ROMANIA
AGRICULTURAL POLLUTION CONTROL PROJECT

PROPOSAL FOR INTEGRATED MANAGEMENT OF THE BOIANU-STICLEANU POLDER

T A B L E O F C O N T E N T S

INTRODUCTION

Romania was, is and will be a country with extraordinary resources and agricultural, natural and human potential.

The last few decades of both intensive and extensive agricultural exploitation led to radical changes in the management of natural resources and also to a change in human mentality.

The programme of flood protection works, both along the internal rivers and along the Danube (including some areas within the Danube Delta) also determined alterations of various habitats and microclimates, the newly established agro-ecosystem tending to limit local and regional biodiversity through uniformity. Subsequent reduction of food chains inevitably determined significant reduction of biomass production in the area.

All these changes occurred within an acute pollution background also influenced by climatic discrepancies, as it is already acknowledged that agriculture is both polluted and polluting at the same time.

Therefore, the concept of "containing environmental externalities" has to be immediately implemented, if we still want a relatively secure environment future.

This is also the goal behind the present project, offered to the Government of Romania, by the Global Environmental Facility through the World Bank, as an immediate support to a real pollution control in agriculture and also within wetland and nature reserve areas.

This project concentrates on seven rural human settlements and Boianu-Sticleanu polder area (three of the communes have territorial administrative jurisdiction over the targeted areas within the polder), where environment-friendly agricultural practices will be recommended, integrated with measures aimed to restore wildlife biodiversity in the area, all these based of course on the interests of local farmers and other stakeholders.

In addition to this, specific local natural assets would also be developed, such as the wetland area, the archaeologically important "Boianu prehistoric culture", the Iezerul Calarasi national level reserve and precious game species in the area.

Within the sinuous but nevertheless hectic context of Romanian transition (both from social-economic and political point of view and also taking into account the need for ever growing public awareness towards environmental protection issues and their involvement at decision making levels), assuming responsibilities deriving from relevant international treaties and conventions signed on behalf of Romania (some of these deemed as prerequisites of our country's admission within the EU) justifies the need for this project, as a practical environmental management and infrastructure exercise.

It is worth emphasizing that for the implementation of the commitment to environmental protection, Romania assumed complex issues, at global level (Agenda 21 – Rio de Janeiro, Rammer Convention on wetlands, UN convention on climatic change etc.), at regional level (Pan-European Biological and Landscape Diversity strategy, EC Convention for wildlife and natural habitats conservation in Europe, Convention of Danube River Basin etc.) and at local level (Convention on migratory species of wild animal conservation, Convention of biological diversity, Danube Delta Biosphere Reserve etc.), all these somehow artificially limited, taking

into consideration the systematic particularity of environmental factors which usually travel from local levels to the global ones and vice versa.

As concerning the specific project task, the following objectives were identified to be of a paramount importance:

a) reviewing the conclusions of the land-use suitability study and baseline survey in order to identify degraded areas that should be taken out of agricultural land-use for tree planting and permanent pasture purposes;
b) prepare implementation plan and investment cost estimates for the proposed tree planting;
c) develop guidelines for the application of the Code of Good Agricultural Practices in the polder area;
d) develop programme for regular monitoring of the quality of both irrigation and drainage water (to check the nutrient balance);
e) prepare Terms of Reference for the elaboration of the Conservation Management Plan for the proposed Iezer Calarasi nature reserve.

Project team consisted of:

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Evaluation of available data and recommended land use

For an accurate interpretation of available information, certain archives were accessed (ISPIF – Institute for Land Reclamation Studies and Projects-Bucharest, former IAS – state farms, information centres of the MAF and MWEP network), focusing on pedogenetical evolution within the context of land-use and irrigation suitability.

A series of field trips and subsequent surveys were carried out in the polder area, generating relevant data from local farmers and from management staff of agricultural enterprises in the area; all this information was then analyzed and was the subject of debate by the project Consultants.

Pedological and agrochemical studies elaborated by ICPA and OJSPA Ialomita, together with hydrological and hydrogeological surveys carried out by ISPIF Bucharest, environmental impact assessment studies carried out by the author (all having a succession of investment implementation stages or direct connection to the surveys carried out in the polder area) showed a slow evolution process of the soil (62% of the area is represented by undeveloped soils, 32% by hydromorphic soils and the least representative are the mollic-type soils-only 6% of the area), not at all unpredictable for this area with some of the youngest (geologically speaking) soils in Romania.

The soil map is presented under Annex 1.
The vast majority of lands in this area have agricultural utilization.

In view of future predominant sustainable agricultural exploitations in this polder area and in the context of ecosystem evenness sometimes tending towards uniqueness (agricultural ecosystems which although policultural may still be limited in their biodiversity), some sensitive and/or inadequate areas for efficient agricultural practices, were identified.

Generally, such sensitive features are related to ecological determinant factors, which can be quantified in soil fertility losses or in biomass production capacity losses (through humus lost due to wind erosion, through delayed spring husbandry works due to waterlogged areas and also through changes in the chemical and physical characteristics of the soil profile such as texture, structure etc. due to salinization and waterlogging processes).

A special category of sensitive areas is represented by those ecosystems or distinct population of flora and fauna which are either protected by law, endemic or very rare. Such an example is Iezerul Lake in Calarasi area, a very important ecosystem for the local biodiversity, through the passage fauna and not only; this area has been proposed to become a nature reserve of national importance (it is situated on the imaginary axis of migratory birds travel).

Within the polder area, there are no areas populated with endemic or protected species, which should come as no surprise given the powerful human influence following the construction of the embankment.

An ecosystem zoning of the polder area is presented (Annex 2), with notice that the degraded areas were not plotted (those affected by domestic waste dumping and accompanied by specific vegetation and fauna).

Areas recommended for tree planting

By overlapping the soil map, the irrigation suitability map and the ecosystematic and hydrogeological zoning maps and by correlating them with results of surveys carried out in the project area, some areas resulted (Annex 3) of which are proposed to be reforested with tree plantations (1,090 ha) of which 162 ha can also be considered as windbreaks. Also, about 300 ha which can further be used as permanent pastures in the polder area were identified.

Previous confirmed research and specialized literature recommend for the southern part of Romania – specially for the Danube floodplain area – for agricultural (cropped) land, an optimum average forestry coverage coefficient of approx. 10%.

The role of such forest vegetation is a complex one, the extent of its effect being directly related to the particular features of the location; for Boianu-Sticleanu, such particularities are:

→ perimetral disposition or on the directions of predominant regional or local winds, with double role: first as crop protection strips (significantly alleviating the erosion effect of strong winds in the polder area) and second as a filter against damaging atmospheric pollutants (dust, sand particles, lightweight waste, various gas and industrial emissions) and sound pollution agents and sources.

→ buffer elements within the ecosystem zoning, ensuring a high degree of biodiversity required by a balanced food chain, able to provide optimum efficiency of biomass production within the polder area.

→ biological drainage without negative side effects (settlements, leaching of useful substances, migration of various pollutants including nitrates within the soil profile).

→ harmonious elements within the generally monotonous landscape of agroecosystems which are known to be lacking vertical development

With the propose of minimizing the area and duration of shade, it is recommended that internal buffer strips (aimed to protect cropped land, canals and access roads) should be positioned along the direction of strong dominant winds and as close as possible to the road platform or to the slope of the canal (whether excavated or constructed in cut and fill); also, the forestry species used for such purpose should compensate the lack of vertical development through an adequate compaction of their foliage (shrubs & bushes).

Such perimeter strips, relatively short but very dense, must also be created on permanent pasture land or as boundaries of individually owned land plots within the Boianu-Sticleanu polder area, ensuring a favorable habitat for wildlife biodiversity (including precious game species).

The following criteria were considered for the selection of areas where agro-forestry practices could be applied:

- Uneven terrain, with small or relatively large depressions
- Areas which may be flooded or land subject to temporary water logging, due to variation of Danube river levels
- Eroded or potentially erodable areas
- Low productivity agricultural land
- Canal, stream or reservoir banks
- Inadequate crop growing micro-climate conditions (strong winds, frequent droughts, early frost etc.)
- Special agricultural areas (high value crops, seed production parcels etc.)
- Land affected by chemical, industrial or agricultural pollution

- Scarce fuel wood resources
- Reduced biodiversity
- Constant need for new revenue sources
- Fishing & hunting facilities

Following the above mentioned criteria a map (Map 1) showing areas where agro-forestry practices can be applied was prepared (see Working Paper 4).

Tree planting program with technical recommendations and investment costs

Based on the map showing areas suitable for tree planting and in consultation with the local landowners, some areas resulted which are proposed for planting with tree.

For the agricultural commercial societies, the following areas are proposed to be planted:

- for S.C. Agrozootehnica Mircea Voda, 150 ha with Euro-American poplar, white poplar (Populus alba) and white willow;
- for S.C. Ceres S.A Ciocanesti, 840 ha with the same species;
- for S.C. Agroservcom Gradistea, 100 ha with Euro-American poplar, white poplar and white willow;

However, a pedological survey on soil profiles is required, before recommending any tree species (the water table level variations and soil carbonate content are very important information).

Table 1: Tree Planting Program in Boianu-Sticleanu Polder

- hectares -

Owner	Project year					Total
	2001	2002	2003	2004	2005	
Mircea Voda	10	15	40	40	45	150
Ciocanesti	10	50	150	250	380	840
Gradistea	10	15	20	25	30	100
Total	30	80	210	315	455	1090

The planting activity would have to be scheduled in time, so that the necessary saplings can be made available along with the machinery required for soil bed preparation, hole digging and husbandry of young plantations.

Reforestation schemes and arrangements

In the polder area, the following species would be used, arranged in accordance with the following recommended schemes and located in favourable spots (from the geomorphology, soil, surface and underground waters point of view):

1. Euro-American poplar - with a density of 625 saplings per hectare; arrangement scheme- 4 by 4 (distance between two consecutive saplings - 4m; distance between two rows - 4m).

2. White poplar - with a density of 1,670 saplings per hectare; arrangement scheme- 3 by 2 (distance between two consecutive saplings - 3m; distance between two rows - 2m).

3. White willow - with a density of 1,250 saplings per hectare; arrangement scheme - 4 by 2 (distance between two consecutive saplings - 4m; distance between two rows - 2m).

Investment costs

The investment costs was calculated based on the specific investment costs utilized by the National Forestry Regia during the year 2000. The costs for each specia and project year are presented in the tables 2, 3, 4 and 5, below.

Table 2. Investment costs for planting 35 ha with White Willow

- thousand ROL -

Planting commencing	Year					Total
	2001	2002	2003	2004	2005	
2001	0	0	0	0	0	0
2002	0	47,000	16,000	5,500	5,500	74,000
2003	0	0	94,000	32,000	11,000	137,000
2004	0	0	0	94,000	32,000	126,000
2005	0	0	0	0	94,000	94,000
TOTAL	0	47,000	110,000	131,500	142,500	431,000

Table 3. Investment costs for planting 870 ha with Euro-American poplar

- thousand ROL -

Planting commencing	Year					Total
	2001	2002	2003	2004	2005	
2001	147,000	87,000	33,000	33,000	30,000	330,000
2002	0	245,000	145,000	55,000	55,000	500,000
2003	0	0	784,000	464,000	176,000	1,424,000
2004	0	0	0	1,274,000	754,000	2,028,000
2005	0	0	0	0	1,813,000	1,813,000
TOTAL	147,000	332,000	962,000	1,826,000	2,828,000	6,095,000

Table 4. Investment costs for planting 185 ha with White poplar

- thousand ROL -

Planting commencing	Year					Total
	2001	2002	2003	2004	2005	
2001	0	0	0	0	0	0
2002	0	280,000	82,500	27,500	27,500	417,500
2003	0	0	448,000	132,000	44,000	624,000
2004	0	0	0	504,000	148,500	652,500
2005	0	0	0	0	840,000	840,000
TOTAL	0	280,000	530,500	663,500	1,060,000	2,534,000

Table 5. Investment costs for the tree planting in Boianu-Sticleanu Polder area

- thousand ROL -

Planting commencing	Year					Total
	2001	2002	2003	2004	2005	
2001	147,000	87,000	33,000	33,000	30,000	330,000
2002	0	572,000	243,500	88,000	88,000	991,500
2003	0	0	1,326,000	628,000	231,000	2,185,000
2004	0	0	0	1,872,000	934,500	2,806,500
2005	0	0	0	0	2,747,000	2,747,000
TOTAL	147,000	659,000	1,602,500	2,621,000	4,030,500	9,060,000

These costs are not including the VAT (19%).

For the details of this estimation see the Working Paper 4, Design of Agro-forestry program.

Pasture program with technical recommendations for grazing management and investment costs

Some 300 ha of degraded agricultural land were identified in the polder area (Map 2). The land belongs to the communas Cuza Voda (150 ha) and Gradistea (150 ha) and is used as natural pasture.
As a contribution to the project, the MAFF has prepared two feasibility studies regarding the rehabilitation of these lands and for the sustainable management of the communal pastures.
The conclusions of these studies will then be incorporated in the overall implementation plan for the polder area.
Based on the first results of the feasibility studies, as an estimate, a lump sum of about 200,000 US$ should be included in the project cost estimate to cover the investment for sustainable use of pastures demonstration.
For the preparation of the plan for sustainable management of the pastures, a specialized agency should be contracted by the PMU.

Regular monitoring of the quality of both irrigation and drainage water

Design and implementation of an adequate, continuous monitoring system for Boianu-Sticleanu polder area (Calarasi), as regarding the quality of irrigation water and drained water, in view of the changes likely to appear in the nutrient balance (N, P, K), must start with a thorough analysis of the irrigation and drainage scheme design, of the land use organization, of specific regulations for operating existing land reclamation infrastructure, by correlating these with the agricultural practices in the area and with the induced environmental impact, known and forecasted for the following years.

One also has to take into account the local conditions and particularities (whether natural or artificial, internal or/and borderly) occurring in time after the completion of the scheme and which may equally influence the location of the control sections or of the verification keys.

Land reclamation works within the polder area

embanked area	22,873 hectares
drained area (open drains)	21,916 hectares
irrigated area	20,150 hectares
drained area (tile drains)	175 hectares
fisheries	740 hectares

Surface and sub-surface drainage in the area:

Open drains are canals 1.5 – 3.5 meters deep, located 400-800 meters one from the other, grouped into 3 schemes: Boianu, Ciocanesti and Calarasi (Iezer).

Their design scheme provides for the water to be evacuated from Boianu I and Boianu II local schemes into the mixed role canal (irrigation and drainage) Botu Dunaricii, which in turn conveys excess volumes of water to the reversible pumping station also called Botu Dunaricii, which evacuates this water into the Danube river.

From Ciocanesti local scheme, drained volumes of water are evacuated through the Bogata pumping station into the Garla Mare natural canal which has multiple functions (irrigation, drainage, replenishment water source for the Calarasi fish lake) and which flowing at the bottom of the terrace, conveys surplus water to the Jirlau evacuation pumping station.

From the Iezer local scheme, water is taken by the C II collector, also with double function (irrigation and drainage) and conveyed to the Jirlau pumping station, from where it is evacuated into Borcea oxbow.

Irrigation infrastructure in the area:

The method of irrigation adopted is sprinkler, relying on buried pressure pipes, with distance between two antennae of 648 meters. Sprinklers are Romanian made, of the ASJ 1 M type. Application scheme is 18 x 24 and the cycle is 12 days.

Irrigation water is ensured from the following sources:

- → Galatui – Calarasi irrigation scheme, with a syphon extracting water from the CA supply canal which in turn abstracts water from the Danube, through the floating pumping station located at Km 388+250
- → Botu Dunaricii canal which is linked to the Garla Mare natural canal by means of watertable level variation, is supplied with water from the Danube through the Botu Dunaricii reversible pumping station (situated at Km 394+800 on the Danube).
- → Ezerul Mostistea scheme, by gravity from the intake located near Dorobantu dam, supplying Batrana – Garla Mare canal.

A. Irrigation scheme design

It consists of the following elements of infrastructure:

Danube embankment, supply canals, drainage canals (both categories of various ranks) both artificial an natural, canals with combined operation or reversible type canals (for irrigation and drainage) with interconnection facilities and all the ancillary equipment (hydraulic structures) such as drainage pumping stations, reversible type pumping stations, culverts etc. and an important conveyance facility (Annex 4).

Irrigation water is supplied from three distinct sources:

1. from the Danube river, by means of the floating pumping station (located at Km 388 + 250) a 65 cu. m/s discharge is conveyed into CA I canal (constructed in cut and fill, with an average height of 5 meters, lined with concrete slabs and crossing the polder area from the south to the north on a length of 7.28 Km, up to the discharge point into Galatui lake), from which an usable discharge of 8.86 cu. m/s is captured for the polder area (7.66 cu. m/s through the intake siphon into the C II reversible canal and the remaining 1.2 cu. m/s by pumping).

2. through the Batrana canal (linking Mostistea with Botul Dunaricii), the polder area receives a 4 cu. m/s discharge, taken from Ezerul Mostistea (Barajul Dorobantu intake) scheme.

3. through Botul Dunaricii reversible pumping station, a 6.5 cu m/s discharge is being conveyed into the natural canal bearing the same name; this natural canal is joining Batrana canal forming the Ciocanesti conveyance facility, which directs water to Garla Mare natural canal (also situated at the bottom of the terrace).

Provision of irrigation water for various local schemes and/or plots is made in accordance with the scattered landowners (contracts for the provision of irrigation water drawn, with individuals, agricultural association or commercial societies) and with the cultivated crops (in direct correspondence with the alternating drought periods); this is why certain problems may appear when wanting to supply enough irrigation water to different locations within the polder area, at any given moment, mainly for irrigating early crops and/or during very dry summers.

The economic advantage of recirculating water within the polder area requires careful monitoring (from the ecological point of view) of its quality, in order to be able to minimize the risk of potential pollution, salinization and other phenomena of soil degradation, generated by irrigation water or by water from the surface drainage network. If only this, is sufficient grounds for the need to closely link the two focalized factors to be monitored, the water and the soil.

B. Operation rules & regulations

Regulations required for the operation of land reclamation infrastructure (supply networks, pumping stations, dykes, water in-field application equipment etc.) have to take into account the opportunities of exploiting the polder area itself, both from the agricultural and from the forestry point of view.

C. Environmental impact of agricultural exploitations and irrigation and drainage schemes

Natural background

Boianu-Sticleanu polder area lies within the Danube floodplain, between Km 370+000 and Km 403+000, being approx. 29 Km long, with a minimum width of 5.5 Km to the west and a maximum width of 13.0 Km to the east.

To the east, the polder area is limited by Borcea Arm (Danube river oxbow) on a length of 33.0 Km; to the west, Boianu-Sticleanu polder area is divided by Mostistea supply canal from Oltenita-Surlari-Dorobantu embanked area.

Local conditions and particularities

Geomorphology of the area:

From the geomorphological point of view, Boianu-Sticleanu area is part of the Danube flood-plain area.

The relief has a small general slope, being scattered with numerous micro-depressions and lower areas.

The general difference in terrain elevation is of 6.2 meters (from a maximum elevation of 15.0 m to a minimum of 8.80 m).

Approx. 90% of the polder area has elevations between 9 and 12 meters. Geologically speaking, the area lies on fine alluvial deposits, which in turn lie on sand and various layers of gravel.

Deeper, the parent rock is constituted of dark marl, clay, sand, limestone and gritstone. In the terrace area, some loess deposits have been identified, occasionally comprising layers of sand.

Classification of the soils in the polder area:

Category I – fine to course sand and slightly loamy sand – plasticity index below 7 and clay content below 15.

Category II – clayish sand, sandy loam and sandy-clayish loam – plasticity index value below 20 and clay content below 30.

Category III - clayish loam, clayish- sandy loam – plasticity index value between 15 and 25; clay content below 30.

Category IV – loamy clay, sandy-clay – plasticity index value below 45; clay content below 60.

Category V – greasy clay - plasticity index value below 45 and clay content below 60.

Category VI – silty soils.

This classification was made for two surveyed depth intervals, one between 0-2 m and a second one between 2-5 m..

The conclusion from the geotechnical survey was that for both depth intervals, the predominant soil categories are IV and V.

Deeper, the layers of sand with gravel with average thickness between 2 and 26 meters, can be found all over the polder area.

Hydrogeological conditions:

a) The aquifer

The hydrogeological survey (Annex 5 and 6) of the area showed the existence of two lithological compounds as described below:

→ near the surface – low permeability compound consisting of clay (occasionally loamy or sandy) with thickness varying between 2 and 22 meters. In certain areas this compound is not present or is alternating with lens of clayish sand (near the Danube embankments).

→ deeper – a more permeable compound consisting of two layers – one upper layer made of sand with variable texture (thickness between 2 and 24 meters) and the second, lower, made of a mixture between sand and gravel and sometimes cobbles (thickness between 1 and 15 meters); in some areas, the upper sand layer may be missing.

This second compound represents the Danube floodplain aquifer, of quaternary age, which has been identified up to depths of 11-31 meters.

The parent rock is represented by clay, marl, gritstoned sand and isolated limestone intrusions.

b) Underground water:

The above mentioned aquifer contains water with ascension potential; this water may be stabilized within the upper compound, at variable depths, according to natural factors (rainfall, infiltration from the Danube etc.).

Danube significantly feeds this aquifer between April and June and drains underground water from the area, at low levels (between September and October).

Precipitation directly influence the supply of this aquifer, but to a smaller extent, especially where the relatively impervious upper compound is missing or is mainly constituted of sand.

On some areas, specifically on low depressions, a seasonal phreatic table may be formed, facilitated by the existence of sand deposits, separated from the main aquifer through lens of clay and loamy clay.

Whenever heavy rainfall coincide with high watertable levels induced by the Danube, the soil being saturated with irrigation water and the evacuation canals being in turn filled with water for irrigation purposes (May to June), then consequences may be disastrous for the crops which suffer from extended periods of waterlogging (the case in 1985 at Mircea Voda state farm).

Watertable levels variation in the polder and low terrace areas generally reflect the variation of Danube river levels, with two major periods:

→ a rising in levels, beginning in November and ending in May.

→ a decrease in levels, starting in June and ending around October.

Maximum watertable levels are usually recorded soon after the maximum Danube river levels between May and June, each year.

Water and Soil Quality Monitoring Program

An extensive soil and water quality monitoring program will be established for the proposed project area, consisting of the biggest part of Boianu-Sticleanu polder area, in order to monitor the changing quality of surface and ground water bodies that eventually are draining into the Danube river.

Standardized water quality monitoring efforts are needed to provide decision-makers in Romania and the public with reliable data on problems and trends in water quality of the Danube River, its tributaries and the Black Sea.

The Environmental Protection Inspectorate (EPI) in Calarasi has an ongoing water monitoring program to monitor the quality of Danube river at ten locations along the Romanian border.

EPI is collecting data on nitrate and phosphorus levels in addition to eight other parameters.

The Directorate of Public Health in Calarasi collects weekly/monthly data on bacteria from several drinking water wells throughout the Cararasi Judet and the Danube river.

Current ongoing efforts on collecting soil and water quality data are hampered by the lack of adequate financial resources, state-of-the-art laboratory and monitoring equipment and chemicals needed for the various analyses and maintenance of the existing water quality laboratories.

In addition to the ongoing efforts by the EPI and Directorate of Health in Calarasi, following will be the specific soil and water monitoring activities of this project:

i) A total of 10 new piezometers would be installed in the polder area, with the aim of sampling ground water quality for nitrate, phosphorus, bacteria and pesticides; depth of these piezometers will be decided after ground water aquifer survey is completed which will include the depth of the watertable aquifers, direction of groundwater flow and possible sources of groundwater contamination and at each of the 10 piezometer sites soil samples will be collected for nitrate and phosphorus analyses.

ii) Three drainage/irrigation canals in the Boianu-Sticleanu polder area along the Danube river that drain into the Black Sea will be selected for extensive water sampling for nitrate and phosphorus analyses.

iii) Water samples will be collected at two different sites on the Danube river for nitrate, phosphorus, pesticides and bacteria analyses (inlet and outlet of the polder).

iv) In order to assess the impacts of GEF investments in the polder area through the introduction of conservation tillage, crop rotation and manure management practices on the water quality of Danube river, SWAT computer simulation model will be calibrated and tested on selected sites in the polder and terrace area and simulations will be conducted to predict the overall effect of management systems on the transport of nitrate, phosphorus, and bacteria to Danube river.

v) Project will purchase equipment for nitrate analyses to strengthen the existing capacity of EPI for analysis of water (soil) samples as well as to support the monitoring work. The project will coordinate this activity with other GEF projects in the Black Sea area.

Frequency of Sampling

The frequency for collecting soil and water samples will depend on the weather and cropping pattern in the areas. A minimum of one water sample should be collected each month from each of the surface water monitoring stations (rivers, irrigation/drainage canal), piezometers, and drinking water wells. Water samples will be collected after every major rainfall greater than 7.5 cm per day or of greater intensity for water quality analyses (the greater likelihood of transport of fertilizers, pesticides,soil particles and manure to surface water bodies will be with major rains and surface water must be sampled for agricultural and bacteria pollutants).

The project should develop a quality control/quality assurance (QC/QA) operational manual to give detailed methodology on sample collection, transport, preservation, storage, and laboratory analytical procedures for chemical and bacteria analyses.

Training

It is recommended that the staff of the EPA laboratory, who will be responsible for analytical analyses for soil and water be trained in the analytical procedures and new laboratory equipment.

Installation of Piezometers and Groundwater Sampling:

Piezometers or groundwater wells for water quality monitoring will be installed. The wells and piezometers required throughout this project will be a 50 mm i.d. PVC pipe with a 0.25 - 0.5 mm width slots. Each piezometer casing will be encased in a metal pipe with a concrete slab, a lock and key mechanism.

All piezometers will be developed immediately after installation. The best way to develop these piezometers/wells would be to purge them several times before use.

Surface Water Sampling

Surface water will be monitored and measured using simple flumes installed at selected locations. Each flume collects water samples as a function of runoff flow volume. Surface runoff from field plots will be analyzed for various agricultural and manure contaminants. Open drains/irrigation channels will be sampled once a month to record both primary and secondary flow.

Conservation Management Plan for the proposed Iezer Calarasi nature reserve

Characteristics of the ecotop and biogenesis

The Ecotop:

Boianu-Sticleanu polder area is situated within the Danube floodplain area, in the South-Eastern part of Romania, at the crossing between the 27° meridian and 44° parallel.

This area, one of the youngest in our country (geologically speaking), was formed as a result of sunken cretaceous relief formations, on which successive layers of sediments had been deposited throughout the quaternary age.

Alluvial deposits are constituted of cobbles (deeper), coarse gravel, coarse to fine sand, silt and clay in layers of variable thickness.

Loess deposits, of the wind erosion type are predominant to those formed by overlapped layers.

Significant in terms of occupied area, are also the wetland and marsh deposits, made up of mineral and organic decomposed matter.

Generally, running waters have considerable longer life than the stagnant waters, the latter category could be easily dried or affected by siltation phenomenon. Also, due to powerful processes of erosion and sedimentation, running streams may modify their course. To a certain extent, this tendency may also be noticed at the Danube river, near the polder area, where the right river bank was eroded and the left bank was influenced by sedimentation.

Danube river, a continental type river is a permanently running watercourse, its width near the Boianu-Sticleanu area ranging between 800-2,500 m and having an average discharge of 6,000 cu. m/s.

The right bank, with sloped areas, is continuously eroded and with poor vegetation.

The left bank of the river has a small threshold like area, along which willow trees and poplars grow and across which water overflows during floods, penetrating the floodplain area which can be 5 to 13 Km wide.

The water velocity obviously determines the quality of sediments, this in turn influencing the biogenesis in the area.

In sections with strong water currents and sandy bed, several plant species may find adequate conditions, such as: Ranunculus, Potamogeton, Salix etc.

Near the banks vegetation is represented by perennials, capable of resisting the winter and spring period, sometimes immersed in the water (Illippuris, Sparganium, Scirpus, Ranunculus, etc.)

Some old stagnant water in the area (Boianu lake, Calarasi lake, areas of Garla Mare, Beliane, Groapa din drum, etc.) may show various degrees of siltation.

For the initial siltation phase, predominant plant species are those from the family of Ceratophyllum Chara; for the medium siltation phase, Potamogeton may appear.

During the next phase of this phenomenon, some species may appear in great number: Butomus, Sagittaria, Alisma, Schoenoplectus etc.

Impact of the land reclamation works on the environment

Soils evolution in the area

Analysis of the soils evolution in the Boianu-Sticleanu polder area was based upon existing specialized studies carried out by D.R.I.F.O.T Bucharest in 1969 (after the construction of the embankment) and by I.C.P.A. Bucharest (Institute for Research in Pedology and Agrochemistry) in 1990. By interpreting the pedological map drawn in 1969, the following 29 soil units were identified (sec map no.10 and ANNEX of SOILS)

By comparing pedological surveys carried out in 1969 and in 1990 (this elapsed time represents a considerable service period for the existing land reclamation infrastructure in the area), one could notice several changes that occurred in the areas with different irrigation suitability potential:

- Areas previously occupied by land in class I and II of irrigation suitability decreased, due to unreasonable irrigation application on land with low depth watertable, leading to settlement, salinization and alkalinization phenomena.
- areas previously occupied by class III, IV and VI of irrigation suitability, remained more or less the same.

As concerning the area affected by salinity, this decreased, but some areas with slight to moderate alkalinity appeared.

From the 1990 pedological survey, one can find out that 6,260 ha are affected by slight salinization and/or alkalinization processes, representing approx. 28% of the total polder area, the existing potential of these phenomena being quite high in the area, as on wide surfaces, watertable is very near to the surface, this enabling removal of existing salts.

Evolution of spontaneous and cultivated flora:

Until it was embanked, the Danube floodplain area had its vegetation influenced by geological, hydrogeological, climatic and biological conditions and only to a small extent by human induced factors. This environment was mainly aquatic, with scarce vegetation and with some intermediate phases it reached the stage of stagnant waters, highly affected by siltation and temporary flooded drylands.

After the embankment was constructed, the pace of vegetation development was accelerated and sometimes, some phases were even leaped over. Changes were significant and profound consisting mainly of tree cutting, scarification and drainage measures.

Cultivated plants (crops) are now occupying the most widely part of the polder area, representing in fact the purpose of operating existing land reclamation infrastructure.

Although widely recognized for their high yield capacity, crops are nevertheless known to simplify system relations, being more unstable than the components of natural ecosystems. Due to the areas where waterlogging is a serious problem, crops are sometime very difficult to husband, some aquatic vegetation (such as reed for example) being easily transformed into weeds, often hard to be eradicated.

Natural pastures in the area, valuable from the livestock fodder point of view, are usually surrounded by forests, cropped land, dyke banks or canal banks.

Aquatic vegetation, once predominant in this area, is now limited to the two large lakes, neighboring wetlands and drainage canals.

Within the polder area, tree and shrubs are poorly represented, consisting mainly of a relatively narrow strip between the embankment and Danube river, Boian woods and isolated spots of poplar and willow trees.

The existing network of drainage canals creates a microclimate deemed favorable to plants and to a significant number of animals (birds, reptiles, amphibians, etc.) which due to their particular feeding habits consume many pests.

Environmental Impact Assessment

Existing land reclamation schemes in Boianu-Sticleanu Polder may have positive or negative impacts upon the environment, but due to their particularities, such schemes may be regarded as ecological measures, able to enforce soil conservation.

Positive impact

a) upon soils:

→ increased agricultural productions
→ improved water balance in the soil, due to reasonable irrigation application
→ increased areas where soils have good potassium and phosphorus reserves
→ smaller areas affected by salinization, due to complex irrigation, drainage and soil treatment measures.
→ smaller areas affected by waterlogging
→ improving the soil air circulation capacity
→ soil conservation

→ limitation of surface run-off potential by proper coverage with vegetation
→ increased humus content in the soil and better fertile potential

b) upon water:

→ ensuring crop water demand through irrigation
→ flood protection through embankments and drainage works
→ lowering watertable levels through surface and sub-surface drainage works avoiding rainfall generated surface stagnant water volumes
→ alternative sources of irrigation water from drainage canals
→ drainage works in areas surrounding rice paddy fields avoid turning such areas into marshes and keep watertable levels low.
→ drinking water sources by catchment of natural springs

c) on flora and wildlife:

→ irrigation ensures increased agricultural production
→ increased amounts of qualitative cereals and fodder stimulates livestock breeding in the area
→ some species of birds temporarily occupy land with irrigation infrastructure for feeding purposes
→ reshaping the vegetation cover (and simultaneously the number of animals and microorganisms within) has beneficial consequences upon the soil organic matter content, soil aeration and fertility potential.

d) on land-use categories

→ maintaining the size of cultivated areas by controlling erosion, salinization and eutrophication phenomena.

e) on social and economic background:

→ land reclamation works facilitate economic development of relevant areas where they were constructed
→ such works protect human settlements against dangerous calamities (floods etc.)
→ land reclamation works (through drainage networks) also contribute to the containment of certain infectious disease (typhoid fever, cholera, dysentery etc.)

Negative impact

a) upon soils:

→ occurrence of secondary salinization phenomenon, either due to excessive irrigation application not correlated with proper drainage measures, or by extensive use of subirrigation
→ design and construction of unlined, or inadequately lined canals, leading to important water seepage, settlement in areas with loess deposits, waterlogging or secondary salinization.
→ seepage from irrigation application, generated by faulty equipment
→ poor management and improper operation of irrigation and drainage schemes

→ soil pollution by utilization of improper irrigation water (slurry from pig farms, industrial pollutants, chemical fertilizers etc.)
→ underground tile drains buried at inadequate distances may lead to a moisture deficit in the soil during dry summer periods.

b) upon water:

→ insufficient correlation between the method of irrigation, soil texture, slope, discharge and intensity of rainfall etc.
→ eutrophication of surface waters due to phosphorus and nitrogen amounts
→ faulty drainage, seepage from irrigation, infiltration under dykes and other structures may all generate waterlogging
→ irrigation using wastewater or insufficiently treated water may pollute surface and underground waters
→ if evacuation is not managed properly, hazardous floods may be generated when existing discharges from the drainage network occur simultaneously with exceptionally heavy rainfall

c) on flora and wildlife:

→ some aquatic species may disappear when drainage works are constructed and operated in the area
→ the existing biotop was affected during canal digging and during spreading of excavated material, as the biological structure of the soil profile was modified
→ by reducing water content in the soil, some aquatic species of plants and animals depending upon these were seriously affected
→ by replacing the willow trees with EuroAmerican type poplar trees, within the embanked area, these trees have a shorter existence (only 8 to 10 years) and cannot represent a favorable environment for diverse fauna and flora.

d) on land use categories:

→ extensive change of land use categories, such as from previous pasture or hay fields to arable, may act as a disadvantage for the development of livestock breeding in the area

e) on social and economic factors:

→ extensive irrigation application may create the means for the transmission of infectious diseases
→ some water sources may be polluted with toxic substances, with dangerous effects on human health

Pollutants which can affect the soil and subsoil of the area

As potential pollution sources in this area, one can mention the following:

→ Industrial emissions (inorganic powders or ashes) from the Calarasi steel works – containing Zn, Cu, Fe, Mg etc.; amounts of such powders accumulated on the soil surface are within tolerated pollution limits.
→ nitrates in the soil are a major reason of concern only when their amount exceed the value needed for the crop nutrition; nitrates content in the ploughed layer of the soil does not

exceed the tolerated value i.e over 100 ppm; higher values can only be met in regions with vegetable crops or unmanaged manure.

→ pesticides-according to previous soil test, these are no source of pollution in this area.

This area has not been irrigated with wastewater so far. Up to 1995, slurry from Cunesti cattle breeding farm complex was discharged into the drainage collector located at the bottom of the terrace. Presently, this livestock farm is undergoing a process of dissolution.

Change in the quality of underground and surface waters in the area

The chemistry laboratory analyzed a number of four water samples taken from drainage canals, with the purpose of establishing the opportunity to use this water for irrigation. Based on the results of these tests (complying with Romanian standard no. 9450/88, it was found that this water is inproper for irrigation utilization, being aggressive towards concrete and of the carbonate and sulphate type.

Environmental impact evaluation and conclusions

Soil samples taken from the area revealed traces of inorganic powders (ashes) coming from the Calarasi steel works, namely zinc (0.8 to 1.6 ppm) and copper (4 to 6 ppm).

Iron and magnesium amounts found are deemed negligible.

Therefore, emissions deposited on the soil surface are within tolerated limits.

Nitrate and pesticide amounts are also below tolerated values within the soil.

From our point of view, salinization and/or secondary alkalinization present in the area are not pollutant agents.

As a conclusion, on approx. 300 ha, some salinity prevention and control measures are needed in this area, and by extrapolating this, such measures are required for a surface of approx. 700 ha at the level of the whole embanked (polder) area.

Recommendations

For the whole area of Boianu-Sticleanu polder, only a few hydro-agricultural improvement measures are needed now, as this territory was projected for drainage and irrigation ever since 1970.

Presently, a considerable area (approx. one third of the total) is moderately to strongly affected by the waterlogging phenomenon, due to low depth watertable, in some cases even in the form of swamp areas. Measures to control this phenomenon include:

- → control of watertable levels by proper evacuation of drained water (drainage canals are presently silted on approx. 40% of their section and are invaded by reed type vegetation (Tipha latifolia and/or Phragmites comunis);
- → reshaping and rehabilitation of existing open drains and collectors, seepage control by lining the main supply canals (together with Manastirea and Galatui canals and Batrana canal situated to the north) which stay full during irrigating seasons etc.
- → extension of drainage infrastructure in the area, by providing buried tile drains especially for the areas formerly occupied by lake beds (heavy textured clayish soils).
- → careful correlation between irrigation application rates, watertable level variation and the texture of the soil

Some agricultural techniques are also required:

→ varying the ploughing depth in order to avoid the "hardpan" occurrence
→ scarification on those areas where human – induced settlement occurred (specifically for the soils with clayish – loamish textures) and on those where tile drains are proposed to be installed.
→ salts leaching using supplementary irrigation application rates for those areas affected by salinization
→ operation-type land levelling, recommended for those surfaces with uneven topography and careful fertilizer application on soils with light texture (sandy-loamy).

Proposals for the reclamation and fertilization of salinized soils:

→ Soil leaching - applying water through suprairrigation during the vegetation season or outside this period (application rates of 30,000 cu. m/hectare). On those areas intended to be leached, prior tile drains installation is needed. Such soil leaching treatments are recommended for a period of 4 years.
→ soil treatment – using materials of the phosphogipsum type; prior to their application, these soil treatment materials must be tested for adequate structure (moisture content, granular size etc.). The required soil treatment application rate is of 10 tonnes of phosphogipsum per hectare, in accordance with the findings of the pedological surveys. The administered dose must not vary with more than 15% compared to the exact amount needed to be applied. After the soil treatment application, a 20 cm no till land preparation is needed, followed by a disk-harrowing. After this, a deep chisel work is required.
Application of such soil treatment substances may be performed during:
→ summer time, as fodder crops are gradually being harvested
→ summer time, on the residue from cereals (stalks etc.)
→ autumn, before the land preparation
→ winter time, on frozen ground, for those areas with autumn wheat etc. (only agrolimestone powder or a similar substance)

For the improvement of agricultural exploitations' efficiency, some fertilizing measures are also needed, using chemical substances and manure.

Recommended quantities are:

→ manure – approx. 30 tonnes/hectare
→ chemical fertilizers – ammonium sulphate – 150 kg/ha

Monitoring the effect of such measures is usually done by means of agrochemical surveys, carried out once every three years.

The following crops are recommended to be cultivated on salinized soils:

→ perennials
→ sorgum, fodder sugar beet, barley, sugar beet, plaster clover (Melilotus officialis)
→ wild camomile (Matricaria chamomila), crocus (Crocus banaticus)
→ alfa-alfa, oil seed rape, millet (Panicum miliaceum), white mustard (Sinapis alba) etc.

Conclusions

Before the embankments were constructed, the mechanism of the hydrographic network was complex, depending on the watertable level variation, duration of floods and moments of their generation etc.

Periodic replenishment of stagnant waters and ponds, together with occasional stronger currents made the mineral and organic siltation process slower only below the multiannual value line.

After the area was embanked, this mechanism became simpler, the floods were eliminated, water circulation grew slower and level variations were significantly smaller, this leading to a faster mineral and organic siltation process.

Impact of associated tree cutting, scarification and drainage measures was certainly significant on the environment.

Alluvial soils in the area have to maintain their fertility potential by reasonable application of fertilizers.

Land leveling, adequate drainage and reasonable irrigation utilization, together with frequent replenishment of the water within open drains and collectors must be carefully managed.

It is recommended that canals are populated with certain species of fish (phyto-carp etc.) which can naturally control the number of aquatic plants (the main reason for drainage network inefficiency).

A major concern should also be the periodic maintenance of canal slopes where weeds can really create serious problems.

Guidelines to good agricultural practices in the polder area

Intensive agricultural practices – and especially those implemented within enclosed or semienclosed areas such as Boianu-Sticleanu polder – do not give a single chance to environmental protection or to ecosystem biodiversity.

Under such conditions, almost in every case, agriculture is to be found both as polluted and polluting.

Such reversible phenomenon can also be found within the above mentioned polder area, manifested through either diffuse or concentrated pollution from industrial and agroindustrial centers, or through careless agricultural practices and lack of domestic waste and manure management, practically leading to the contamination (to different degrees) of all the three basic ecological components (air, water and soil).

Whereas pollution from “external” sources (i.e. to the polder) gradually decreased as a result of major industrial shut-down (only Danube water quality may still be at risk in the case of

accidents occurring upstream), "internal" sources of pollution are still potentially hazardous, with negative consequences to the local environment, to the communities located downstream and ultimately to the Danube Delta and Black Sea area.

These "internal" sources of pollution are directly related to current agricultural practices in the area and also to poor management of domestic waste in the polder area, in the neighboring communities and in the terrace area.

In order to put an end to these ecologically unsound practices, one must have some guidelines required for the implementation of good agricultural practices in the polder area, which should comply with applicable Romanian legislation (Govt. Decision no. 964/2000) and also with relevant EC requirements.

The Romanian Government issued a decision (**no. 964/October 13, 2000**) which basically adopts a master plan designed to protect streams against nitrates pollution from agricultural sources; it also defines a series of criteria required for the identification of those water bodies already polluted with such substances and of potentially affected water courses, simultaneously incorporating the Romanian version of the Code of Good Agricultural Practices.

A. TARGET:

Reducing nitrates pollution, preventing such pollution and implementing the reasonable utilization of nitrogen – based chemical fertilizers

Provisions (they have to be differentiated for each region, according to general or particular conditions):

1. periods deemed inadequate for applying fertilizers to the field
2. specific fertilizer application technologies for geomorphologically particular terrains (steep slopes, depressions, flooded areas, waterlogged areas, high watertable levels etc)
3. field application technology for organic or synthesis fertilizers (dosage rates, uniformity of application, compliance with regulations which define the tolerated amounts of nitrogen compounds within surface and underground waters etc.)
4. proper utilization of land (crop rotation and optimum ratio between land occupied by permanent crops and land occupied by annual crops)
5. maintaining minimum amounts of vegetation in the field, able to cover the land during the winter season, in order to retain nitrogen.
6. drawing rotation plans and keeping soil records for each crop and each parcel
7. recommendations on the handling and storage of chemical fertilizers, including on the delivery terms and conditions (not in bulk, only in durable, impervious bags of various capacities, marked using damage proof labels – stating the fertilizer type, its chemical structure and concentration, degree of solubility, date of manufacture and validity term etc.), special handling procedures, total quantity delivered, address of the manufacturer etc.
8. information regarding the combined application of chemical fertilizers and manure, in accordance with the soil nutrients balance and with the prognosticated crop nitrogen requirement.
9. provisions described under 8) apply to all synthesis obtained substances, utilized in agriculture.
10. as concerning the land reclamation works, the operation and maintenance regulations will be followed in accordance with the natural water and soil resources'

preservation, specifically aiming to implement multiple request irrigation application (targeted at the crop, the soil and the watertable levels) during the entire vegetation season.

Proposed Code of Good Practices for the Protection of Waters and Soils within Boianu – Sticleanu Polder

(Adapted from I.Toncea)

This Code of Good Practices is a succesion of practical rules that should be obeyed by farmers from the Boianu – Sticleanu polder area:

1. Extension of agro-forestry systems such as windbreaks/shelterbelts, hedgerows, filter strips and narrow vegetative barriers on land deemed as inadequate for agricultural purposes (with periodic waterlogging, rich in soluble salts or exchangeable sodium or with low fertility potential).
2. Cultivation of 25 – 30% of the arable area with annual and perennial leguminous crops.
3. Reduction of tillage depth by 5 – 10 cm and gradual replacement of the traditional moldboard plough with conservation tillage and reduced tillage systems.
4. Combined utilization of existing drainage schemes, both for draining surplus water and for the completion of crop water demand, associated with the accurate monitoring of water quality and soil salinity.
5. Crop irrigation using conventional clean water and application rates in correlation with the soil moisture storage capacity; for the case of applying irrigation prior to sowing, the tilth depth would be of maximum 25 cm.
6. Crop fertilization using solid (organic semi-digested manure, compost, vegetable rotten material, green fertilizers and bacterial fertilizers) and ecological fertilizers; liquid fertilizers are forbidden from use.
7. The application rate for semi-digested manure and compost should be of maximum 10 t/ha and year; for a 4 -5 year rotation, the maximum rate is 40 – 50 t/ha; manure would only be applied during July – October interval, as the main fertilizer, provided the watertable depth is not too small, by even spreading on the land, immediately followed by soil incorporation using the disk-harrow, after which the land is ploughed.
8. Leguminous seeds treatment using specialized bio-products (e.g.NITRAGIN) for peas, beans, soya-bean, alfa-alfa, etc. Dosage: 4 bottles (200 – 250 ml each) for the amount of seed required for one hectare.
9. Growing green fertilizers and incorporating them into the soil, together with the whole residue amount (straw, sunflower stems, weeds, etc.)
10. Field burning of various straw, stems and other vegetal residues is definitely prohibited.
11. Accurate fertilizer dosage application, in accordance with the requirement of each crop, adapted to the soil's agro-chemical indices and correlated with the previously used agricultural technology.
12. The use of nitrogen-based and foliage-targeted fertilizers should only occur in the spring and summer (during the vegetation season) and phosphorus & potassium-based fertilizers should be applied during summer and autumn, prior to ploughing.
13. Fertilizers (ecological and organic) would only be spread using terrestrial mechanized means, localized and in an evenly manner.
14. Unilateral nitrogen fertilization is forbidden and no un-wrapped organic or chemical fertilizer amount should be allowed to be stored on the soil, not even on a temporary basis.
15. Within the Protected Area only authorized treatments and fertilizers should be used in the way specified in their authorization; field spreading only using terrestrial means is advisable too.

16. Any amount of manure and fertilizers, including their wrappings should only by deposited in specially designated locations, previously approved by the Environmental Protection Agency.
17. Grazing should be performed in dry soil conditions (outside March to April interval) and during the winter season; it is preferable to graze only sheep and young cattle; the optimum values of animal load are within the range of 1.5 – 2.0 livestock units per hectare.

ROMANIA
AGRICULTURAL POLLUTION CONTROL PROJECT

TERMS OF REFERENCE

DESIGN OF CONSERVATION MANAGEMENT PLAN
FOR THE IEZER CALARASI NATURE RESERVE

BACKGROUND

The Government of Romania has obtained a Grant from the Global Environmental Facility to support an Agricultural Pollution Control Project. The ultimate goal of the project is to reduce the discharge of nutrients and other agricultural pollutants into the Danube River, Danube Delta and Black See through integrated land and water management.

One of the Project activities is to assist the Government of Romania to promote ecologically sustainable land-use in the Boianu-Sticleanu Polder, including the preparation and implementation of a Conservation Management Plan for the Iezer Calarasi area proposed to be declared a nature reserve.

This area – about 3,200 ha - which over 4 decades ago was natural wetland, is partly administered by Calarasi municipality (20%) and by Cuza Voda commune (80%).

Local biodiversity is represented by birds (13 species, of which 7 are officially protected according to the Berna and Bonn conventions on wildlife preservation) such as: the red-necked goose (*Branta ruficollis*), the white-headed duck (*Oxyura leucocephala*), the common pelican, (*Pelecanus onoerotalus*),the winter swan (*Cygnus Cygnus*), the small egret (*Egretta garzeta*), the red heron (*Ardea purpurea*), the white stork (*Ciconia ciconia*).

Other unprotected species existing in the area include: *Podicepes critatus cristatus*, the sweet water tern (*Larus ridibundus*), the moor hen (*Fulia atra*), the big and the small cormorant *(Phala crocorax carbo*/ pygmaeus), the eastern flossy ibis (*Plegadis falcinellus*) etc.

Among mammals one can mention the otter (*Lutra lutra*) which is very sensitive to the water quality and to the environment quality in general (for this reason being a precious bioindicator) being itself a protected species (according to the Berna and Bonn conventions), the common badger *(Meles meles*), the hare (*Lepus capensis*), the fox (*Vulpes vulpes*), the mole (*Talpa eurapaea*), the muskrat (*Ondata zibethica*) and the common gopher (*Cittelus citellus*).

Among the reptiles one can mention: the grass lizard (*Lacerta agilis*), the river snake *(Serpentes ord*.) and the sweet water turtle (*Emys orbicularis*).

The amphibians are represented by two common species: *Rana esculenta* and *Bambina bambina*.

The mollusk family is represented by snails (*Limnea starynalis*), oysters (*Anodont*a and *Unio*), the bittern or mine drum (*Botaurus stellaris and Hydrophilos piccus*)

The fish are those characteristic to the Danube fed ponds such as the carp (*Cyprinus carpio carpio*), the crucian (*Carassius auratus gibelio*), the pike (*Esox lucines*), the perch or zander (*Lucioperca lucioperca/sandra*), the sheat fish (*Silurus glanis*) and the perk *(Perca fluviatilis*).

The vegetation is dominated by the sedge (*Carex),* the mace reed (*Typha angustifera*), the common reed (*Phragmites communis*), the couch grass (Agropyrum repens), the Dutch rush or shave grass (*Equisetum hiemale*) and the duckweed or frog foot (*Lemna minor*).

It is worth emphasizing that all the aforementioned species existing in the area are made reference to in the Romanian Government Decision no. 236/24 November 2000 - Appendix 3, for which reason, the designation of a special preservation area for migratory birds is necessary.

It is a fact that late in the autumn, flocks of red–necked ducks (rare, protected species) massively transit the Iezeru Calarasi area, huge numbers deciding to rest within this spot, according to the harshness of the winter season, as do all the other species of migratory birds.

These are enough grounds for formal declaration of this area as nature reserve. The formal proposal for declaring Iezer Calarasi area as a natural reserve was made by the Calarasi County Council and a favourable permit was issued by the Romanian Academy – The Commission for Nature Monuments Protection.

During the first stage, most of it already completed, this area would be declared as wetland natural reserve, subject to applicable national legislation. In an ensuing stage, this area would be governed by international regulations - as special protection migratory birds reserve, also taking into account all the environmental protection conventions and treaties signed on behalf of Romania (see annex --) and the Romanian Government Decision no. 236/24.11.2000 concerning the statute of protected natural areas and the preservation of the wild flora and fauna.

OBJECTIVES

The objective of the consultancy assignment is to: (i) design and cost a Conservation Management Plan for the proposed Iezer Calarasi nature reserve and (ii) prepare an indicative four-year investment program.

The Conservation Management Plan will support the operation of Iezerul Calarasi area as a nature reserve/special migratory birds protected area, thus providing solutions to the particular ecological problems of this area, aimed to ensure its future conservation, preservation and sustainable utilization as part of the national natural patrimony.

Simultaneously, such a plan has to be able to provide the keys to implement the actions that derived from those environmental commitments assumed by Romania, such as preserving wetland areas of international importance and the habitats of aquatic flora and fauna, together with all the other components of relevant ecosystems and food-chains:

→ conservation of existing wildlife and especially the protection of rare or endangered species of migratory birds;
→ preservation of natural habitats;
→ conservation of existing biodiversity of this area;
→ maintaining the ecological balance in the area

TASKS

The principal tasks are as follows:

(a) analyze the current situation and prepare an ecosystematic zoning of the nature reserve area;

(b) prepare an inventory of local flora and fauna components;
(c) ecosystems identification (including those of borderline influence) and the identification of their particular and significant components;
(d) identification of endemic, rare or protected elements belonging to the local species of wildlife;
(e) development of a sustainable utilization of natural resources (biological and belonging to the biotop);
(f) ensuring a systematic evolution through the conservation of biosphere life support mechanisms;
(g) develop a program for permanent and adequate monitoring of the nature reserve area;
(h) promotion of international scientific cooperation with the aim of eliminating the risks of some wildlife species becoming extinct;
(i) quantifying the effects of the nature reserve operation, at local, regional and global level.
(j) Provision of technical assistance required for the elaboration of the documentation (scientific based study) needed to obtain the nature reserve status for Iezerul Calarasi area (first at national level and thereafter at international level, as part of the national and international network of protected areas).

OUTPUTS

(a) basic study required for the adoption of proposed Iezer Calarasi nature reserve area;
(b) four-year program for ecological reconstruction and rehabilitation in the nature reserve area;
(c) Conservation Management Plan including rules and regulations to be enforced within Iezer Calarasi nature reserve area (related to agricultural activities, fishing, hunting and tourism);
(d) endowment, training, public awareness and research facilities requirement;
(e) a four-year plan for the implementation of the proposed Conservation Management Plan by the responsible authority with the support of the Project Management Unit;

In view of the previous tasks described, the following activities have to be implemented:

→ ecological campaigns performed in monitoring and investigation stations;
→ ecosystematic survey of the polder area;
→ defining the exact geographical location of the nature reserve;
→ creating a specialized data base, encompassing data and information on lakes, average food-chain elements and soils in the area of the nature reserve;
→ designing an adequate size, buffer area surrounding the nature reserve;
→ setting up environmentally friendly agricultural exploitation technologies, suitable to be applied within neighboring ecosystems;
→ elaborating a Code of Good Fishing Practices, as fisheries are active outside the crop vegetation period;
→ proper design of land reclamation schemes within the polder area and their adequate operation (including qualitative and quantitative monitoring of lake water and water from adjacent canals, specifically those with combined, irrigation and drainage role);
→ identifying and ecologically rehabilitating those habitat regions which were disturbed or altered (including through dredging operations);

- → identifying extinct wildlife species and their natural habitats, in order to be able to recolonize them in the future;
- → establishing the off-limits areas for hunting and fishing within the polder;
- → evaluating local implications of operating this nature reserve, as well as the consequences for the wider floodplain and Danube Delta areas;
- → setting up the formal statute of this nature reserve, in full compliance with the applicable relevant legislation;
- → elaborating an emergency intervention plan for various incidents and accidents occurring in this area;
- → encouraging social and economic activities in the polder area, up to the limit of pollution or disturbance to natural restored ecosystems, including the provision of incentives to introduce agro-tourism by private investments ;
- → establishing adequate management of fisheries in the area;
- → promoting the development of sustainable agriculture in the polder area;
- → including this area within regional territorial development master plans;
- → continuous and efficient monitoring of the nature reserve area (parameters such as condition of natural resources and biodiversity etc.) by using skilled personnel (periodically trained), specialized sample collection d processing equipment and communication and rapid intervention facilities;
- → including this area within regional Danube river basin and Black Sea environmental protection programs;
- → establishing and developing professional ties with specialized NGOs;
- → making good use of all the opportunities capable of promoting and advertising this nature reserve;
- → establishing facilities required for the national and international level data exchange, processing and access (GIS etc.);
- → enforcing cooperation with other nature reserves situated in the Danube Delta and floodplain areas, as well as with international similar reserves for any available support for the efficient management of this area;

INPUTS AND MANAGEMENT OF THE ASSIGNMENT

Consultants inputs: The assignment requires a multidisciplinary team (conservation management plan specialist, biologist, botanist, migratory bird specialist, fish farm specialist, environmental specialist, agriculturist, soil specialist) with a total input of 18 men*month.

Distribution of tasks:
The Conservation Management Specialist will coordinate the work and will be responsible for preparing the draft and final reports (6 months).

A biologist specialist will be recruited to carry out specific parts of the task (including the fauna) – (4 months).

A botanist specialist will be recruited to carry out specific parts of (b), (c), (d), (f), (g), (i), and (j) of the task (1 month).

A migratory birds specialist will be recruited to carry out specific parts of (b), (c), (d), (f), (g), (i), and (j) of the task (1 month).

A fish farm specialist will be recruited to carry out specific parts of (b), (c), (d), (f), (g), (i), and (j) of the task (1 month).

An environmental specialist will be recruited to carry out specific parts of (a), (c), (e), (f), (g), (i), and (j) of the task (including land reclamation, NGO's, emergency intervention plan, ecological reconstruction and rehabilitation) – (two months).

An agriculturist will be recruited to carry out specific parts of (a), (b), (c), (i), and (j) of the task (1 month).

A soil specialist will be recruited to carry out specific parts of (a), (i), and (j) of the task (1 month).

A topography specialist will be recruited to carry out specific parts of (a) and (j) of the assignment (1 month).

REPORTING AND TIMING:

The consultant will report to the Manager of the PPU, who has overall responsibility for project implementation. The PMU Manager will agree the work plan with the consultants at the start of the assignment.

The Draft Report will be reviewed by the PMU Manager and the MWEP representatives and all their comments will be incorporated into the Final Report.

The Draft Report will be submitted within 6 months after signing the contract and a Final Report within 2 months after the PMU has approved the Draft Report (provided this deadline is agreed by the PMU Manager).

All reports should be drawn in English and Romanian and should be submitted in two copies.

DOCUMENTS TO BE CONSULTED

- Proposals for Integrated Management of the Boianu-Sticleanu Polder, 2001
- Agenda 21, Rio de Janeiro, 1991
- The Pan-European Biological and Landscape Diversity Strategy-Council of Europe-1996
- Law no. 5/1991, regarding the Convention on wetland of international importance (M.Of. 18/26.01.1991)
- Law no. 13/1993, regarding the Convention for wildlife and natural conservation in Europe (M.Of. 62/25.03.1993)
- Law no. 58/1994, regarding the Convention on biological diversity (M.Of. 199/02.08.1994)
- Law no. 13/1998, regarding the Convention on migratory species (M.Of. 24/26.01.1998)
- Law no. 111/1998, regarding Romania's adherence to the UN Convention for desertification control (M.Of. 222/17.06.1998)
- Law no. 24/1994, regarding the UN Frame Convention on climatic changes (M.Of. 119/12.05.1994)

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