lake; and within a planned programme of rotation can produce a mosaic of beds of different age and structure, which enhances the diversity of the ecosystem.

15.1.2.4. Bird-hunting

Bird catching is not an economically significant or stable activity in Burullus area, although some individuals and families might resort to it on a seasonal basis only in order to augment their income. Conflicts with nature conservation arise particularly when threatened species, such as the Corncrake, are taken. Bird catching, particularly within a protected area, is counter-productive in attracting eco-tourism to the area, which has the potential to bring in far more money than bird catching does.

15.1.2.5. Tourism

The international tourism potential of Burullus area remains largely untapped. This is mostly due to: 1- the lack of awareness, on the part of both the local inhabitants and municipal authorities, of the economic value of this industry and its potential contribution to the advancement of their well-being; 2- all Islamic sites of historical and touristic value remain to be uncovered from beneath massive sand dunes; and 3- security considerations related to combating illegal smuggling along the coast line.

15.1.3. Potential Value

15.1.3.1. Ecological improvement

Lake Burullus plays an extremely important ecological role. It acts as a buffer zone between the Mediterranean Sea and Nile Delta. It stops seawater intrusion into the productive agricultural lands in Nile Delta. It is also a basin for the purification of the drainage water pouring from the catchment area in Nile Delta before its discharge into the Mediterranean. Conservation and improvement of the ecological conditions on the sand bar between the Lake and the Sea would have decidedly beneficial consequences for Egypt as a whole.

15.1.3.2. Landscape and visual improvements

The wide open vistas, and generally unspoiled character of the lake and its natural habitats, retain their attractiveness. This can be improved further by: 1- campaigns to pick up rubbish and other discarded material; 2- “keep Burullus tidy” campaigns, aimed at villages and children; 3- strictly enforced planning laws to prevent urbanization of the coastal strip now crossed by the international road; and 4- in other areas still retain their wild or natural character.

15.1.3.3. Education and research

Burullus Reserve Area can play a significant educational role through the organization of excursions for school and university students to attend practical classes and carry out field studies. Improvement of research facilities in the Reserve (e.g. laboratories for water and soil analyses, herbarium, metereology station, equipment for identification of flora and fauna, and data bases) would greatly enhance co-operation between Burullus and other research institutions in the country with beneficial results for both.

15.1.3.4. Recreation and leisure

Burullus Reserve Area is a preferable destination for some holiday-makers who come from adjacent villages and towns to spend the day on the Lake and some of the islets. However, with some improvement in local hotels, clubs, cafés, restaurants and other catering facilities in Kafr El-Sheikh Governorate, the Reserve could become one of the major tourist attractions in the country, especially for people from neiboughring Governorates (Gharbia, Dakahlia, Sharkia, Behaira and Menoufia) in and around Nile Delta who have to

travel long distances to spend their summer vacations in other sea-side resorts. The Baltim summer resort is outside the Reserve.

15.1.3.5. Generation of revenue

The resources of Burullus are already being used to their limit, and beyond, by the local people. Sustainable resource management is essential if these resources are not to be steadily reduced and squandered. To counter short-term loss of income in applying sustainable management, other sources of revenue must be identified. Fortunately, Burullus has huge potential value in its wildlife. Wildlife resources are increasingly being recognized as a means of bringing new money into local economies. There is now a very big market in eco-tourism throughout the world. Wildlife enthusiasts from Europe and North America, in particular, are drawn increasingly to sites of high wildlife value and natural beauty. Protection followed by promotion of Burullus's environmental riches can combine to bring international tourists, to the site. This can only be achieved through careful planning, including the development or support of more diverse activities (such as handicrafts, training of local people as guides and wildlife specialists), improvement of facilities and infrastructure and the willingness of local communities and authorities to participate in the development.

15.1.3.6. Demonstration possibilities to other protectorate managers

The experience gained by the Burullus management team in preparing and implementing a conservation management plan places them in an ideal position to act in future as hosts and demonstrators to other protected area managers, both from Egypt and elsewhere in the Mediterranean. Not only is the site suitable, but a modern purpose-built facility is available: the new Visitor Center.

15.1.3.7. Stronger protection through legislation or designation

The implementation of management will strengthen enforcement of current legislation and provide the first step towards protection and enhancement of the nationally and internationally important biota of the site. A management plan agreed by all participants and stakeholders will strengthen resolve and create a co-operative approach to safeguarding the future not only on the site's environmental values, but also the resources on which the local population depends.

15.1.3.8. Public visitor enjoyment

The opening up of a new visitor center, improvement of facilities and information, development of participatory programmes and all the other initiatives proposed in this management plan will form the basis for greater public involvement in and enjoyment of the Reserve and its assets.

15.1.3.9. Maintenance of heritage and way of life

Emphasizing the need to protect resources by using them in a sustainable manner, the management plan will conserve not just wildlife but the traditions and way of life which have maintained the local human population for generations and which are such a feature of Burullus Wetland. The social and historical character of the site is also an asset in attracting eco-tourists, many of whom appreciate cultural heritage as much as wildlife.

15.2. IDEAL LONG-TERM OBJECTIVES

The management plan of Burullus Reserve has the following five long-term objectives (after Kassas et al. 2002): 1- to restore ecological (including biodiversity) and landscape values which have been lost or damaged, 2- to maintain and enhance the ecological and landscape values of the site, 3- to conserve Burullus resources through sustainable management, 4- to improve socio-economic opportunities for local people and 5- to develop public awareness for nature conservation.

15.2.1. Restoring Ecological and Landscape Values

Studies in a range of disciplines have demonstrated that the condition of the site has deteriorated alarmingly in recent years. The major over-riding factor in this is the use of the lake as a discharge area for agricultural drainage water. This has had a severe effect on water balance, water quality, water condition, natural communities and income generation for people reliant on the lake. Restoration of these lost or deterioriated values will require a radical re-evaluation of the hydrology with a view to returning it to a more natural system.

15.2.2. Maintaining and Enhancing the Ecological Values

This objective relies heavily on the first one. Unless a return is made to a system which replicates the previous natural hydrological system, maintenance of current values can not be achieved and management measures would, at best, slow down the rate of deterioration already occurring.

15.2.3. Conserving Resources Through Sustainable Management

There is no point in enacting restoration measures only for the gains to be eroded by unplanned, unsustainable exploitation of resources. In order to fully restore and conserve ecological and landscape values, the resources which make up these values need to be maintained. This can only be achieved by application of the principle of sustainable resource management.

15.2.4. Improving Socio-economic Opportunities for Local People

Local stakeholders will understand the principle of sustainable use of resources as a means of maintaining the necessary levels of resources for future years. However, in most cases they are not in a strong enough financial position

to reduce or set aside activities which determine their income in favour of a long-term approach. In reality, they cannot be expected to forego part of their income as a sustainability measure without compensating for that loss elsewhere. Currently, resources are over exploited and, with a growing human population, pressure on those resources can only increase. Introduction of the concept of sustainable resource management must therefore be accompanied by alternative income generation opportunities and particularly those which diversify the money-earning process.

15.2.5. Developing Public Awareness for Nature Conservation

Public awareness campaigns make local people more aware of the natural and cultural values of their site and how these are their support system by supplying the resources on which they rely. Greater awareness and respect for nature conservation makes the task of implementing conservation and resource management measures much more effective. Awareness programmes can extend to people from outside the local environment, including people from abroad, attracted by the information such programmes engender. Most importantly of all, it extends the skills, knowledge and interest of local people. The environmental and cultural values of Burullus are a resource, which is currently largely unexploited. Greater interest and knowledge can translate into using that resource, for instance in educational, interpretation and eco-tourism purposes. Opportunities thus emerge, for instance related to eco-tourism, which diversify income generation without putting further strain on the resources.

15.3. OPERATIONAL OBJECTIVES

The principal objectives define the direction that the management programme will take, but not the detail. To achieve each objective, a number of measures and tasks are required. Each of these needs its own “operational objective” to ensure that it complies with the general directives of the plan, that the outcome or result can be assessed and that it relates directly to one or more of the principal objectives. Once the operational objectives have been determined, a series of measures or “projects” can be developed in order to achieve them. Thus there is a step-wise progression in devising a management programme from principal to operational objective and on to identification of projects or measures. Taking into account the values of the site, its needs and constraints, the following operational objectives have been identified. Some are related to more than one principal objective, but they are arranged in relation to the principal objective to which they most closely correspond.

A- Restore ecological and landscape values which have been lost or damaged

1. Restore salinity level

2. Initiate a network for monitoring water quantity and quality
3. Treat water for re-use
4. Monitor climate changes

B- Maintain and enhance the ecological and landscape values of the site
1. Propose a scheme of zonation
2. Take *in situ* measures of species conservation
3. Initiate *ex situ* conservation measures
4. Establish a system of data management
5. Monitor species diversity
6. Initiate a programme of research

C- Conserve Burullus resources through sustainable management
1. Improve the situation of law enforcement
2. Revise legislative and institutional aspects
3. Sustainable use of fish resources
4. Sustainable use of reed growth

D- Improve socio-economic opportunities for local people
1. Initiate capacity-building schemes
2. Develop eco-tourism
3. Fund raising

E- Develop public awareness and respect for nature conservation
1. Raise level of public awareness
2. Initiate publicity programmes

15.4. IMPLEMENTATION

15.4.1. Management Strategies

After the determination of the operational objectives, the next step is to decide how the objectives will be met. Different methods are required for different measures, and indeed some measures may require different strategies depending on location. The approach to a particular operational objective also depends on the category to which it belongs. For instance, the approach required to practical issues, such as maintenance of facilities, requires skills and considerations different from those of maintaining habitats or biodiversity.

15.4.1.1. The main areas of activity

The main areas of activity can be summarized as follows: 1- restoring, maintaining or enhancing the habitats, biotopes, habitat structure and diversity of habitats and species; 2- public use, recreation, visitor facilities, education, demonstration and study or research; 3- estate management; and 4- miscellaneous other elements.

Habitats and species: The choices to be made here include non-intervention, limited intervention and active or strict intervention. Burullus is such a large site that active intervention is not a realistic possibility, particularly with the limitations of staff and resources. Instead, the strategy of active intervention will be implemented solely in areas of highest habitat and biodiversity value. This will be achieved by designation of zones in which strict protocols for the conservation of the zone and its interests will be applied. Other intermediate ("buffer") zones will also be designated, supported by sets of regulations which will achieve limited intervention (though mainly on a non-enforcement basis). In reality the status of areas outside the strict conservation zones, will be mainly non-intervention until publicity and public awareness measures can raise them to limited intervention.

Public use: Much of the site will be open access. Some activities will be liable to permit or permission and some high conservation areas will be closed to the public. Visits for research, study, education and appropriate recreational activities will be encouraged, though access to sensitive conservation zones will be largely restricted to bona fide research workers. Because visits are to be encouraged, a strategy of active publicity will be pursued, which will be linked with public awareness, education and other campaigns. A visitor center is being constructed and further facilities are planned for visitors.

Estate management: A considerable number of management measures cannot be carried out without planning for practical issues such as boundaries, fences, vegetation management and so on. These need to be costed in any management plan and are best presented as one or more "projects".

Miscellaneous: Issues such as legal instruments and regulations, employment of staff, contracting of services, accommodation, equipment, and health and safety statements are all part of management planning and are best presented as one or more "projects" in their own right.

15.4.2. Zoning and prescriptions

The zoning of certain areas helps to identify and protect key sites for conservation, to establish rules and regulations for the enforcement of strict or limited intervention and to clarify and simplify management implementation by staff and other participants.

15.4.2.1. Units

The whole of Burullus Protectorate Area has been allocated to one of three management categories: core zone, buffer zone or transitional zone (Shaltout 2002). The core zones are areas of strictest intervention and correspond to ecological units. The other zones, of lower intervention management priority, are best treated as functional units – although they often include one or more clearly defined ecological units.

15.4.2.2 Management zones

15.4.2.2.1. Core zones

The core zones at Burullus Protected Area are locations of highest environmental and/or cultural value and therefore requiring a higher level of management intervention. Selection of the core zones was based on their suitability in terms of size, ease of protection and as representative areas of highest floristic and faunistic community diversity in the Protectorate. The aims of designating these areas as core zones are: 1- to protect endemic, rare and globally-threatened species; 2- to minimize the impact of human activities on well-established, rare or unique habitat types; and 3- to allow visitors to experience, enjoy and benefit from the different physical, biological and cultural aspects of the Protectorate. In this respect, three core zones are proposed (Fig. 15.1). Core zone 1- includes the two islets of Al-Kawm Al-Akhdar and Deshimi. Al-Kawm Al-Akhdar is the largest islet in the Protectorate (approx. 3 km^2), it contains: 63 of the 89 species of plants recorded in all islets including the endemic *Sinapis arvensis* subsp. *allionii*, large numbers of animal species, 4 of the 6 habitat types identified in all islets, 7 of the 13 plant communities in the Protectorate. Deshimi islet (approx. 1 km^2) has the second highest species, community and habitat richness in the Protectorate, and its surface is characterized by high sand dunes. Both islets are important stopover sites for many resident and migratory birds, and most of their area is largely uninhabited.

Core zone 2 includes the section of the sand bar east of El-Hanafi village with a width of 2.5 km, and extends between the sea shore in the north and the northern shore of the Lake in the south (approx. 5 km^2). This site includes also all types of sand formations (sand flats, sand hillocks, and sand dunes) prevailing in Burullus, as well as wet and dry habitats of the Lake and shores. It has high species diversity, coupled with high phytomass; and unlike the rest of the sand bar, it is free of rainfed agriculture, settlements and other human impacts.

Core zone 3 includes the sea inlet (El-Boughaz), which is the only passage of exchange of water, and biota between the Lake and the sea (approx. 20 km^2). It is the richest part of the Lake in the fry of different mullet and other marine fish species This inlet is one of the most fragile natural habitats in the Protectorate, the erosion-accretion activities lead to widen it at times and to close it at others.

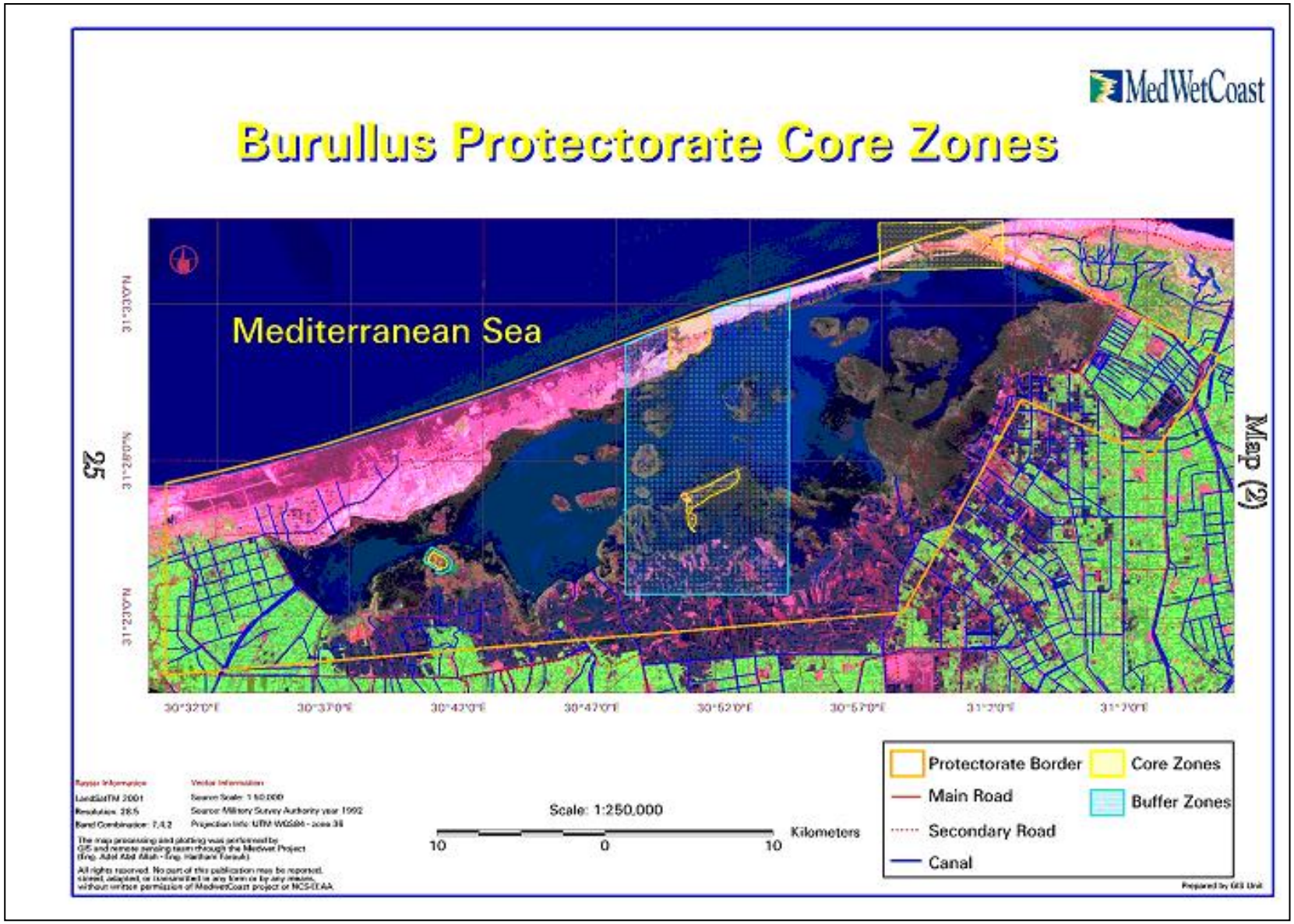

Fig. 15.1. **Map of Lake Burullus showing the core zones**.

15.4.2.2.2. Buffer zone

The definition of a buffer zone is a zone outside but immediately surrounding a core zone. Its purpose is to act as buffer for the core zone, meaning that restrictions can be placed on certain activities within the buffer zone which are liable to impinge on or damage the interests of the core zone. Only one buffer zone is suggested to surround Al-Kawm Al-Akhdar islet (from core zone 1) and the whole of core zone 2. It extends between latitudes 31° 23' 47" and 31° 31 53" – 31° 33' 41" N, and longitudes 30° 37' 21" and 30° 53' 40" E. It covers an area of approximately 170 km^2.

15.4.2.2.3. Transitional zone

The definition of a transitional zone is one that falls within the Protected Area and its rules and regulations but is not otherwise subject to specific intervention management. This does not mean that areas designated as transitional zones have no conservation significance. The objective of conserving resources through sustainable management applies as strongly to this zone as any part of the Protected Area. Owing to the immense biological, ecological, economic and cultural importance of Lake Burullus, it is suggested that the entire area (410 km^2) should be regarded as the transition zone of Burullus Protected Area. All the sand bar that separates the Lake from the sea should be treated also as a transitional zone , as well as the terrestrial area south of the Lake and close to the shore.

15.4.2.3.Touristic zoning

A map of accessible and inaccessible islets in the Lake and tracks on these islets and on other terrestrial parts of the Protectorate should be drawn and made available to visitors. Clear road-signs with names of places and arrows indicating directions to them should be fixed along all tracks and cross-roads. Daily patrols by rangers and community guards must pay due attention to the presence of these signs, their clarity and ease to follow by visitors.

15.4.2.4. The impact of zoning

The proposed scheme should help in conserving the endemic, rare and globally threatened species as well as to conserve unique habitat types without imposing undue restrictions on the use of the resources by local inhabitants or the enjoyment of cultural features and the impressive scenery by the visitors.

15.5. ACTION PLAN

15.5.1. Management Action Plan

There is need for five major programmes that respond to the following five principal objectives: 1- restore ecological and landscape values which have been lost or damaged, 2- maintain and enhance the ecological and landscape

values of the site, 3- conserve Burullus resources through sustainable management, 4- improve socio-economic opportunities for local people, and 5- develop public awareness and respect for nature conservation. Projects have been devised each of these headings. These respond to the operational objectives enumerated in 15.4 above. Additional projects, coming under the general heading. Estate management and administration are also included in the plan, these are not directly related to any one principal objective, but are essential prerequisites if the principal objectives are to be achieved. These additional considerations can be converted to an objective: to provide the administration and facilities necessary to implement management measures supporting the principal objectives.

The advisory committee should be slightly re-structured to management (steering) committee and consists of: Governor of Kafr El Sheikh (Chairman), Secretary-General of Kafr El Sheikh (Vice-Chairman), MedWetCoast Project Manager, Director of Lake Burullus (representing the Ministry of Agriculture), and Manager of the Protectorate (Secretary). The local representative of each of the following institutions are also included: Ministry of Health, Ministry of Housing and New Communities, Coast Guards (representing the Ministry of Defense), Police Force (representing the Ministry of Interior), and Chief of Fishermen Co-operatives. This preliminary structure may be reviewed every two years and the new structure is appointed by a decree issued by the Governor of Kafr El Sheikh. The role of this Committee should be re-formulated from being merely consultative to the more effective function of decision-making. Bi-monthly meetings of this committee should deal principally with the following tasks: setting policies for the management of the site within the framework of the management plan, supervising the implementation of projects indicated in the management plan, reviewing periodically the progress made by the management team in the implementation of projects, and proposing changes in the work plan as the need arises.

A further executive committee headed by the Manager of the Protectorate will assist the above committee and, in particular, undertake the following functions: implement the directives of the Management Committee, carry out the day-to-day tasks of patrolling, and report to the Management Committee on all new developments in and around the site.

Implementation of these programmes and their component projects is an integral part of the management of the Protectorate. Some of these projects are priority activities that are basic requirements for the operation of the Protected Area. Others are complementary actions that ensure the sustainability of the endeavour. Some of these may be implemented in a second phase of operation. First priority projects are mainly the direct responsibility of the Protected Area

management team. Others may require co-operation and shared responsibility between management and competent governmental and non-governmental stakeholders. The management committee will assign these shared functions.

15.5.2. Programmes and Projects

Programme 1. Restore Ecological and Landscape Values which Have Been Lost or Damaged

Project 1.1. Restore the Lake's natural hydrological system

This part of the action plan aims at restoring the diversity of water quality (salinity) in Lake. Under previous pristine conditions the Lake represented on ecotonal pattern between saline (marine) water in the northern reaches (fed through the inlet) and brackish water in the Southern reaches (fed by agricultural drainage and surplus freshwater). This provided habitat for diverse fish species. At present the Lake is dominated by brackish (almost fresh) water. This programme will require continuous monitoring of water quantity and quality (Project 2.2), management of the hydrology of the Lake through control over the volumes of inflowing drainage water. The research programmes (Project 2.4) will include hydro-meteorological studies (including rates of evaporation, among others).

Hydrological control measures may include: 1- re-institute procedure of "winter closure" in the southern outskirts (Kafr El-Sheikh Governorate) of Lake Burullus; 2- divert part of the drainage water to be reused in newly reclaimed lands, or to flow to the sea (scheme named El-Moheet drain is an effective mean); and 3- maintain the sea inlet (El-Boughaz) open and clear to ease seawater flow into the Lake. Hydrological control measures will require engineering schemes of scale and cost. Cost estimate of this programme is $ 2000000.

Programme 2. Maintain and Enhance the Ecological and Landscape Values of the Site

This programme represents the core element in the plan of action; the measure of its success is the ultimate indicator of achievements. Projects included in this programme require the participation of all stakeholders and the support of the other four principal programmes.

Project 2.1. Implementation of zonation scheme

This project will aim at the demarcation of the zones of the Protected Area .This may include 1- closure of core zone, designed fencing that does not bar natural ecological exchange but bar human interference of the terrestrial sites, and designed warning signs around the two core-zone islets; 2- signs that mark the boundaries of the buffer zones, paved tracks in terrestrial buffer zones

designed to lead to sites of interest to visitors; and 3- clear signs and notices will be informative and indicate what is permissible and what is not, these notices will also list briefly and clearly elements of good behaviour in the Protected Area. The ecological zonation may require modifications in subsequent years in the light of added information resulting from monitoring and research activities. Modification may entail changes in demarcations, signs and tracks. Cost estimate of this project is $ 100000.

Project 2.2. Establishment of monitoring networks

This project will aim at establishing an operative environmental, including biodiversity, monitoring network. The function of this network is to feed the data banks with up-to-date reports on the status of the ecological elements of the Protected Area. This project may include:

1- establish a set of points for periodical sampling of water for analyses, the set will represent the various ecological zones of the Protected Area, analyses will include water chemistry, physical features and biological (plankton and submerged biota) elements, sampling will also include bottom sediments;

2- establish a programme for monitoring diversity and status of species, the purpose is to monitor species and their populations and to use this information to indicate the ecological health of the habitats;

3- data fed to the data bank will enable the production (once every 3 – 5 years) of revised lists of the principal biota elements, including flora, avifauna, mammals, herpetofauna, insects and arachnids and plankton;

4- selected samples (vouchers) will be deposited in *ex-situ* reference collections.

This is project and continuous activity venture, would require a team of trained personnel. Cost will include: 1- establishment of monitoring networks ($ 500000), 2- training (included in project 6.1), and 3- running yearly expenses (regular budget).

Project 2.3. Establish reference collections and data bank

This will be accommodated in the Visitors' Centre and be elements of a natural history museum (for education and research). The data bank will also provide the Protected Area Management Committee with information necessary for assessing the operation of the management plan and means of its development. This central body will be linked with the monitoring network (Project 2.2) and with ongoing research activities (Project 2.4). Reference collections will include: flora (herbarium), avifauna, mammals, herpetofauna, insects and arachnids, fish, and mollusks. A documented reference collection of soil types will be built, kept and updated with additional types to be discovered in the scientific surveys. A data bank is a computerized depot for data on biodiversity (with its various elements), ecological monitoring and research results. It will also contain a geographical information system (GIS) for Lake Burullus. This will eventually be a part of the national network of data-bases of

protected areas and biodiversity. The data bank will issue periodical reports on the status of conservation and sustainable use of natural resources. Cost estimate is $ 500000.

Project 2.4. Programme of research and studies

There will be need of research work on population and ecosystem dynamics, assessment of ecological changes, ecological responses of key species, etc. There will also be need for research studies related to sustainable use of species especially fish species. Environmental impact studies related to new development schemes (e.g. the new fishing port, the new international highway, land reclamation projects, summer resorts schemes, etc.) need to be carried out and submitted to relevant authorities. Because fisheries and fish-farming are important socio-economic activities in Lake Burullus, there is need for a series of research studies with the purpose of finding bases for sustainable use of fish resources. In particular there is need for establishing scientifically based quotas of commercial species of fish. The whole area of northern Delta including Lake Burullus is a vulnerable site to climate change related sea-level rise. Research programmes need to address this issue. These research programmes may be carried out by the technical staff of the Protected Area or staff of Universities and research institutions. All research needs to be coordinated within a planned programme of the Protected Area. Funds need to be available for supporting these research activities. The cost estimate of this project is $ 200000 per year.

Project 2.5. Wildlife clinic

The operation of the Protected Area would need to avail itself of facilities for: a wildlife clinic, particularly important for marine animals and migratory birds reaching the shores of the Burullus sand bar in need of medical care. Cost estimate is $ 20,000.

Programme 3. Conserve Burullus Resources Through Sustainable Management

Project 3.1. Sustainable use of reedbeds

This programme will sustain surveillance of reed growth through a network of sites for monitoring standing crop. Research studies (Project 2.4) on the ecology and biology of the reed-swamp ecosystem will provide guidance for harvesting. In the light of information collected from monitoring and research an annual schedule for use will be set by the Management Committee. Cost estimate, additional to contributions of other programmes is $ 10,000.

Project 3.2. Develop legal and institutional structures

The purposes of project include: development of legislative instruments operative in the Protected Area and its associated territories, improve prospects

of law enforcement relevant to environmental management and conservation of natural resources, define roles of institutions participating in management of the Protected Area and its associated territories. This project may include:
1- organize series of lectures and panel discussions on legislative instruments operative in the Protected Area, audience may include members of the management committee, councils of Kafr-El-Sheikh Governorate and the five concerned districts, and senior members of the departments of local government;
2- revise and resolve conflicting elements of the legislation, close loop-holes through which violations may escape punishment, and provide the managers of the Protected Area and their partner stakeholders with support of law;
3- develop guidelines for defining roles and responsibilities of institutions participating in management of the Protected Area, and for integrating the roles of institutions that issue licenses for fishing, hunting, and boats;
4- develop facilities available for law-enforcement bodies: the manager of the Protected Area, Water Surface Police Force, police stations to be increased from the present number of 2 to 3 - 4, and increase the number of boats available for monitoring and policing.
5- set and enforce quotas, including timing of fishing, the purpose is to minimize stock depletion and to sustain ecological equilibrium, this should be based on sound scientific inventories.

This project requires legal and administrative studies that are discussed and debated in appropriate for Law experts, civil society bodies including fishermen associations, and government technicians, should take part in these fora. Cost estimate for studies is $100000, and for facilities for law enforcement is $1000000.

Programme 4. Improve Socio-economic Opportunities for Local People

Project 4.1, Develop alternative livelihoods

The purpose of this project is to develop alternative sources of income or further develop existing sources so as to alleviate excessive ecological pressures of prevalent livelihood system (fishing). This project gives priority to participation of women, and may include: 1- cottage industries, this includes development and further improvement of existing industries and rehabilitation of industries that were once prevalent, necessary technical and marketing studies needed, programmes for promoting products, a small revolving fund needs to be available; 2- eco-tourism, organized guided tours for holiday-makers, this could provide during summer (July – September) alternative use of fishing boats for Lake-voyages in unrestricted parts of the Protected Area; and 3- establish public amenities to visitors, including eco-lodges, special-meals restaurants (e.g. sea-food and indigenous meals).

This project requires active participation and support of local societal bodies (e.g. NGOs and fishermen associations). The first preparatory year will be spent in studies, planning and establishing the support facilities including a revolving fund. Subsequent years will be for initiation and development of the project. Cost estimates of the first year is $ 100000, subsequent years need $ 200000 per year, and revolving fund of $ 500,000.

Programme 5. Develop Public Awareness and Respect for Nature Conservation

Project 5.1. Public awareness and participation

The purpose of this project is to raise the awareness of people of all ages and gender so as to ensure their support to, and participation in, the operations of the Protected Area. This project is a shared priority and may include: 1- guided visits of school and university students to parts of the Protected Area and its Visitors' Centre, these visits will be available to all students of Kafr-El-Sheikh Governorate, with repeated visits to students in the five districts that share the Protectorate; 2- public lectures in the district cultural centers, special seminars for members of the village and municipal councils and executives; 3- special workshops for the NGOs interested in fields of environment and conservation, to be informed about activities in the Protectorate and to solicit their support and participation; and 4- a publicity programme that includes publish an information newsletter, articles in local and national press, presentations in the Delta TV, and produce video-films to be made available to schools and NGOs, among others.

This project requires participation of the Protected Area management and associated institutions. Cost estimate per year is $100,000.

Project 5.2. Build bird watching hides

The purpose of this project is to build 5 small wooden hides in selected sites in the unrestricted zone of the Protected Area. These hides will be available to visitors with interest in bird watching. Cost estimate is $ 10000.

Project 5.3. Children’s playground

The operation of the Protected Area would need to avail itself of facilities for a playground for children in the area of the Visitors' Centre, this will combine education and recreation functions. Cost estimate is $ 5000.

Programme 6. Provide the Administration and Facilities Necessary to Implement Management Measures

Project 6.1. Manpower development.

The purpose of this project is to provide the Protected Area with the manpower necessary for its operations. Three categories of personnel need to be

recruited and trained: rangers, technicians for monitoring programmes, and community guards. This project will primarily include initial training courses in Burullus and in other protected areas in Egypt, especially in Sharm El-Sheikh Training Centre; and may also include training abroad. Initial training will be completed and refreshed in the years. This project is in a first priority category, initial training in the first 2- 3 years, refresher training is continuous. Cost estimate is $ 500000.

Project 6.2. Fund raising

The purpose of this project is to secure flow of financial resources needed for the effective implementation of programmes comprising this plan of action. Governmental and non-governmental resources including donations, and international donor sources need to be explored and tapped. Sources from the Protected Area (e.g. entrance fees, and licensing fees) could also be a significant element. Exploratory studies need to be carried out by professional experts, subsequent negotiations with national and international sources (bilateral and multilateral) need to be initiated, and if legal actions (related to levies or charges) are necessary steps would be undertaken. Appointment of a fund-raising officer may be necessary. Cost estimate of preparatory studies to be carried out by expert consultants, and of funding promotion activities is $ 10000.

Additional Actions

The human settlements in villages and towns associated with Lake Burullus, and the prospected settlements that are likely to develop in association with the international highway are sources of considerable volumes of solid waste and sewage. Part of these materials will be discharged, mostly untreated, to the Lake and be a source of pollution to be added to the discharges of the agriculture drains. The management plan and action programmes need to address this issue in close colaboration with local authorities who have plans to address the problems of waste. The Protectorate management, with the support of the Management Committee, will use its resources to assist providing priority to the settlements in direct contact with the Lake.

15.6. SUMMARY

Surveys showed rich biodiversity of planktons, higher plants, and fauna including birds. The Lake is a wintering area of international importance for waterbirds. Biodiversity includes numbers of rare, endemic and threatened species. Fisheries provide the principal life-support system for the inhabitants: production approximates 51000 ton $year^{-1}$. Other resource uses include: agriculture, livestock farming, fish farming (about 155000 ton $year^{-1}$), reed harvesting, bird hunting, tourism and recreation.

The Lake and its surroundings are subject to ecological constraints that relate to excessive use of resources such as land reclamation, fish farming, over-fishing, over-hunting, and overwhelming flow for drainage water. Likely future constraints relate to impacts of new development projects, including: the international highway that runs along the sand bar, fishing port to the west of El-Boughaz, future sea-side resorts, etc. To this may be added the likely impacts of future climate change including sea-level rise.

The main long-term objectives of the present management plan include: 1- to restore pristine ecological and landscape values, 2- to maintain and enhance ecological and landscape values, 3- to conserve the Burullus resources through sustainable management, 4- to improve socio-economic opportunities for local people, and 5- to develop public awareness for nature conservation. The management plan aims at achieving the five main long-term objectives by 2010 through field actions (programmes and projects), and establishment of effective institutional arrangements. Six principal programmes could be implemented during the initial two years: five correspond to the 5 long-term objectives, and the sixth is to provide the administration and facilities to implement the plan. 13 projects under these six programmes are outlined, with total cost estimates of $ 5650000.

15.7. REFERENCES

Anonymous 2002. Site Diagnosis for Burullus Protected Area. MedWetCoast, Nature Conservation Sector, Egypt. Envir. Aff. Agency (EEAA), Cairo, 41 pp.

Kassas, M. *et al.* 2002. Management Plan for Burullus Protected Area. MedWetCoast, Global Environment Facility (GEF) & Egypt. Envir. Aff. Agency (EEAA), Cairo, 89 pp + 12 annexes.

Shaker, F. A.; El-Kholy, E. S.; Abulzahab,T. A. and Fathy, M. A. 2000. Socio-economic Development for Burullus Protected Area. MedWetCoast Project, Egypt. Envir. Aff. Agency (EEAA), Cairo, pp. 64.

Shaltout, K.H. 2002. Zoning in Lake Burullus. MedWetCoast, Nature Conservation Sector, Egypt. Envir. Aff. Agency (EEAA), Cairo, 21 pp.