

CURRENCY EQUIVALENTS

Currency Unit = Romanian Leu

- US\$1 = Lei 450 on January 1, 1993
- US\$1 = Lei 735 on July 1, 1993
- US\$1 = Lei 1,075 on December 1, 1993
- US\$1 = Lei 1,304 on December 22, 1993
- US\$1 = Lei 1,683 on July 16, 1994

MEASUREMENTS

The metric system has been used throughout the report.

ABBREVIATIONS

AR	-	Apele Romane RA
BOD	-	Biological Oxygen Demand
CRIM	-	Environmental Radioactivity Research Laboratory
DDBRA	-	Danube Delta Biosphere Reserve Administration
DDI	-	Danube Delta Institute
EBRD	-	European Bank for Reconstruction and Development
EPA	-	Environmental Protection Agency
GEF	-	Global Environmental Facility
GIS	-	Geographic Information System
GOR	-	Government of Romania
GPS	-	Global Positioning System
IC	-	Research Institute
ICBP	-	International Council for Bird Preservation
ICIM	-	Institute for Environmental Research and Engineering
IGFCOT	-	Institute for Geodesy, Photogrammetry and Cadastral Planning
IGG	-	Institute of Geology and Geophysics
IMH	-	Institute for Meteorology and Hydrology
ISPIF	-	Institute for Studies and Design for Land Reclamation
IUCN	-	International Union for the Conservation of Nature (now World Conservation Union)
IWWRB	-	International Waterfowl and Wetland Research Bureau
MOD	-	Memorandum of the Director
MWFEP	-	Ministry of Waters, Forests and Environmental Protection
NGO	-	Non Government Organization
PIU	-	Project Implementation Unit
SPA	-	Specially Protected Area (of the Biosphere Reserve)
WWF	-	World Wide Fund for Nature

FISCAL YEAR

Government of Romania: January 1 - December 31
World Bank: July 1 - June 30

ROMANIA

DANUBE DELTA BIODIVERSITY PROJECT

GRANT AND PROJECT SUMMARY

Recipient: Government of Romania

Cofinancier: Not Applicable *

Beneficiaries: Ministry of Forests, Waters and Environmental Protection;
Danube Delta Biosphere Reserve Authority; Danube Delta
Institute; Conservationists; the General Public

Amount: SDR 3.1 million

Terms: Grant

Financing Plan:

GEF	US\$4.5 million equivalent
GOR	US\$0.3 million equivalent plus contributions in kind
Total	US\$4.8 million equivalent

Economic Rate of Return: Not Applicable

Map: IBRD 25411

* A number of organizations are providing technical services free of salary costs (World Wildlife Fund, International Council for the Preservation of Birds, Universities of Georgia and Massachusetts).

ROMANIA
DANUBE DELTA BIODIVERSITY PROJECT

Background

1. The Danube Delta is one of Europe's most extensive wetlands remaining in a natural state. It forms a unique series of interrelated ecosystems, with its large reed beds, maze of tributaries, white willows and poplars, canals and lakes rich with aquatic plants, and dunes with their mosaic of forests and semi-arid grasslands. The Delta also plays a role as a chemical and physical filtering system for flood water flowing over the river banks. The Delta ecosystem covers about 600,000 ha. Of this, 450,000 ha lie within Romania and the rest in Ukraine.

2. The Danube Delta is an important wildlife habitat, and has the largest number of birds of any South European wetland. It is a key area for passage of migrants and wintering birds, when the number of winter wildfowl may exceed 2 million. Over 320 species of birds are found in the Delta, and over 170 species breed there. The Delta contains most of the world's population of the endangered pygmy cormorant, 5% of the world's population of dalmatian pelicans and more than 50% of the palearctic breeding population of the more common pelican. The slender billed curlew, red breasted goose and the lesser white-fronted goose are globally threatened species that use the area during migration or in winter. The Delta also has large populations of several colonial waterbird species that are not yet in danger of extinction, but whose populations have recently declined drastically, especially in Europe, including the smew, ferruginous duck and red breasted pochard.

3. The Delta is an economic resource. The Sulina channel, straightened for shipping in the 1890s, provides the basis for important navigation and port activities. About a third of the 75 species of fish are exploited by commercial fishing. The Delta also attracts tourism, and produces reeds that can be harvested. But the Delta's status as a wildlife habitat and economic resource is at risk because its resources have not been sustainably managed. One indication of this is the decrease in the catch of migratory (sturgeon, shad) and other fish (carp, pike, zander, bream), once a major resource. For example, the annual sturgeon catch has declined from 1,000 tons in the 1930s to the current 10 tons. This has made it more difficult to earn a livelihood and has led to a decline in the number of full-time fishermen. In the last 20 years, the population of the Romanian part of the Delta has declined by 30%, to an estimated 15,000 people; it is thus very sparsely populated. Fish catch in the Black Sea has also declined dramatically.

4. There are several reasons for the decline. There has been interference in the natural hydrology cycle by the construction of canals, dikes, and polders in the Delta and of dams upstream, with no analysis of their environmental impacts, as well as by embankment of the upstream Danube flood plain. There have been ill-conceived attempts at intensive agriculture, fish farming, and forestry development, leading to changes in ecosystems and habitats and long-term declines in productivity. The habitat has been damaged by inappropriate harvesting methods, such as the use of heavy machinery to harvest reeds. Other causes for the decline include pollution (including eutrophication caused by fertilizers

applied upstream of the Delta and pollution from upstream urban and industrial activities) over fishing and limited, but uncontrolled, tourism.

5. In 1990 the Romanian government, in recognition of the importance of the area, declared an international biosphere reserve over 590,000 ha of the Delta, adjacent coastline and water bodies, and established the Danube Delta Biosphere Reserve Authority (DDBRA) to address the problems facing the area. 53,000 ha are currently under strict protection. A governmental decree also stopped all future reclamation works, banned sand mining and established a policy that gives priority to conservation in the Delta. In late 1991, the biosphere reserve was declared a World Heritage site by the World Heritage Committee which operates under the auspices of UNESCO. Romania has a total of 1.14 million ha of protected areas. The significance of the Delta, comprising about half of this total, is apparent.
6. In September 1990 a team coordinated by the IUCN (International Union for the Conservation of Nature) investigated the conservation status of the Delta. This exercise led to the first International Danube Delta Biosphere Reserve Planning Seminar in September 1991. The seminar generated strong support from a range of international organizations, bilateral donors, and environmental NGOs for developing a program for long-term conservation and management of the Delta. The seminar also produced the components of a management plan including establishment of legal and administrative objectives, and conservation, socioeconomic, research and monitoring and public awareness objectives for improved Delta management. The functions and structure of the DDBRA were clarified in Law 82/1993, approved in December 1993. The EBRD, through a ECU 0.73 million grant, has provided assistance in improving the administrative framework and developing a management plan. The proposed GEF project complements this program by focusing on the technical aspects of biodiversity conservation and on protected area management.
7. Project objectives. The project aims to protect the Romanian Delta ecosystems. It would contribute to the conservation of biodiversity within the Delta, strengthening the capacity of DDBRA and the Danube Delta Institute (DDI), a research institute whose primary role is to conduct research on the delta ecosystems on behalf of DDBRA. It would enable DDBRA and DDI to monitor and manage protected areas effectively, working with local community groups to ensure sustainable resource use, and restoring some wetlands to their natural condition. An innovative feature comprises testing various approaches to wetland restoration and monitoring their impact. The project must be seen within the context of three other GEF supported projects being developed for the region. The first is the GEF project for the Ukrainian part of the Danube Delta, which parallels this project. The second is the Danube River Basin Environment Program, a project supported by several donors, which aims to develop a plan for improved environmental management of the basin, reducing pollutant loads and strengthening institutions. The third is the Black Sea Management Project, coordinated by UNDP and the Bank, which aims also to prepare a plan for improved, coordinated management by all riparians, together with priority investments. The Danube Basin, Delta and Black Sea are closely related ecosystems, and an objective of all

three projects is to demonstrate the value of a coordinated approach to resolving water pollution and biodiversity problems with transborder linkages.

8. Project description. The project includes the following components:

- (a) Strengthening the wardens department, to support nature protection, surveys, public awareness and nature interpretation in the Delta, through the provision of equipment to enhance mobility and surveying, infrastructure and training (US\$1.48 million);
- (b) Monitoring, through improved population and species inventories, ecosystem surveys, and development of an integrated database using GIS technology to provide the basis for development of resource management plans (US\$0.64 million);
- (c) Restoration of abandoned fish and agricultural polders to their natural condition with impact and hydrological monitoring, together with applied research into reed restoration (US\$0.57 million);
- (d) Protection of a lake from direct inflow of Danube water; willow planting; village woodlots; pilot protection of fish fingerlings from an irrigation pumping station intake; removal of some deteriorating metal structures for aesthetic enhancement; sturgeon propagation following studies; and establishment of a small grants fund to fund research proposals with special focus on management of buffer zones (US\$1.18 million);
- (e) Public awareness, including support to the wardens to work with schools and local communities, support to the DDBRA in production of public awareness material, and support to local NGOs to enable them to expand their public awareness activities (US\$0.15 million);
- (f) Assistance with coordination of activities between Ukraine and Romania, and limited technical assistance for project management, especially for procurement and disbursement (US\$0.19 million).

A. Implementation

9. The project would be implemented jointly by DDBRA and DDI. DDBRA would have primary responsibility for the components for Wardens Strengthening, Public Awareness (together with the local NGOs: ProDelta, Friends of the Delta, ECOS and the Romanian Ornithological Society) and regional coordination, while DDI would have primary responsibility for ecosystems monitoring, and pilot polder and wetland restoration. DDI would assist with purchase of stream gauging equipment on behalf of Apele Romane, the national water hydrologic monitoring agency, which undertakes Danube river discharge

measurements. DDBRA will contract for civil works connected with wetland restoration on behalf of DDI.

10. Assistance in implementation of certain components would be provided by a variety of specialized agencies; World Wildlife Fund Germany through the Auen Institute for Floodplain Ecology would assist in polder restoration in Cernovka and Babina, and in public awareness. "BirdLife" (the International Council for Bird Preservation) would assist in bird monitoring and public awareness. The Dutch Rijkswaterstaat would assist in polder restoration in Holbina, and in vegetation mapping. The University of Massachusetts would assist in training in use of Geographical Information Systems, and development of an integrated database using GIS. The University of Georgia would assist in research into reed restoration. The Extension Service of Regensburg would assist in sturgeon propagation if studies show this approach to be viable in the Delta. All of these organizations have established contacts with the DDI and DDBRA and the GEF project would build on these. A research grants committee would be established to review research proposals and assess their suitability for qualifying for funding.
11. A Project Implementation Committee, composed of experts from DDBRA, DDI and MWFEP, has been established which would have day-to-day responsibility for project implementation. A Project Advisory Committee would meet periodically to advise on and review implementation. A Research Grants Committee would review research applications under the small grants component. MWFEP would provide overall guidance on project coordination. It would assure linkages between the Black Sea and Danube River GEF projects, and would ensure participation by other Romanian environmental institutes as necessary.
12. Project sustainability. GOR have committed the budget for an increase in the DDBRA staff to 260 over the next five years; staff currently on the payroll are 170. The management plan being prepared with EBRD/IUCN assistance includes proposals for increasing the revenue sources of the DDBRA, through charges on tourist and other activities. Existing DDI staff could implement the components of the project for which they are responsible. Sufficient budget has also been allocated for operating costs, and for other activities of the DDBRA related to, but not financed by, the project. The situation will be reviewed closely during project implementation.
13. Lessons from previous Bank involvement. In view of the recent political changes in Romania, and the long hiatus in Bank operations before that, it is difficult to draw valid lessons from previous Bank involvement. Experience with recent operations indicates, however, the importance of government commitment, and the need for a very clear understanding on the part of implementing agencies of the procedures for procurement and project administration. Experience with biodiversity projects in other countries emphasizes the importance of securing the support of local communities for conservation programs, and the need to adapt project design to the implementation capacity of local institutions.

14. Rationale for GEF funding. The project forms the link between the GEF-funded Black Sea Project and the Danube Basin Environment Programme, supported by many donors including the GEF. These three projects together will support environmental management of an international river basin and waterway. The Danube Delta, Europe's largest remaining natural wetland, represents an ecosystem of international importance. Finally, the project will contribute to two GEF principal objectives, protecting biodiversity, and improving management of international waters.

15. Community involvement. Local communities would be involved in the project in many ways. Park wardens are recruited from villages in the Delta, and are very much part of local communities. A major part of their work comprises public awareness activities and these would be supported under the project. Local communities are involved in bird monitoring, with the support of the local authorities, local NGOs including the Romanian Ornithological Society and an international NGO "BirdLife." This work is ongoing, it would be further supported under the project, and its output would be an ornithological management plan. A second local NGO Prodelta, currently working with villages and school groups to develop better understanding about the Delta, would also be supported. Park infrastructure would be constructed using local materials and building techniques and contracted to Delta inhabitants.

16. Project monitoring and evaluation. Project achievement indicators would be established and integrated into progress reports. These would include "physical" achievement indicators such as numbers of wardens trained, publication of ecosystem monitoring results, maps, preparation of management plans and completion of wetland restoration works; biodiversity/ecosystem impact monitoring is also built into the polder and wetland restoration components, and the results would be published. A project implementation review would be undertaken jointly by GOU and the Bank after 2-1/2 years of project implementation. Regional coordination meetings would also provide an opportunity for sharing the results of this pilot wetlands biodiversity restoration project with other Black Seas riparians.

17. At Negotiations, the Recipient agreed to or confirmed the following:

- (a) the organizational arrangements for project implementation outlined above, including appropriate project reporting and monitoring arrangements;
- (b) the procurement and disbursement and project accounts arrangements outlined in Schedule B of the MOD;
- (c) coordination of project activities with the Ukrainian and other regional and international authorities, and sharing of research results and management plans;
- (d) recruitment by DDBRA of three additional staff: a training specialist, a public awareness specialist, and a natural resources assessment specialist by March 31,

1995 together with recruitment of 20 wardens per year through the five-year project period; and

- (e) adequate budgetary allocation to fund the Romanian contribution to project costs.

18. Environmental aspects. The project would have a positive impact on the Delta ecosystems, and would prepare the way for more extensive wetlands restoration, and sustainable use of the Delta's resources. Strengthening of the DDBRA warden's department is expected to protect the fauna against the expected increase of foreign tourists and in particular against foreign hunting interests. The local population (which is very small) have participated in preparation of the Delta Management Plan being prepared with the assistance of EBRD/IUCN. Their concerns will further be taken into account in the public awareness/community involvement activities to be financed under the GEF project. The project has been rated Category C.

19. Project benefits. The project will support local authorities in their effort to develop integrated management of the Delta as a series of interrelated ecosystems, to protect and enhance its biodiversity while providing for the improved well-being of the local population. Strengthening of the warden's department and improved public awareness will improve overall park management; improvement of monitoring and research will increase understanding of the processes in the Delta and assist better management planning; pilot wetland restoration and its monitoring will prepare the way for enhancement of biodiversity on a more substantial scale, and will permit sustainable economic activities in fisheries, reed harvesting and ecotourism.

20. Project risks. Principal risks include the capacity of the project implementing agencies to execute the project satisfactorily, and the limited impact that the Danube Delta project can have on biodiversity without improvements in the Danube river water quality. The first risk is addressed through the provision of low cost technical assistance, with which the Romanian authorities are familiar, and through assistance with procurement. The second risk is addressed in part through focusing on the areas where the project can have an impact, including improved protected area management and ecosystems restoration. Improvement in upstream Danube river water quality is largely beyond the reach of this project.

Attachments

Washington, D.C.
August 25, 1994

SCHEDULE A

ROMANIA

DANUBE DELTA BIODIVERSITY PROJECT

Cost Estimates

	<u>(US\$ '000)</u>			<u>% Foreign Exchange</u>	<u>% Total Base Costs</u>
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>		
COMPONENTS:					
1. Strengthening of the Wardens Department	966.8	516.0	1,482.7	35	35
2. Ecosystem Monitoring	97.1	544.4	641.5	85	15
3. Polder Restoration	284.8	290.1	574.9	50	14
4. Pilot Wetland Restoration	805.1	371.5	1,176.6	32	28
5. Public Awareness	21.5	134.2	155.7	86	4
6. Management and Coordination	<u>13.9</u>	<u>178.8</u>	<u>192.7</u>	<u>93</u>	<u>5</u>
TOTAL	2,189.1	2,034.9	4,224.0	48	100
Physical Contingencies	218.9	203.5	422.4	48	10
Price Contingencies	<u>87.7</u>	<u>51.6</u>	<u>139.4</u>	37	<u>3</u>
GRAND TOTAL	<u>2,495.8</u>	<u>2,290.0</u>	<u>4,785.8</u>	<u>48</u>	<u>113</u>

Financing Plan (US\$ million)

	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
GOR	0.3	0.0	0.3
GEF	<u>2.2</u>	<u>2.3</u>	<u>4.5</u>
	2.5	2.3	4.8

ROMANIA
DANUBE DELTA BIODIVERSITY PROJECT

Procurement and Estimated Schedule of Disbursements

Procurement Methods (US\$ million)

	<u>ICB</u>	<u>LCB</u>	<u>Other</u>	<u>Total</u>
Equipment & Supplies (Financed by GEF)	-	-	1.6 ^{1/} (1.5)	1.6 (1.5)
Vehicles & Vessels (Financed by GEF)	-	-	0.4 ^{2/} (0.4)	0.4 (0.4)
Civil Works (Financed by GEF)	-	0.6 (0.5)	0.5 ^{3/} (0.5)	1.1 (1.0)
TA, Training (Financed by GEF)	-	-	1.2 ^{4/} (1.2)	1.2 (1.2)
Operating Costs (Financed by GEF)	-	-	0.5 ^{5/} (0.4)	0.5 (0.4)
Total	-	0.6 (0.5)	4.2 (4.0)	4.8 (4.5)

^{1/} International shopping US\$0.8 million, local shopping US\$0.5 million, direct purchase US\$0.3 million.

^{2/} Local shopping (US\$0.2 million) and international shopping (US\$0.2 million).

^{3/} LCB (US\$0.6 million), force account (US\$0.16 million) and local shopping (US\$0.34 million).

^{4/} IBRD guidelines.

^{5/} Procedures acceptable to the Bank.

Disbursement Categories

<u>Category</u>	<u>GEF Grant Allocation</u>	<u>Amount (US\$M equivalent)</u>
Goods	100% of foreign expenditures; 100% of the ex-factory price of domestically produced goods, 90% of other goods purchased locally	1.8
Civil Works	90% of expenditures	0.9
TA Training	100% of expenditures	1.1
Recurrent Costs	80% of expenditures	0.4
Unallocated		0.3

Disbursement Schedule (US\$ million)

<u>IBRD Fiscal Year</u>	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>
Annual	1.6	1.1	1.0	0.5	0.5
Cumulative	1.6	2.7	3.7	4.2	4.5

ROMANIA

DANUBE DELTA BIODIVERSITY PROJECT

Timetable of Key Processing Events

- | | | |
|-----|----------------------------------|---|
| (a) | Time taken to prepare: | 18 months |
| (b) | Prepared by: | Ministry of Waters, Forests and Environmental Protection, Danube Delta Biosphere Reserve Authority and Danube Delta Institute, with the assistance of Consultants |
| (c) | First Bank mission: | May 1992 |
| (d) | Appraisal mission departure: | October 1993 |
| (e) | Negotiations: | July 1994 |
| (f) | Planned date of Effectiveness: | September 1994 |
| (g) | List of relevant PCRs and PPARs: | None |

GLOBAL ENVIRONMENT FACILITY

ROMANIA

DANUBE DELTA BIODIVERSITY PROJECT

TECHNICAL REPORT

TO THE

MEMORANDUM AND RECOMMENDATION OF THE DIRECTOR

August 25, 1994

**Agriculture and Environment Operations Division
Country Department I
Europe and Central Asia Region**

CURRENCY EQUIVALENTS

Currency Unit = Romanian Leu

US\$1	=	Lei 450	on January 1, 1993
US\$1	=	Lei 735	on July 1, 1993
US\$1	=	Lei 1,075	on December 1, 1993
US\$1	=	Lei 1,304	on December 22, 1993
US\$1	=	Lei 1,683	on July 16, 1994

MEASUREMENTS

The metric system has been used throughout the report.

ABBREVIATIONS

AR	-	Apele Romane RA
BOD	-	Biological Oxygen Demand
CRIM	-	Environmental Radioactivity Research Laboratory
DDBRA	-	Danube Delta Biosphere Reserve Administration
DDI	-	Danube Delta Institute
EBRD	-	European Bank for Reconstruction and Development
EPA	-	Environmental Protection Agency
GEF	-	Global Environmental Facility
GIS	-	Geographic Information System
GOR	-	Government of Romania
GPS	-	Global Positioning System
IC	-	Research Institute
ICBP	-	International Council for Bird Preservation
ICIM	-	Institute for Environmental Research and Engineering
IGFCOT	-	Institute for Geodesy, Photogrammetry and Cadastral Planning
IGG	-	Institute of Geology and Geophysics
IMH	-	Institute for Meteorology and Hydrology
ISPIF	-	Institute for Studies and Design for Land Reclamation
IUCN	-	International Union for the Conservation of Nature (now World Conservation Union)
IWWRB	-	International Waterfowl and Wetland Research Bureau
MOD	-	Memorandum of the Director
MWFEP	-	Ministry of Waters, Forests and Environmental Protection
NGO	-	Non Government Organization
PIU	-	Project Implementation Unit
SPA	-	Specially Protected Area (of the Biosphere Reserve)
WWF	-	World Wide Fund for Nature

FISCAL YEAR

Government of Romania:	January 1 - December 31
World Bank:	July 1 - June 30

GLOBAL ENVIRONMENT FACILITY

ROMANIA

DANUBE DELTA BIODIVERSITY PROJECT

TECHNICAL REPORT

Table of Contents

	<u>Page No.</u>
I. BACKGROUND AND SETTING	1
A. Significance of the Danube Delta	1
B. Flora and Fauna	2
C. Hydrology	4
D. Economic Activity	7
II. INSTITUTIONAL SETTING AND PROJECT JUSTIFICATION	9
A. Protected Area Management in Romania	9
B. The Ministry of Waters, Forests and Environmental Protection	10
C. Danube Delta Biosphere Reserve Administration	10
D. Danube Delta Institute	11
E. Local and Other Organizations	11
F. Donor Involvement	12
G. Regional Linkages and Justification for GEF Funding	13
III. THE PROJECT	13
A. Project Summary	13
B. Detailed Project Description	14
1. Institutional Strengthening of the Ecological Warden's Department	14
2. Monitoring	18
- Ecosystem Surveys and Population/Species Inventories	23
- GIS and Data Management	23
- Hydraulic Monitoring	23
3. Pilot Polder Restoration to Natural Conditions and Reed Restoration Research	35
4. Ecosystems Restoration	39
5. Public Awareness and Community Involvement	42
6. Regional Initiatives, Coordination and Management Assistance	45

Table of Contents (cont'd)

	<u>Page No.</u>
IV. PROJECT COSTS	47
A. Project Costs and Financing	47
B. Procurement	48
C. Disbursements and Accounts	50
V. ORGANIZATION AND IMPLEMENTATION	51
A. Implementation	51
B. Monitoring, Reporting and Supervision	52
C. Public Awareness/Community Participation	53
D. Project Benefits and Risks	53
VI. AGREEMENTS REACHED	54

Annexes

1. Detailed Project Costs
2. Draft Legislation for DDBRA
- 3.. Existing and Proposed Structure of DDBRA and DDI
4. Magnitude and Frequency of Water Levels Recorded at Tulcea, 1932-92
5. Implementation Plan
6. Terms of Reference for Technical Assistance
7. Inflation and Exchange Rates Forecasts
8. Documents Available in Project File

Map

IBRD No. 25411

GLOBAL ENVIRONMENT FACILITY
ROMANIA
DANUBE DELTA BIODIVERSITY PROJECT
TECHNICAL REPORT

I. BACKGROUND AND SETTING

A. Significance of the Danube Delta

1.01 The Danube Delta is the largest and least damaged wetland complex in Europe, covering about 600,000 ha, including 450,000 ha in Romania and the rest in Ukraine. It is an extensive network of river tributaries, canals, lakes and reed swamps as well as forests, meadows, sandy grasslands and dunes, which together form an unique mosaic of terrestrial and aquatic habitats, each supporting a rich biodiversity of flora and fauna species. The Romanian part of the Delta was declared a Biosphere Reserve in 1990, the Reserve covering 591,000 ha. 53,000 ha. are strictly protected, and 103,000 ha. are classified as a marine buffer zone. The area of the terrestrial buffer zone has not yet been gazetted.

1.02 The Delta exhibits a classic Delta triangular formation with branching tributaries of the Danube River extending out from an apex to nearly 100km in length and width before discharging into the Black Sea. The Delta has a temperate to continental climate with local influences from extensive water surfaces and marsh vegetation as well as strong north-easterly winds from the Black Sea. The Delta acts as a large-scale filtering system between the Danube River and the internal lakes. The Delta's ecological integrity and health are dependent on the condition of these dynamic water courses.

1.03 In spite of pressure from grazing, silviculture, hydrological alteration and agriculture during this century, the Danube Delta still supports diverse and large populations of fish, birds and rare mammals. There are over 75 species of fish belonging to 22 families, most of which are freshwater, but many Black Sea species rely on the Delta for breeding and survival of juveniles. Approximately 320 bird species live in the Delta at various times of the year and several represent globally threatened species.

1.04 The Delta's terrestrial and aquatic habitats support a diversity of vegetation. White willow hardwoods line the river tributaries while the coastal dune systems support ash-oak forests. Most significant to the waterfowl and mankind are the reedbeds, the most extensive in Europe. The same pressures cited above are also threatening the vegetation, which in turn affects the fauna.

1.05 The Danube Delta is an integrated system at every level -- ecological, hydrological, economic and cultural, that must be respected and managed as such for long-term sustainability of the natural resources it provides and the people who depend on it. Despite production pressures the Delta remains largely intact, especially when compared to

other wetland ecosystems in the region. The changes in government policy since the revolution offer scope for conservation of the biodiversity of the Delta through a combination of protected area management, small-scale economic activity and sound scientific research. Conservation and environmentally-based resource management of the Delta warrant assistance from the GEF in light of its biodiversity and international waters significance.

B. Flora and Fauna

1.06 The vegetation can be characterized into three distinct zones: (a) the **fluvial zone** with natural levees along the Danube river tributaries and canals, (b) the **transition zone** of murky, lagoonal backswamps, extensive fen peat deposits and large, well-filtered, clear-water lakes; and (c) the **coastal zone** with sandy beach-barrier complexes including dunes, spits and islands that have been deposited from north to south by coastal drift in the Black Sea.

1.07 Although forests occupy only about 5% of the Delta area, they are significant and have characteristic species in both the riverine fluvial zone and sandy coastal zone. White willow, *Salix alba* and *S. fragilis*, dominate the fluvial zone since they require periodic flooding for regeneration, while poplars, thrive on higher ground beyond the river's edge. The ridges and depressions of the coastal dunes support a wide range of discrete forest habitats that vary with groundwater fluctuations, dune height and humidity, including oak-ash hardwood forests, lianas, shrubs and grasslands. The willow forests are nesting sites for colonies of egrets, herons, ibises and raptors such as falcons and eagles. The dry grasslands in the depressions between large dunes support breeding populations of curlews. The sandy islands of the coastal fringe are used for feeding by terns, gulls and Dalmatian pelicans.

1.08 The freshwater lakes and marsh systems in the transition zone support a range of macrophytes including several species of water-lilies and are largely bound by extensive reed beds. These reedbeds represent the largest closed unit of reeds in Europe, reaching heights up to four meters. The reeds also form "plauris" - floating islands - throughout the lakes that provide safe homes for many animal species. These extensive lake and marsh systems are the main feeding habitats for most of the Delta's birds including bitterns, marsh harriers, rails, nesting colonies of pelicans, egrets and herons. Migratory ducks and geese use the lakes for feeding and roosting in autumn and winter. Diving ducks feed on benthic mollusks, cormorants dive for fish, while geese which feed on farmlands rely on the lakes to roost. During the cold winter months the brackish lakes closer to the sea freeze less frequently than the interior freshwater lakes, making the Delta a key northern over-wintering spot. Plants also offer an ideal habitat for a number of animal species, and the one of the last refuges for the European mink, the wildcat and the freshwater offer.

1.09 Grasslands are dominated by two types: the Pannonic grasslands bordering Lake Razim, and the Xerothermic grasslands of the coastal barrier area. Only odd pockets of the former remain, due to intensive cultivation. Popina island on Lake Razim, however, supports a good example of this community. The Xerothermic grasslands include *Cynodon dactylon* as the main species, and a herbaceous component which includes *Euphorbia seguierina*, *Onosma arenaria* and *Polygonum arenarium*.

1.10 The dune forests, in particular the ash-oak forests, are threatened from the introduction of exotic species which alter community composition, from a high density of cattle grazing which prevents forest regeneration, and from changes in groundwater regimes due to canal construction. The extensive reed beds of the Delta have traditionally been harvested for thatching, fencing, fuel and cattle litter. Speculation on intensive exploitation for a cellulose industry in the 1950s led to the construction of polders and use of heavy machines for harvesting. These machines damaged the plants in such a way that regeneration was impossible. Fortunately such practices have stopped and only light equipment and hand techniques are used today.

1.11 Results of systematic bird counts in the Delta have not been published; however, there is information on distribution and number of breeding and nesting colonies of waterfowl since the 1930s, especially for the western side of the Delta. While it is difficult to estimate changes in total population size without long time series data, there is clear evidence of species decline due primarily to loss of habitat through conversion of wetlands into agriculture and fish farming areas. Some waterbird species forage far away from their nesting site, therefore damage to a wetland habitat in one part of the Delta can affect the food availability for birds nesting a great distance away. The wetlands that remain have also deteriorated in quality due to changes in flooding regimes, upstream pollution and draining of floodlands which used to remove excessive nutrients from the river water. Such eutrophication has resulted in a decline in fish, invertebrate communities (e.g. bivalves) and submerged macrophytes, all food sources for the waterfowl. Pollutants such as organochlorines and heavy metals in the water and substrata may be negatively affecting shell thickness and tissues of the birds and therefore reduce breeding success of some birds, especially raptors, pelicans and cormorants. Grazing cattle trample eggs and disturb nesting places. Tourism and hunting, if not managed in an environmentally sensitive manner, disturb waterbird colonies. Nevertheless, the Danube Delta has a considerably larger number of breeding bird species than the other south European Deltas. These include the pygmy cormorant, half the Palearctic breeding population of the white pelican and five percent of the world population of Dalmatian pelican. The Danube Delta is an important area for passage migrants and wintering birds. These include the endangered slender billed curlew and red-breasted goose, smew, ferruginous duck and red-breasted pochard. Numbers of wildfowl in winter may total 2 million or more.

1.12 As indicated earlier, the Delta's fish communities are rich with 75 species representing 22 families, one-third of which have traditionally been exploited for commercial fishing. Fish communities in the Delta's three main branches include migratory species of sturgeon and shad, as well as semi-migratory species of carp and bream, using the floodplains as preferred spawning grounds. Since these floodplains have been cut off from the Danube River by dykes, fish have declined in productivity, catch size, species diversity and commercial value. For example, in the early 1900s over 1,000 tons of sturgeon were caught each year in Romania, while only 20 tons were landed in 1989. While predatory high-commercial value species as sturgeon and shad have declined, the numbers of non-predatory species has increased. The production of herbaceous fish species from present-day fish farms has overall not been very successful.

1.13 Reduction in species richness and annual catch is due to overall habitat degradation caused by a interrelated factors including: polder construction, dams, eutrophication due to dykes, loss of aquatic vegetation, industrial and organic pollution from upstream, declining flood levels and overfishing. Polders, canals and dykes alter normal spawning regimes and offspring have a difficult time reaching deep water sites during the winter.

C. Hydrology

1.14 The Danube is one of the largest rivers in Europe with a catchment of 805,300km² and an average discharge of 6,300m³/sec. The apex of the Delta is just upstream from the town of Tulcea (Romania), where the Danube divides into the northern Chilia branch, while the southern branch divides just downstream from Tulcea into the central Sulina, and the southern Sfintu Gheorghe branches. The three branches transport respectively 60%, 21% and 19% of the total discharge at low (normal) river levels, and 72%, 11%, and 17% at high (flood) levels. The Chilia branch forms the border with the Ukraine, where at its mouth the most active Delta formation takes place, advancing into the Black Sea at about 50m per annum.

1.15 But for the high relative humidity caused by the large water surface, the climate of the Delta would be similar to that of the surrounding steppes: mean annual rainfall ranges from 425mm in the west to 325 mm in the east, while evapotranspiration is in the range of 950-1,000mm per year. The rainfall shows large variations, e.g. 123mm was recorded in Sulina for all of 1920. The strong winds experienced in the spring and autumn, from the north east at the coast, and from the south inland at Tulcea contribute to the high evapotranspiration. As a result of the prevailing north easterly wind, there is transport of beach material towards the south. In the absence of such material, or because of man-made barriers such as breakwaters, coastal erosion takes place (at Sulina), while at the mouth of the Sf. Gheorghe branch a slight accretion occurs, probably from the higher flood discharges through that channel. Peak discharges occur in the period April-May (May mean monthly flow is 8,900m³/sec) as a result of snowmelt and spring rains in the catchment, and lowest discharge (mean monthly flow of 4,200m³/sec) in October. Spring is the period when floods occur and over-bank flow takes place. Because there are no tides in the Black Sea, drainage is impaired and the Delta remains wet throughout the day and the year, in spite of the dry summers. The discharge of the Danube is so large, and the Black Sea coast has such a flat gradient, that the coastal waters are only slightly brackish.

1.16 Human intervention in the regime of the Delta started after the Crimean war in the middle of the 19th century and was at first directed towards creating and maintaining shipping channels in the three major branches, followed by canalisation of some channels linking the internal lakes to the major branches. The first polder was constructed in the late 1930s. Major interior canal building and polder construction took place between 1948 and 1965, but polder construction continued right up to the revolution in 1989. Upstream of the Delta, construction of flood protection banks on the left bank took place in the early 1960s, while dams on the Romanian tributaries, the Iron Gates dam, and irrigation intakes along the

Danube took place between 1969 and 1989. Finally in 1990, the Black Sea shipping canal was completed, linking the harbor of Constanta directly with the Danube.

Flooding

1.17 The magnitude, duration and pattern of flooding is fundamental to the ecological processes going on in the Delta. In wet years, overtopping of the banks occurs over substantial lengths from a few days to up to four months. In the driest years the inundated area will be restricted to a few swamp depressions or lakes with direct channel connections to the main river. Inundated areas gradually return the stored water as the river level falls, but substantial areas remain under water long after flood waters in the river have receded and many parts remain under water for most or all of the year. The reduction in area which is subject to the natural flooding regime is sometimes mentioned as a reason for the loss of biodiversity. This can be for several reasons:

- (a) reductions in flood water levels resulting in a reduction in the frequency that river banks are overtopped and in the duration of flooding;
- (b) disconnection of empoldered areas from the river; and
- (c) interruptions to the normal direction of flow of flood waters.

1.18 The evidence about (a): a significant change in river regime, appears inconclusive. It is stated that the construction of all the embankments upstream of and inside the Delta has changed the regime of the river since about 1960. Confining the river would result in a reduction of channel storage, causing higher flood water levels, but for a shorter duration. However, the construction of many dams on the tributaries would counter this effect. In Annex 4 the magnitude and duration of water levels at Tulcea are compared for the 31 year period 1932-1962 and the 30 years 1963-1992. Whereas the average annual maximum level for the first period was indeed a lower 318 cm against 349 cm for the second period, the average annual duration of levels above 300 cm for the first period was 40 days/yr against 60 days/yr for the second, contrary to expectation. Mean water levels at Tulcea for the first period were also lower than for the second, pointing to a wetter situation in the catchment during the second period. This is corroborated by mean annual flows observed for the entire Danube at Isaccea station, just upstream of the Delta: for 1932-62 it was 6,352m³/sec, against 6,595m³/sec for 1963-92.

1.19 With respect to (b), the ecological impact of empoldering an area will eliminate inundation and transforms the area from wetland to dry land, or to a fish polder without the normal regime of inflow and outflow. However, the effect on the rest of the Delta will only occur as a result of (a) and/or (c).

1.20 About (c), the effect of interrupting the normal overbank flow lines is very hard to predict without a (costly) mathematical model. It is sometimes claimed that the loss of flood storage due to empoldering gives rise to increases in both water level and flow velocity in the

main channels. If true, this could have important repercussions on the magnitude and frequency of flooding and the balance between erosion and sediment deposition. However, the importance of this effect appears frequently overstated. The total area of the polders lying alongside the main river channels is 72,785ha. At 1.0m depth of flooding this is equivalent to 728 million m³ (MCM), and at an exceptional 2.0m flooding, 1,456MCM. For the 71-year average flood discharge for the months March through July, the flood storage foregone in those 73,000ha of polders would be equivalent to very low percentages of the overall flood volume:

	River discharge m ³ /s	Monthly volume <u>MCM</u>	Cumulative volume <u>MCM</u>	Flood storage as % of <u>728 MCM</u>	Foregone flow volume <u>1,456 MCM</u>
March	7,246	19,370	19,370	3.8%	7.6%
April	8,757	22,730	42,100	1.7%	3.4%
May	8,886	23,834	65,934	1.1%	2.2%
June	8,263	21,423	87,357	0.8%	1.6%
July	7,009	18,774	106,131	0.7%	1.4%

The total loss of storage caused by polder construction is less than 1% of the total flood volume in an average year.

1.21 The dramatic reduction in the Delta's biotope, in particular of the high value fishes, the visible increase in eutrophication as witnessed by increased algae blooms and by measured steep increases of the nitrogen and phosphorus concentration in water samples taken at many locations, and the increased rate of sedimentation in a number of lakes and channels, all indicate changing conditions. However, these need not only be caused by changes in hydrologic conditions. They are certainly also due to an increase in chemical pollution from industry and agriculture and probably from over-fishing of certain species. Reduction in reed growth may not only have been due to mechanical harvesting, but also partially because a high nitrogen content in the water reduces the weight ratio between rizomes and stalks, thus weakening the plants.

1.22 It is often stated that the Delta functions as a filter for the Black Sea. Research has indicated that a bed with reed vegetation reduces the suspended sediment load and also part of the dissolved nutrient load. The construction of many internal canals has resulted in by-passing this filtration and shortening the unobstructed transport of suspended sediment to the internal lakes of the Delta. Thus, hydraulic construction would appear to have reduced the internal filtration effect. Floods carry the bulk of the annual sediment load. The percentage of the flood discharge which passes unobstructed to the Black Sea through the three main branches has not been investigated, nor how much of the stored flood water in the Delta eventually returns to the main branches and the sea. Such information would be relatively easy to collect and would confirm or refute the statement that the Delta also functions as a filter for the Black Sea.

1.23 The overall sediment load of the lower Danube has decreased in recent years, from 67.5 million t/yr for the period 1921-60 to 52.7 million t/yr for the period 1961-1983, a reduction of 22%. This is said to be due to the construction of dams on the tributaries, some of which trap heavy metals and other toxic substances. It is said by some that this reduction in sediment has led to the deterioration in reed growth and to increased coastal erosion. The consultants preparing the Preparation Report have not discovered scientific evidence linking decreasing sediment runoff to increased coastal erosion or to decreased reed growth.

1.24 Based on the review of information carried out for the Project Preparation Report, it is concluded that chemical pollution of river water probably plays a much greater role in the decrease of biodiversity than possible changes in the hydraulic regime.

1.25 High levels of heavy metals, organochlorine pesticides and phenolic compounds as well as nutrients (nitrogen and phosphorus from fertilizers) have been reported for the Danube water. The Cousteau team (1993) showed that the major sources of pollution are at the downstream end of the Danube basin in Romania, Bulgaria and the Ukraine. Environmental studies are already underway in the catchments of the major Romanian Danube tributaries to identify sources of pollution and recommend remedial measures.

D. Economic Activity

1.26 The Delta has a population of about 15,000. Population has declined over recent years, from 22,000 in 1970, as fish catch has declined, and younger people, deterred by transport and infrastructure deficiencies and lack of employment opportunities in the Delta, have moved away to urban areas. Almost all the population lives in a total of 7 villages, of which the largest, Sulina, at the mouth of the Sulina branch and a port and transshipment centre, has about 5,500. Thus the Delta, for the most part, is very sparsely populated; moreover the population is aging, with only 20% under 39 years in 1992, compared with 55% in 1970.

1.27 The Delta has been settled since before Roman times; traditional economic activities included fishing, reed harvesting for thatch and other purposes, and smallscale agriculture and animal husbandry. More recent development can be categorised in five phases:

- (a) Creation of the Danube River commission in 1856 after the Crimean war, and subsequent engineering works to improve navigation, specifically through the straightening of the Sulina channel: this has increased the velocity of water and hence sediment flow, and the channel must be dredged several kilometres into the Black Sea to remain navigable. Despite the present low use of this channel for shipping (due to a wrecked vessel which partially blocks the channel and has not been removed since 1991), as well as current economic difficulties, and the existence of the Constanta canal to the south, navigation will continue to be an important economic activity in the Delta.

- (b) Creation of protected areas starting in 1930. These totalled five by 1956, with an area of 40,000ha; presently there are 10 protected areas covering 52,000 ha.
- (c) Proposals to develop the Delta, and the construction of pilot polders in the 1930s and 1940s; of particular significance during this period was the development of mechanical reed harvesting, in order to provide raw materials for a cellulose factory at Braila, completed in 1958. By 1965 63,000 hectares had been empoldered for reed production, and production was 226,000 tonnes. After this, production fell rapidly, to 55,000 tonnes in 1975 and 33,000 tonnes in 1993. Polderisation prevented the free flow of water necessary to healthy development, and mechanical harvesting apparently damaged the reed rhizomes, inhibiting growth; the Braila factory resorted to wood as its raw material. Conversion of reed polders for agriculture and fisheries also began during this period.
- (d) Preparation and implementation of the 1975-90 Complex Economic Plan for the Delta, with the following targets:

	<u>Area of Polders (ha)</u>		
	<u>1975</u>	<u>1993</u>	<u>1995 (targets)</u>
Agriculture	6,000	39,974	97,000
Fisheries	29,000	44,487	52,000
Forestry	0	6,442	29,000

Source: Pons 1992 and DDBRA 1/200 000 map 1993.

A number of economic companies were formed to exploit the developed land, including 11 fisheries companies and 5 agriculture companies. These companies employ about 5,700 people, including 4,000 Delta residents.

Production from the polderised land has in general been very disappointing; production of fish from farms was only 3,710 tonnes in 1992, due to unsuitability of areas (plours, peatbogs), inadequate technologies, and, more recently, lack of funds for feed and pumping. Some 12,500 ha of fish ponds have been abandoned. Fishing from natural waters is estimated at about 7,000 tonnes, and has halved over the last few decades, with, furthermore, the composition changing to less commercially valuable species. This has been due to overfishing, to reduced habitat and breeding areas caused by the polderisation, as well as to declines in water quality. Similarly, crop yields are also for the most part uneconomically low because of unsuitable soils and low rainfall. Livestock is important: about 19,500 ha of the polderised land is used for communal grazing. Animals are also raised on naturally occurring marshy pastures around villages, and in reedbeds. Finally

about 6,000 ha of poplar and willow plantations have been established, in addition to the 23,000 ha of naturally occurring forest (mostly oak and willow).

Large-scale polderisation interfered with the hydrology of the Delta and reduced wildlife habitats; economically, furthermore, it does not appear to have been successful.

- (e) The 1989 revolution, the end of new polder development and the establishment of the Danube Delta Biosphere Reserve (DDBR) in September 1990, and its recognition as a Ramsar site in May 1991. The DDBR covers 591,000 ha, but about 150,000 ha of this is water.

1.28 In addition to navigation, fishing and agriculture, tourism has been of some significance in the Delta. There were a total number of 161,200 tourist-nights spent in and around the Delta in 1991, of which 80% comprised Romanian visitors. Tourism declined in 1992 and appears to have declined further in 1993. Accommodation is mostly of rather poor quality. There are opportunities for expanding tourism; however, these must be carefully regulated -- particular care is necessary in issuing hunting licenses.

1.29 An economic survey was made of the Delta in the summer of 1993 with the assistance of the EBRD financed Technical Cooperation Project (see para 2.03), which provides a picture of present economic activities and potential.

1.30 While it is clear that the Delta ecosystems have deteriorated over the past years, this project can address only those problems which can be solved within the Delta itself. In particular a principal cause of the decline in water quality and eutrophication is due to heavy nutrient content of the Danube water entering the Delta. This problem will be addressed through the Environmental Program for the Danube Basin River, also financed by the GEF, but it will take many years for the situation to improve.

II. INSTITUTIONAL SETTING AND PROJECT JUSTIFICATION

A. Protected Area Management in Romania

2.01 Romania has a total area of 24 million ha, of which protected areas cover only 4.8% or 1.14 million ha, comprising three biosphere reserves (2.96%), 2 national and 2 natural parks (1.68%) and 571 strictly protected areas (0.64%). The significance of the Delta, covering 591,000 ha, is apparent. In addition to the protected areas, 30% of the forest area of 6.5 million ha is managed for watershed protection with minimal harvesting, and the forests support widely varied flora and fauna. Currently, management plans have not been prepared for protected areas, and, again except for the Delta (see below) there is no system of park wardens or rangers (though there have been forest wardens in protected areas under the control of the Forest Administration). This lack of management has been due in the past to fragmentation of responsibility for protected area designation and management, which is

gradually being overcome. Overall, the forested areas of the Carpathians, and the Danube Delta, support ecosystems of international importance, of which the Romanian authorities are fully aware. Recent institutional changes reflect the priority given to an integrated approach to protected area and biodiversity management. Romania's protected areas were briefly described in the 1992 Bank Environmental Strategy Report for Romania, and the FAO/Bank Forestry Sector Report. Overall, to date Bank environment sector dialogue has given less priority to protected area or natural resource management than to industrial pollution issues and there have been less focus overall on environmental issues than in Ukraine.

B. The Ministry of Waters, Forests and Environmental Protection

2.02 The Ministry has three departments, as indicated in its title. Institutes relevant to the Delta in the Department of Water Resources Conservation and Management include (i) Apele Romane, the Romanian Water Authority established in 1991, responsible for water supply, but also for rainfall and climate, river level, discharge and water quality monitoring, (ii) The Institute for Meteorology and Hydrology (IMH), also responsible for river flow, climate and groundwater monitoring, and (iii) The Institute for Environmental Research and Engineering (ICIM), responsible for environmental assessment, hydraulics and geotechnical engineering. The Department for Environmental Protection (with directorates for Environmental monitoring, nature Conservation and Ecological Reconstruction) also has three organisations of central importance; (i) The Environmental Protection Agency (EPA), with offices in each of the 41 counties, and until December 1992 responsible for monitoring water quality, (ii) The Danube Delta Institute (DDI-- see para 2.05) originally established in 1932; and (iii) The Danube Delta Biosphere Reserve Administration, established in 1989 to administer the Biosphere Reserve (see para 2.03). The responsibilities of the DDBRA have been established by decree, and legally confirmed by Law 82/1993 regarding the establishment of the DDBR. There are overlapping responsibilities for certain activities, particularly as regards water quality monitoring.

C. Danube Delta Biosphere Reserve Administration

2.03 The DDBRA currently has an establishment of 221, of which there are 51 vacancies. Its responsibilities are described in Law 82 issued 7th December 1993 (Annex 2) and include assessment and conservation of the genetic resources and biodiversity of the Delta, assessment and control of appropriate levels of economic activity, preparation of management plans, promotion of scientific research, defense of the interests of local inhabitants together with local public administrations, promotion of public awareness, and cooperation with other organisations. The DDBRA was divided into three departments: (i) park inspectors (inspectors and ecological guards); (ii) economics (budget, administration and logistics); and (iii) technical (regulations, conservation, monitoring and projects). However, following the recommendations of the EBRD Technical Cooperation Study, the establishment has been increased to 260, with a restructuring of the DDBRA to include 5 departments with the great majority of the staff, as now, in the warden's department (Annex 3). These departments include Planning and Regulation, External Relations and Education, Natural Resource Evaluation, Wardening and Economics. The proposals have been accepted by the

government and budget allocations for staff increases have been made. However, recruitment of qualified staff at the salaries offered is a constraint. The EBRD report recommends that the DDBRA should have the status of an autonomous agency, with its own salary structure, and some source of income from fees and licenses; it is not known whether this is possible.

2.04 Up to the present, the Park Wardens Department, with a staff of 81 out of an establishment of 120 is reasonably organized and operational albeit under-equipped. Under the EBRD Technical Cooperation project a skills-gap analysis was undertaken of the staff in DDBRA. The plan is to increase the establishment of the Wardens' Department up to 200. The DDBRA is currently renting a building, but budget allocation has been made to construct a new headquarters on the Danube.

D. Danube Delta Institute

2.05 The DDI, which was incorporated as the research division of the DDBRA in 1989, reverted to its former status as a research institute within the Ministry in December 1992 (government decision No. 792) with an organizational structure according to provisions stipulated in the Draft Research Law. With an establishment of 229, 197 staff on the payroll, of which 50 are university graduates, compared with 25 in the DDBRA, it has substantial expertise. It has two main departments, design (originally concerned with polder design under the complex plan, and now much reduced in size), and research. Its structure is described in more detail in Annex 3. Its research department is responsible for "providing the scientific basis for the formulation of government policy and activities pertaining to the conservation and management of nature and natural resources of the DDBR." Research projects under way include assessment of fish populations, reed resources, flora, game resources and environmental impact assessment of various activities in the Delta. Most of the work undertaken by DDI is under contract to DDBRA. The GEF project would provide support to the DDI through DDBRA for improved monitoring of flora, fauna and ecosystems, and for assessing the effect of the proposed pilot wetland restoration activities.

E. Local and Other Organisations

2.06 The economic companies were discussed in para 1.27(d). In addition the Tulcea district council, an elected body, together with the government appointed prefect, is responsible for administration of Tulcea district, which covers most of the biosphere reserve. Any decision of the council can be challenged by the DDBRA under law 29/90. Local NGOs active in the Delta include PRODELTA and Friends of the Delta. Both work with local communities promoting public awareness of the importance of the Delta and its conservation. National NGOs with active monitoring programs include the Danube Delta Museum in Tulcea, the Grigore Antipa Museum in Bucharest and the Ornithological Society of Romania.

F. Donor Involvement

2.07 Although Auen Institute of the World Wildlife Fund Germany (WWF), the Dutch Rijkswaterstaat (Flevoland) and the American Academy of Sciences had been providing limited assistance to research work in the Delta since 1990, the DDBRA/IUCN (International Conservation Union) Management Objectives, produced following an international seminar held in the Delta in September 1991, set the stage for assistance on a more substantial scale. The seminar followed 18 months work of data analysis and consensus building and efforts to secure international recognition for the importance of conserving the Delta. The management objectives were presented in six broad categories: establishment of a legal framework, an administrative and planning framework, and conservation, socio-economic, research and monitoring and public awareness/education frameworks. The original GEF project proposal covered all the activities included in the IUCN document (support for an endowment fund to cover recurrent costs, staff training and technical assistance for development of a management plan, wetland rehabilitation, better water management, development of water models, ecological monitoring and GIS/management facilities and infrastructure, research, and public awareness/community support).

2.08 The EBRD financed a Technical Cooperation Project for institutional strengthening in 1992, which will continue until 1995, funding 730,000 ECU for training, technical assistance, review of legislation and development of an integrated environmental management plan involving community participation. The government budget is financing construction of signposts and some wardens' stations within the delta, as well as increases in staff, and a headquarters in Tulcea. The GEF project will focus more on the technical aspects of biodiversity conservation, within the context of the institutional and economic development activities of the EBRD project.

2.09 The WWF, through the German Auen Institute for Floodplain Ecology, has provided the DDI with computer equipment and some training in interpretation of remote sensing. It provided for the publication of a brochure produced by one of the NGOs, and it has provided some overseas training. It has also worked with the DDI on preparing a proposal for pilot wetland restoration (this proposal is included in the GEF financing package), and has developed a good working relationship with the Romanian authorities. The Rijkswaterstaat is assisting DDI with computerized vegetation mapping under a bilateral program. The Austrian Government is considering assistance to the Romanian authorities in developing a mathematical hydrological model for the delta which would help to assess hydrological processes. Birdlife (formerly the International Council on Bird Preservation (ICBP)) are assisting DDI, DDBRA and the Romanian Ornithological Society on bird monitoring and public awareness. The American Academy of Sciences has promoted a scientific exchange program: research proposals prepared jointly with the DDI and the University of Georgia (USA), on applied research on reed restoration, and DDI and the University of Massachusetts on development of a GIS mapping system, are particularly relevant to the GEF project. The Cousteau Foundation has also done some investigatory work in the Delta. Thus, a number of other international organizations are active in the Delta, though mostly on a very small scale.

G. Regional Linkages and Justification for GEF Funding

2.10 The project proposed for Romania runs in parallel to that proposed for the Ukraine Danube Delta: similar methodologies for ecosystems and water monitoring will be proposed for each, and the project will finance increased coordination between the two countries on problems connected with the Delta.

2.11 The proposed project is also closely linked to two other GEF supported projects currently being developed, the Danube River Basin Environment Programme, and the Black Sea Environment Program. The Danube Basin Programme is being implemented jointly with EBRD, UNDP, USAID, Austria, and the Netherlands and is funding several programs for improved, regionally integrated river basin planning and management. These will improve water quality in the Danube river and, eventually, reduce the pollution load to be absorbed by the Delta. Danube water accounts for about half of all water entering the Black Sea, and is thus responsible to a substantial extent for its excessive nutrient load and consequent eutrophication. The Black Sea project includes preparation of an investment plan and aims to establish a regional strategy for improved environmental management, linking river basin management, coastal zone and marine resource management. It also includes a biodiversity component. The Danube Delta project is the first biodiversity protection project to be prepared for the Black Sea wetlands. Financing of the proposed Danube Delta Project by the GEF is justified because of the ecological significance of the Delta, significant grounds in itself. Within the broader regional context, it would also contribute to improve biodiversity management of the Danube Basin, Delta and Black Sea.

III. THE PROJECT

A. Project Summary

3.01 The project would have the overall objective of protecting and enhancing the Delta ecosystems, contributing not only to conservation of biodiversity within the Delta, but also to improvement of water quality in the Black Sea, and improvement of the Black Sea ecosystems. It complements closely the institution strengthening activities supported by the EBRD Technical Cooperation Project. Detailed project costs are indicated in Annex 1. The project includes the following components (all costs are base costs, excluding contingencies; November 1993 US\$ prices):

- (1) Strengthening the wardens department, to support nature protection, surveys, public awareness and nature interpretation in the Delta, through the provision of equipment to enhance mobility and surveying, infrastructure and training (US\$1.48 million);
- (2) Monitoring, through improved population and species inventories, ecosystems surveys, hydrological monitoring and development of an integrated database using

- GIS technology to provide the basis for development of resource management plans (US\$0.64 million);
- (3) Pilot restoration of polders to natural conditions, with impact and hydrological monitoring, on abandoned polders together with applied research into reed restorations (US\$0.575 million);
 - (4) Additional pilot wetland restoration, including protection of a lake from direct inflow of Danube water; willow planting; village woodlots; pilot sturgeon propagation; protection of fish from the lake Razim irrigation intake; removal of some deteriorating metal structures for aesthetic enhancement; together with establishment of a small grants fund to fund approved research proposals with special focus on management of buffer zones (US\$1.18 million);
 - (5) Public awareness, including support to the wardens to work with schools and local communities, support to the DDBRA in production of public awareness material, and support to local NGOs to enable them to expand their public awareness activities (US\$0.155 million); and
 - (6) Assistance with coordination of activities between Ukraine and Romania, and limited technical assistance for project management, especially for procurement and disbursement (US\$0.19).

B. Detailed Project Description

COMPONENT 1: Institutional Strengthening of the Ecological Warden's Department

Implementing Agency: DDBRA

Cost Total: US\$1,482,700

(i) Overview

3.02 . The present warden's department, out of an establishment of 120, currently consists of a Director, one Deputy, a 15-member professional "inspectorate" team to monitor resource exploitation and an 83 member "guards corps" to patrol for illegal hunting, fishing and forestry, as well as report on pollution and bird counts. The department divides the Delta into 12 districts, 6,000 ha each. There are proposals to increase the guards staffing further up to 200 over time, to meet environmental protection, monitoring and public awareness needs throughout the Delta.

3.03 The guards are recruited from the local population, and live and work in the Delta in isolated conditions with low pay and minimal equipment or supplies. This results in a high turnover and difficulty in hiring staff trained beyond secondary school level. In addition, their policing role often places them at odds with the local communities. Protected area examples around the world increasingly illustrate that effective biodiversity protection

requires environmental education and community involvement as the groundwork for enforcement measures, so people may better understand how protection may benefit, rather than restrict, their lifestyle.

3.04 The project supports a multi-purpose guards structure, identifying the training and equipment needs, while details on the ecosystem monitoring section and interpretive guides section are presented in the Monitoring and Public Awareness components respectively. As noted in Chapter 2, DDBRA have had difficulties recruiting new qualified technical staff. As minimum, by March 31, 1995 a training specialist, natural resources assessment specialist with knowledge of computerized systems, and public awareness specialist would need to be recruited. At Negotiations GOR agreed to recruit these three individuals by this date [para 6.01 (e)].

3.05 The GEF Project assumes a recruitment of 20 wardens per year to bring the staff up to 152 over 5 years, allowing for some staff turnover. At Negotiations GOR also agreed to this recruitment schedule (para 6.01(e)). The Wardens focus will be on protection activities during the first years of the project while recruitment and training are taking place, but in time have a much broader conservation and public awareness role.

3.06 Wardens would be responsible for activities in the 13 counties of the Delta, and would be divided into inspection, patrol, ecological survey and recording, guiding and infrastructure sections. Detailed costs are indicated in Annex 1.

1. *Inspectors*: This group would be in the Warden Department but not actually "Wardens". They are professional scientists who carry out monitoring and compliance activities dealing with water pollution, forest and agriculture practices, shipping impacts, etc. and integration with national monitoring and standards program as well as those of the Black Sea and Danube River. They would work closely with the Warden Patrol Section in familiarizing them with the environmental standards and activities that need patrolling. They will also work closely with the Warden Survey Unit and the DDI. The inspectors will take the lead on guiding surveys and monitoring activities especially during the first years of the project while the Wardens' focus on protection.

2. *Patrol Section*: They would be the great majority of the Department, and maintain an enforcement role on licenses, permits and fines throughout the 13 countries, with a senior warden for each district, and two section leaders.

3. *Survey and Recording Section* This team would focus on doing ongoing, routine surveys, e.g. bird observation, would link the DDBRA with the DDI and other research organizations and universities in surveys and inventories on wildlife and habitat status, water quality, etc.

4. *Guiding Section*: Approximately 30 wardens would be the main link between the Delta and the public, interpreting both the ecological and cultural environment through talks, nature activities both in the Delta and throughout the region, providing public awareness at all levels and encouraging community involvement.

5. Infrastructure Section: This group would oversee contract works on buildings, exhibits, observation posts, and hydrological engineering needs in a way to minimize habitat disturbance. They would also learn from local artisans on building techniques, and would supervise contracts for restoration of polders to wetland conditions.

(ii) Training (US\$326,000)

3.07 Training to support enhancing the capacity of the existing and new staff, with an emphasis on career development would be structured as outlined below. This is based on a gradual expansion in scope and scale of the wardening department over the project, with an emphasis on basic patrolling functions, and infrastructure building during the first two years given the current need for controlling poaching and basic park protection. In-service training would be provided in a purpose-built training boat, which would move between different districts in the Delta to provide on-site training. More specialized roles for environmental monitoring and guiding would be developed in the later years as well as more detailed courses for all sections. Under the EBRD Technical Cooperation project a training plan is being finalized. The proposed training activities in this component may be modified when the final EBRD proposals are available.

1. *Foreign Study Tours:* Visits to well-managed wetland protected areas in Europe would be organized for 8 staff: Director, 2 warden leaders and 6 section Heads, for one month during the second year of the project. The host of the study tours will visit the Delta prior to the overseas tours to understand the training needs of the warden teams. The DDBRA senior staff will have had study tours through the EBRD project during the first year of the GEF project.
2. *Section Head Training Internships:* Four Section Heads would work with overseas park authorities for two months in day to day activities of the host park. This would take place during the end of the second year of the project, once the warden units have developed.
3. *Warden Foundation Course:* 1 month overview course would be offered on all aspects of wardening and park management in the Delta. This would be offered twice a year for 20 new recruits each time, beginning the first year. This would be taught by the Wardens Chief and Training Specialist with input from the section heads.
4. *Patrol Induction Year:* This would begin during the second year of the project, and would be provided for new wardens through the rest of the project. The wardens would focus on protection activities and overall management needs. This training, together with specialized training, forms the core of the on-the-job training, and would use the mobile boat extensively. One field visit to another Romanian protected area and one to the Ukraine Delta would also be provided for each warden in groups throughout the year.
5. *Section Specialization Courses:* Once the 5 sections have been established, there would be two week courses (e.g. public awareness, laws and regulations) taught by the section heads, once per year, beginning the third year of the project.

6. *In-depth Specialization Courses*: Three, two-week courses for each section, e.g. monitoring, public awareness, totalling six weeks of college-level training would be taught by Romanian specialists during the fourth year of the project.

7. *Language Skills*: A permanent language lab will be set up in Tulcea during the first year, with intensive courses and facilities for ongoing use, to teach English, German and French over the course of the project.

8. *Construction Skills Training*: This would be technical training for the wardens by the local craftsmen in carpentry, bricklaying, thatching, boat building, for the construction for related park infrastructure (watchtowers, exhibits, buildings) in ways that are traditional and environmental, and can ensure ongoing-maintenance of park facilities and preservation of traditional skills. This would be ongoing through the life of the project.

9. A *training officer* would be financed through technical assistance for 3 months to develop the curricula for all of the training activities outlined below and in conjunction train the newly appointed DDBRA staff training specialist.

(iii) Equipment and Vehicles (US\$503,000)

3.08 Items that are specifically for Monitoring by the monitoring rangers or Community Involvement by the Interpretive Wardens are listed in their respective components. The following equipment would be needed to carry out park wardening operations for patrolling, monitoring and guiding:

- . Transport (boats, vehicles); Communication (radios); Optical Instruments (cameras, binoculars, cameras, video); Office equipment (fax, photocopiers); Information Material (field guides, educational), Field equipment (clothing, camping gear), Survey equipment (GPS, diving, flora and fauna monitoring), Training equipment (tape recorders, books, supplies) and training boat (with teaching/public awareness materials) to serve for training and public awareness activities.

(iv) Infrastructure (US\$305,000)

3.09 For effective biodiversity protection, the wardens will need a Headquarters, district offices, storage facilities for large equipment, training facilities, visitor information/participation centers, field posts, exhibits and accommodation. For field-oriented training, the existing Ecological Information Center at Uzlina could be used, since it is already dedicated to this purpose and owned by DDBRA.

3.10 Significant park infrastructure components, such as signs, exhibits, watchtowers, and information centers are in preparation with funding from the DDBRA investment budget. These are described in the Public Awareness Component. In addition, there is a need for staff housing to attract qualified people and information center-warden offices in the districts.

The project will renovate flats for up to 20 families and finance construction of 4 traditional-style information/office centers in the Delta.

3.11 Villagers leaders and local youth will be contracted by the project to help in the building of park-related infrastructure (e.g. observation towers, exhibits, boundary markers) so they can have a greater understanding of the purposes and needs of the reserve. This will be coordinated with the "construction skill training" course for the Wardens identified in the previous section. Leaders will be found from the villages who are experts in certain skills (e.g. carpentry) to both teach the Wardens and the youth.

3.12 Increased staff costs. The staff on the warden's payroll would be increased from 81 to 152 over a 5-year period. GOR have already budgeted for this staff increase.

COMPONENT 2: Monitoring

Implementing Agencies: DDBRA, DDI/BRG (Biodiversity Research Group),
Apele Romane

Cost Total: US\$641,000

A. Present Monitoring Status

3.13 The ecological processes of the Delta have undergone much change. The DDI and other organizations have conducted monitoring activities to provide information on the causes of environmental degradation and the resulting changes in biological community composition and distribution. This information forms the background for appropriate management of the Delta Biosphere area with regard to zoning and activity regulation.

3.14 The DDI presently has 32 staff that work in six research areas, including reed, fish, biodiversity, forests, tourism and pasture. Together they are implementing the following biodiversity-related programs: assessment and protection of biodiversity of DDBR; characterization of ecological factors defining natural systems in DDBR; study of DDBR fish, reed, vegetable and game populations and establishment of conditions of sustainable use; development of conditions to use landscape for tourism; ways to limit negative impacts of economic activities on natural systems; and inclusion of economic and social activities in ecological management of DDBR. Additional organizations collect data on hydrological and geomorphologic parameters.

3.15 The following provides an overview of the ongoing monitoring activities in the Delta by various organizations:

Species/Population Survey and Inventories:

3.16 Presently the DDI/Biodiversity Research Group (DDI/BRG) is conducting activities on species/populations. They have a staff of 15 with assistance from 7 of the DDBRA

wardens, as well as assistance from collaborating universities, botanical gardens and museums. This group conducted 4, 2-week expeditions in 1992-93 and categorized the natural areas (not the impoldered areas) of the Delta into 27 biotypes based on geomorphology, vegetation associations, water supply. They record and capture specimens of fish, mammals, aquatic invertebrates, birds as well as transects for flora. The data are recorded according to species name, taxonomy, ecological data, qualitative abundance and computerized in point-specific references, but are unpublished and not in database format. There are no studies of flora/fauna dynamics or systematic vegetation monitoring. The data so far indicate a need to redefine and choose additional protected areas. Studies are needed to make sustainable estimates of game resources, working with hunting associations. The following chart illustrates the current state of knowledge on biodiversity in the reserve.

Recorded Species in the Danube Delta Biosphere Reserve	
FLORA	No. of Species
Algae	213
Fungi	32
Lichens	110
Higher plants	804
FAUNA	
Invertebrates	
(excluding insects)	575
Insects	1234
Fish	75
Amphibians	8
Reptiles	18
Birds	320
Mammals	57

Note: Known species only; actual number of species of invertebrates and lower orders of plants are likely to be much higher than this.

Forest Vegetation

3.17 The DDI is conducting a forest (including riverine and coastal strand) inventory with planned completion in 1995. They use standard inventory practices, e.g. transects, sampling for growth and productivity measures, community composition, etc. A 1:50,000 vegetation map (also indicating polder use) was produced by DDI and Rijkswaterstaat (Flevoland) of the Dutch government in the summer of 1993. It has been digitized and color copies at the 1:100,000 scale are available. 1993 Landsat imagery has also been provided to the DDI by the Rijkswaterstaat.

Aquatic Plants (Reeds, Waterlilies)

3.18 The DDI Reed Research Group is in the process of preparing maps of reeds with transects, resulting in 24 vegetation types. The transect samples include list of species, percent cover, reed type, height, diameter, biomes, chlorophyll, microfauna, shoot density, reed quality assessed through silica richness. They plan to have annual satellite images as well as an update of air photos which were last taken in 1990/91, and compare these with those from the 1970s and 80s. They wish every April to have images of harvested reeds and in August images of burned areas to predict the next years harvest.

Birds

3.19 The birds of the Danube Delta are perhaps the most "high profile" species of the Delta with regard to conservation, yet as noted earlier migrating and breeding populations are declining due to loss of habitat and deterioration of water quality. Presently there are a number of different groups conducting bird surveys and inventories, based on 63 key species and 13 zones in the Delta. The DDI/BRG conducts daily sightings by 6 observers utilizing Bird life (ICBP) guidelines and makes monthly, computerized totals. The DDBRA Wardens also conduct daily sightings and record information on forms about on reproduction, nesting and feeding areas. They have also been conducting pelican ringing as part of an international program coordinated by Tour de Valet (France) but more rings are needed for effective results. The Ornithological Society of Romania (OSR) also helps with sightings and ringing since 1990 and publishes overall results four times per year. The OSR also conducts mid-winter bird counts with the IWRB.

3.20 The NGO Bird Life (formerly International Council for the Conservation of Birds, ICBP) has had a Memorandum of Understanding with the DDBRA since 1992 to provide technical assistance on bird management and public awareness (described in the respective component). To date they have provided binoculars, telescopes, books, clothing and 2 boat engines. These items have been a valuable part of the Wardens current capacity to carry out bird-related activities (e.g. counts and protection). An ornithological management plan and outline of a long-term monitoring and bird protection program are in the first draft stage. Bird Life has also agreed to start training and study-tours for the DDBRA and the ROS, building on Bird Life's experience in wetland management through governmental/NGO partnerships in practice throughout the mediterranean Ramsar sites. As part of carrying out

the above activities Bird Life sponsored an advisor for three months during 1992 to help with the drafting of the bird-related sections of the management plan.

Fish

3.21 The DDI Fish Research Group has conducted annual fish stock assessment of principal species since 1984, utilizing FAO methodologies. These are based on sampling at 11 collection points with boats and seine nets of natural water bodies (polders excluded). Fish body size and egg count measurements are put into computer models to make annual recommendations for fish exploitation. Annual reports on biomass, sustainable yield recommendations and area and species distribution, population totals, mortality, sex distribution and effort per year are made based on mathematical modelling and provide the basis for catch recommendations for the next year. Data from fishing companies on fish stocks of the principal species are available since 1960. There are 1,000 fishermen in the area working for 7 state companies and 4 private companies.

Mammals

3.22 The DDI/BRG traps rodents and insectivorous and sights and records other mammals. Yet both baseline and monitoring work is needed with a protection focus on the mink which lives on the plours, wild cats and otters in the waters. In contrast populations of the wild boar need to be managed, possible through organized hunting. The mink and the otter have a high-profile conservation value that could be encouraged by NGO groups in public awareness activities.

Air Quality and Radioactivity

3.23 The Environmental Protection Agency (EPA) monitors air quality in Tulcea township at one sampling point on a daily basis, and a further eight sampling points on a monthly basis. A synthesis is published every month and data are available from 1987. The EPA has also from 1987 collected samples on a daily basis, for analysis of radioactivity in the Tulcea area and from Sf. Gheorghe (1987 to March 1993); the latter has since been taken over by the DDBRA. The results are sent to the MWFEP and to the radioactivity laboratory in Afumati.

Climate and Hydrology

3.24 The national hydrometric network is operated by RA Apele Romane. In the Delta staff from the Tulcea office, under the Constanta regional office, measure daily water levels at 26 stations, and on a monthly basis discharge, suspended sediment and bed load at 11, 7 and 5 of these stations respectively but this routine is on the verge of breakdown for lack of replacement of equipment over more than 15 years. The Institute for Meteorology and Hydrology maintains 8 climate stations. The DDI hold the data for the period 1932-1992 for the Tulcea point, but records go back to 1879 for Tulcea and to 1895 for Isaccea. The Department of Physical Geography at the University of Bucharest has for over 20 years

assembled hydrological data about the Danube Delta. This has culminated in the development of a basic hydrological model of the Lake Matita-Merhei complex. Data are available for various lake systems covering the period 1968-1992.

Water Quality

3.25 Water quality data for Tulcea at 19 points within the Delta are available for the period 1978-92, the sampling and analysis having been undertaken by the EPA and its predecessor at its Tulcea laboratory which is ill-equipped. In December 1992 the Government transferred responsibility for water quality monitoring to Apele Romane. In the meantime the EPA continues the monitoring of the above 19 points. In 1992, however, the DDBRA also assumed responsibility for monitoring water quality at Tulcea, and within the Biosphere Reserve. The DDBRA now undertakes daily and monthly water sampling and analysis for Tulcea and Vilково stations respectively, using the DDI laboratory. In addition, DDI has since 1984 also monitored water quality, initially at 15 stations with varying frequency, and since 1991 at 10 stations monthly, and 41 stations quarterly, for which data are available at DDI.

3.26 The Faculty of Biology at the University of Bucharest and Braila Research Station have carried out research since 1980 on nutrient cycling and aquatic ecosystems which includes some water quality measurements, particularly in the lake systems within the Delta. Most recently (1990-92) data has been collected at locations upstream of the Delta.

Soils

3.27 There is an unpublished draft 1:50,000 scale soil map of the Delta based on the work of the DDI and Dr. Munteanu from ICPA in Bucharest, dating from 1985. This will be published as a color 1:100,000 map in 1994 by Rikswaterstaat. In addition soil maps for the following polders and proposed polders are available at the Institute: Dunavat I, Dunavat II, Holbina I and 500 ha of Holbina II, Caemurlea, 6 Martie, Lunca, Erenciuc, Leahova, Izmeica, Periteasca, Murighiol, Somava, Obretin I, Popina, for which areas the DDI has physical and chemical analytical data for some 2000 soil auger sample points. Soil sampling (and analysis) is also undertaken by DDI research teams from cultivated and abandoned polders, and natural vegetation sites, as part of the polder restoration, impact of economic development and sustainable pasture projects.

Socio-Economics

3.28 15 yearly published census provides data on human population and occupancy. The last census was in 1992. The DDI socio-economic research group collates data from the commercial companies, and carries out limited socio-economic surveys of Delta villages: 17 were surveyed in 1992, and 10 will be surveyed in 1993. Data about land ownership are held by the Cadastral Mapping Office (OCOTA), which has a local office in Tulcea.

Shipping

3.29 Non computerized data regarding shipping are kept by the Port Authority, which include daily records of (a) ships using Tulcea port, including weights and cargo carried, and (b) of the shipping passing through Tulcea. These are records of shipping cargoes (and the ships) that have unloaded at Tulcea. The depth of the Sulina channel is monitored each month with an echo sounder.

Commercial Activities

3.30 Data on the commercial activities in the Delta are held by the 21 companies concerned, including the agricultural fishery and forestry companies (see Section 4.4). The data which have been collected about the Delta by the above organizations and institutes can, to a great extent, serve as the baseline information for a database. However, as some of these (e.g. ICIM) are partially privatized, some payment may be required.

B. Proposed Monitoring Activities

3.31 The Project would build on existing work to support three broad activities.

1. Ecosystem Surveys and Population/Species Inventories (US\$142,000):

3.32 Seasonal and annual surveys to identify baseline and monitoring status of major ecosystems and habitats (river tributaries, canals, lakes, reedbed swamps, forests, dunes) would be continued. Population and species inventories of key indicator, endemic, exotic and endangered species provide information on access life history trends, harvesting rates, population threshold, causes for community change and population decline, focusing on forest vegetation, macrophyte aquatic plants, birds, fish and mammals.

2. GIS and Data Management (US\$330,000):

3.33 An integrated informational data base using GIS technology will result in a variety of map overlay based (on the ecosystem and species information as well as satellite and aerial imagery) will provide tools to assess biological diversity and management priorities. This GIS will result in maps useful for assessment of the suitability of existing protected areas, consideration of reclassification and zoning options and refine management plans, in light of ecosystem and population sustainability needs, economic pressures, infrastructure development and regional influences.

3. Hydraulic Monitoring (US\$123,000):

3.34 Support would be given to improved water discharge and water quality monitoring.

3.35 The monitoring component will result in:

- (a) The establishment of baseline conditions and monitoring programs for management recommendations: key indicator species, biologically rich areas and high-risk habitats (hotspots) and control areas and wetland restoration treatments;
- (b) Analysis of differences with regard to habitats and flora/fauna community composition between protected areas (core conservation areas, control sites) and areas not protected, including polders being restored, to provide indications of effectiveness of protection and guidelines for rezoning and/or expanding protected areas;
- (c) Relevant information from publications, maps, aerial surveys, remote sensing, etc. in flora and fauna would be compiled into a DDBRA database, targeted for resource management applications, but linked with a DDI research-oriented database to clarify existing state of knowledge and gaps;
- (d) Accurate base maps from which other data can be referenced including time series, point source and geographical coordinates. This will be done with satellite imagery, aerial photographs and ground truthing with Global Positioning System (GPS) locators. It will become a prototype and standardization for ecological zones and land-use units. Recent aerial photography will also be used;
- (e) Inclusion of information into a simple GIS format in the DDBRA to be used for management, planning and public awareness needs. The GIS system will be capable of selecting spatial ecosystem areas and specific species information, as well as have prediction and modeling capacity;
- (f) Red Data Book: The Danube Delta has many endemic, rare and threatened species, which need to be systematically identified, counted and published as part of establishing a baseline set of data. The production of a Danube Delta Red Data book will facilitate the inventorying of important species and assist monitoring by a different interest groups;
- (g) Organization by DDI of a series of symposia and conferences on the environmental status of the DDBR in collaboration with other national and international bodies to ensure. (Information exchange that is targeted to the local communities, with less emphasis on scientific research is described in the Community Involvement Component and primarily implemented through the DDBRA Interpretive Wardens.); and
- (h) The training of the DDI Biodiversity Research Group and the DDBRA Monitoring Wardens, NGO staffs and community members in a variety of biodiversity assessment and management techniques that foster broad-based understanding and support of conservation of Delta habitats.

3.36 While the flora/fauna monitoring component would primarily be carried out by the DDI Biodiversity Research Group with support by the Survey Section of the DDBRA Warden Department, a wide range of community members, including school groups, university researchers, and NGOs would also be involved in bird monitoring.

(1) ECOSYSTEM SURVEYS AND POPULATION SPECIES INVENTORIES
(US\$142,000):

3.37 The DDI's various research groups (described earlier) would work together to form an expanded "Biodiversity Research Group" of about 32 existing staff. The following indicates activities that have been identified by this group to be carried out during the next five years.

(a) Bird Monitoring:

3.38 An avifauna biodiversity index and breeding points have been maintained for selected species, including pelicans, cormorants, storks, spoonbills including pairs, death rate of young and date of last successful breeding pair. But interpretation of present research is inadequate for conservation needs since there are no results from long series of counts for the whole Delta and information on trends regarding breeding success is minimal. Systematic methods for the Delta need to be published to be easily used by different groups, and better transport and field equipment is needed to reach many of the difficult access points in the Delta throughout the year.

3.39 The monitoring program for birds will focus on migration (through ringing), nesting, population dynamics, threatened species, repopulations and population losses.

3.40 The following approaches to bird inventories are outlined and would be developed into activities of this component.

- (i) Species-based monitoring: Simple counts and population assessment is needed for priority 8-15 species (e.g. red breasted goose, white pelican, pygmy cormorant and Dalmatian pelican, white tailed eagle and white stork), including regular monitoring of key sites every 2 weeks and intensive mid-winter counts for the wintering waterfowl and crane migrators. Information on dates and bird numbers, nests, eggs laid/nest, fledged young leaving the nest is needed for population trends.
- (ii) Habitat-based monitoring: A variety of habitats (lakes, reed beds, marshes, meadows, grasslands, woodlands, coastal dunes/spits) to be selected with each approximately 500 ha in size, to represent 10-15% of the total area of that habitat and be selected on a stratified random sampling basis. Each site needs to be visited 5 times per year, 2 winter, 3 spring/summer. The number and activity of all birds present should be recorded

- (iii) Continuous effort trapping sites: Two decoy observation places are needed for trapping with mist-netting to be placed where concentrations of migratory birds occur. Trapped birds should be ringed and information on morphology collected, and released.

3.41 As described previously, BirdLife has provided initial equipment and technical assistance to bird-related conservation activities. The GEF project will support their ongoing participation, building upon this relationship through the following inputs:

- (i) Transport and living costs for the BirdLife ornithological specialist to visit Romania (Delta) two times per year for three weeks each year, throughout the project in order to help the DDI, DDBRA and the Romanian Ornithological Society to implementing the monitoring activities, and help with the integration of monitoring methods (e.g. surveys) into formats appropriate for GIS (via communication with U.Mass and Rijkswaterstaat). They will also help the DDI Biodiversity Research Group in monitoring practices and ecological relationships relevant for the other flora and fauna that are part of overall wetland habitat and encourage a habitat-based approach to bird-management. Another BirdLife person will be funded for the same periods to assist with Public Awareness and Regional Cooperation initiatives, but this is described in those components. BirdLife will be contributing their staff time to the GEF project at no cost to Romania or GEF.

(b) Fish Monitoring:

3.42 This activity focuses on the study of fish populations in the DDBR to establish conditions of sustainable fishing.

- (i) Development of baseline fisheries information for all species, not just commercially valuable ones, with an emphasis on endangered species and those which are bioindicators;
- (ii) Development of an ongoing monitoring program together with fishermen to look at time series change, population trends, indications of water quality and health, potential economic resources and overall biodiversity recovery.

3.43 The program began in 1991, but the fish research team has been working in fish stock assessment since 1984. The program will be continued in 1996-2000 period. The basic purpose of fish stock assessment for inland fisheries of DDBR is to provide advice on the Maximum Sustainable Yield of fish aquatic resources. The other goal is the determination of migratory anadromous (shad and sturgeons) fish stock size and their trend. In addition the study analyses the elements on fish ecology (biotic and abiotic features) to explain the present status of fish stocks in DDBR. Finally a management strategy for sustainable exploitation fish resource will be elaborated together with the measures for the restoration of fish population stocks in decline.

reed productivity. Both baseline studies and an ongoing monitoring program for reeds and aquatic macrophytes would be developed.

(d) Flora/Fauna:

3.48 Flora/fauna inventories began in 1991 on basic taxonomic, community composition and species diversity and population density work on the wild genofund through the DDBR. This will continue in 1994-95 and focus on algae, aquatic macrophytes, reptiles, mammals, etc. This information will continue to be collected in a manner that is computer compatible. It includes information on: dates, previous records, species range (local Romanian, European, global), geographical coordinates, abundance, endemism, etc. From this data basic maps for each species will be produced in color-codes based on abundance, occurrence and habitats.

3.49 Publications including four volumes will be produced including: I (Flora), II + III (Invertebrates) and IV (Invertebrates). This will form the basis also for the production of a Red Data Book for the Danube Delta on rare, endemic and threatened species, which will be a valuable tool for monitoring and serve as a field guide for a broad variety of users. The work will continue through 1998 with a more detailed emphasis higher-order macrophytes and fauna, main order of aquatic worms and crustacea, insects, fishes, reptiles and mammals.

(e) Traditional Pasture:

3.50 Surveys and inventories will examine traditional foddering plant species found in grazing areas, as well as pasture capacities for selected areas. It will look at the evolution of flora, biodiversity and bio-mass production, and vegetative quantity and quality. Experiments will be conducted on the relationship and ratio between the mixture of graminaceous and perioral vegetable fodder for the improvement of natural pasture.

3.51 The project would provide vehicles and boats (US\$43,500), specialized field equipment (US\$57,200) and office equipment (US\$21,400) to the DDI Biodiversity Group to assist them in implementation of these activities, which form the scientific basis for development of management plans. The socio-economic survey group, with the assistance of survey work carried out with EBRD, are contributing the socio-economic inputs to development of these plans. Printing and publishing research material and attendance at short specialized courses abroad would be financed (US\$15,500).

2. GIS AND DATA MANAGEMENT (US\$330,000)

Current Database Arrangements:

3.52 In addition to data collection and analysis associated with the Institute's research, the DDI also has a database development project: "The assessment of the informatic system of the DDBR Authority including remote sensing and GIS". The objective is the establishment of a pilot GIS for the DDI data which are of interest to the Authority.

3.44 The sampling is carried out yearly in the 11 main complex lakes in DDBR: Baclanesti Lake, Razim Lake, Fortuna Lake, Sinoie Lake, Gorgova Lake, Somova Lake, Matia-Merhei Lake, Trei lezere Lake, Isacova Lake, Uzlina Lake, Puiu-Rosu Lake. The main samples are from industrial fishing seines in autumn, and from fish traps in spring and summer. Anadromous migratory fish are sampled in spring at Danube Delta branch mouths and upstream to 52 Marine Mile, from fish landing points, and own survey fishing (Sfintul Gheorghe, Chilia Veche and Isaccea). The samples included 1,000 to 3,000 individuals of main species (Bream, Gibel carp, Roach, Pike-perch, Shad and Sturgeon).

3.45 The following data are recorded: Total Length, Standard Length, Weight. The scales and bones are taken from fishes to provide age structure of population. Eggs are collected to determine the individual or population fecundity species for estimate of total eggs produced in spawning period. In 1993 a study was started on unexploited parts of population concerning small fish (larva and juvenile), to complete all table life of the fish stocks.

3.46 The methods of data processing and analysis use FAO programs and include the following steps:

- (i) Establishing the structure and distribution length-frequencies and age-frequencies;
- (ii) Determination of relationship between weight and length;
- (iii) Calculation of growth equation parameters, and mortality rates (total, natural and fishing mortality);
- (iv) Virtual Population Analyses (VPA), to estimate numbers and biomass in Kg, of population;
- (v) Plotting isopleths graphic Yield/Recruit, and definition of the character of exploitation (model Beverton-Holt);
- (vi) The modelling of effective and biomass population, changing only fishing mortality, or mesh size, or both;
- (vii) Prediction of the short or long term change effect in population (new effective and biomass).

The project would provide additional fish monitoring equipment to support these programs.

(c) Aquatic Plants:

3.47 This activity would support the continued monitoring of the transects of aquatic plants (especially reeds) by DDI with DDBRA assistance, as well as others as needed (e.g. universities, NGOs) ensuring that the data are standardized and produced in an accessible format. Remote sensing and aerial photographs would be interpreted for species specific and

3.53 The DDI is in the initial stages of transferring data from unpublished reports into computer files, and the digital database now contains the following files:

- Map of DDBR - Scale 1:200,000 (AutoCad Format);
- List of mammal species found in the DDBR in 1991 (scientific names, habitats, abundance);
- List of species occurring in the DDBR recorded in the literature (flora and fauna) Source: author, year, article/book, species name and location;
- Table of hydrological levels at Tulcea station (1932-1991);
- Table of hydrochemical levels (O₂, pH, CBO₅, NH₃, NH₄) in Danube branches or lakes (1982-1991, stations, date);
- Draft Fisheries map (1991);
- Table of fish production by year and species (selected fishing companies) and maximum exploitation levels (by year [1991], species and lakes);
- Sketch map of reed harvesting areas;
- Sketch map of principal grazing areas (1991);
- Table of the distribution of domestic animals in the DDBR (1991);
- Sketch map of hunting areas (1992);
- Draft map of hunting areas (1993);
- List of wild animals which are hunted;
- Map showing tourist routes and period of operation;
- Data on the social conditions of the DDBR population;
- Reed/plant association biomass production data and production areas (maps at 1:25,000).

3.54 The database at present is a series of tables, for single data points (with a common graphical interface), which are related to map units. Hydrological level data are displayed in graphical form, but it is not possible to query the actual database. The general land-use map and the reed map in preparation are held within the AutoCad programme, which permits spatial referencing, area calculation and data layering. The maps have not been geometrically corrected, and at present there is no associated map database, although an experimental record exists for the reed map. The project would assist with the development of GIS capability for database management in the DDI and DDBRA, and would improve the data collection capability of Apele Romane by providing hydrological equipment.

Geographic Information System Development (GIS):

3.55 Geographic Information System (GIS) technology offers the opportunity to conduct a multi-disciplinary inventory of the ecological, anthropological, socio-political, and economic elements of the Danube Delta. Such an inventory is helpful for developing sustainable management programs for the Biosphere Reserve and for conserving the biological diversity of this unique wetland system. Gap Analysis approaches can identify those areas of the Delta with high biotic diversity, high levels of endemism, or threatened, critical or unusual habitats or biota. These are typically identified by high species richness or vegetation types that may be threatened by current and future resource utilization or land

use changes. Managing these "hot spots" for their natural values and the landscape linkages between them should minimize the loss of the Delta's natural biodiversity heritage. Critical to this assessment is the identification of areas, especially bird colonies, that are sensitive to human disturbance and subsequent establishment of special and temporal buffer zones for these sensitive areas. Identification of these sites and the conservation of the Delta's spectacular avifauna are essential for the development and maintenance of a successful ecotourism industry in the Biosphere Reserve. Identification of polders according to their intended use and status, and the evaluation of reed beds will help managers assess production and restoration potential. A Danube Delta biodiversity database also will provide a basis for development of a long-term biodiversity monitoring program in the region.

3.56 Two initiatives are in progress that will greatly enhance the work by DDI (and others) and make it more useful for management activities to be carried out by the DDBRA. The Rijkswaterstaat (Flevoland) of the Dutch Public Works Ministry, has a Memorandum of Understanding (MOU) with the DDI for some GIS training and provision of equipment for the period of 1994-1999. The University of Massachusetts (U.Mass) (USA) began working with the DDBRA and DDI in 1991 through the "US-Romanian Summer Program for Young Investigators in Ecology/Environmental Sciences", and realized the need for integrated data collection and management. This component builds on the assistance by the Dutch government and supports additional work through U.Mass as described below:

(i) Rijkswaterstaat Assistance (Funded by Dutch Government 1994-1999)

3.57 Flevoland's cooperation will focus on:

- the application and implementation in Romania of satellite image processing and GIS facilities, for Danube Delta survey and monitoring, for Romanian research and management purposes and Dutch research purposes;
- research quantifying relations between geomorphology, hydrology and ecology for the purpose of ecological restoration projects in the Netherlands and to develop sustainable management plans for the Danube Delta area; and
- the exchange of know how and documentation and specialists in the field of the ecological restoration.

The work in progress includes:

3.58 An all-Delta 1:50,000 vegetation map (also indicating the actual land use in the polders) has been produced by DDI and the Flevoland Institute in the summer of 1993. It has been digitized to an ARCINFO format in Tulcea, using the ARCINFO software that the Flevoland Institute delivered to DDI in August 1993, and is now available at 1:100,000 scale.

3.59 One all-Delta LANDSAT image (June 1993) has been delivered to DDI by the Rijkswaterstaat. DDI has set up a temporary cooperation with the Institute for Geology and Geophysics in Bucharest for image processing. DDI does not yet have the needed ERDAS software of its own. For future cooperation, the Rijkswaterstaat Institute has purchased three other all-Delta LANDSAT images (April 1990 TM, August 1991 TM, 1984 MSS). One more image has been ordered (1975 MSS).

3.60 The Flevoland Institute has given a very short ARCINFO training (August 1993) in DDI when installing the ARCINFO package in Tulcea. It has given an introduction to ERDAS satellite image processing in the Netherlands to 3 DDI staff (October 1993). Danube Delta LANDSAT images were tested for their suitability for planning reed management.

Work to be carried out in 1994, agreed with DDI:

3.61 An all-Delta soil map will be produced by the Institute for Soil Science and Agrochemistry (ICPA) Bucharest, DDI and DF1 in 1994. Production includes digitizing to ARCINFO (by Romanians) and printing in full-color 1:100,000 (by DF1). ARCINFO training (two Romanians during two weeks) in the Netherlands, using the all-Delta maps will be provided.

Equipment provided to DDI by the Netherlands:

One PC ARCINFO package, including ArcEdit, ArcPlot, Starterkit, PC Overlay, PC Dataconversion (August 1993).

One A3 Calcomp digitizer (PC 8000824) + 16 button mouse (PC 8900219, August 1993).

One HP Designjet 650c inkjet colorplotter + 100 AO sheets + supplementary ink cartridges (November 1993; in transport).

(ii) University of Massachusetts Technical Assistance (to be supported by the GEF Project)

3.62 Using GIS digital map overlays, a variety of physical, biological, and land use data will be compiled to provide a tool to inventory biological diversity and to provide a broad assessment of protection priorities and management needs in the Danube Delta Biosphere Reserve. Development of this GIS system for the Biosphere Reserve will contribute directly to development of an integrated, ecologically based management plan for the Reserve, provide an efficient platform to integrate the multi-disciplinary research program now being expanded in the Delta, and provide a base for development of a long-term biodiversity monitoring program in the region.

General Strategy

3.63 A GIS computer system consisting of a workstation and an auxiliary platform, large and small plotters, a digitizing tablet, and support peripherals will be acquired for the project. The data base will be compiled from existing data sources and the preliminary analyses conducted in the United States in cooperation with U.S. and Romanian scientists. This will require that two Romanian scientists from the Danube Delta Institute come to the United States for up to 8 months. One of these individuals must be a computer specialist and the other a scientist who has extensive knowledge of the soils, vegetation communities, and land use activities of the Delta. As described previously, the DDBRA will be developing a Natural Resources Assessment Department. The GEF project would also support 1 DDBRA staff to participate in this training. The training will comprise 4 months in USA, 1 month back in Romania, 4 months back in USA and 1 final month in Romania. This will allow sufficient hands-on experience in the USA and application during the project in Romania. Once the system is developed and analyses conducted, the equipment and data base would be transferred to the Danube Delta Institute in Tulcea, Romania. U.S. scientists would continue to provide technical assistance to the Institute as requested as the system further develops to meet Biosphere research and management needs.

Base Map of Vegetation, Soil Types, and Hydrologic Characteristics

3.64 Digital base maps will be developed for the entire Danube Delta Biosphere Reserve using ARC/INFO. Thematic Mapper (TM) or SPOT satellite data will provide a baseline map of natural vegetation, agriculture and developed areas at 1:25,000 scale. TM coverage of the Delta will require 1.5 scenes. Vegetation/wetland/land use polygons will be delineated on screen using ARC/INFO at approximately 1:25,000 scale at a minimum mapping unit of 1 ha. Polygons will be labeled using a variety of sources, including recent aerial photographs (1:23,000 and 1:40,000 scales) and large scale vegetation maps of Letea and Caraorman forests. Forest vegetation types will be distinguished by dominant overstory species. Additionally, elevation data from topographic maps and soil types from existing soil maps will be incorporated into digital overlays to facilitate evaluation of current and future land use practices for agricultural production and wetland restoration programs. The locations and depths of channels and lakes will also be incorporated if these data are made available from Romanian Institutes. The base map, produced as described above, will be compared to assorted local maps to test for consistency. Random points will be selected in different vegetation/land use state and compared between maps.

Mapping Land Ownership, Agriculture, and Other Land Use Activities

3.65 Land ownership will be categorized according to state, collective, private, church, or school from government records, and land use activity identified from aerial photos. The boundaries of all polders will be determined from aerial photos, and intended use (agriculture, reed production, fisheries, silviculture) and status (active vs. inactive) identified. Additionally, the potential for production in reed beds will be evaluated from interpreting vegetative composition from aerial photos and classed within the vegetative overlays.

Mapping Core Bird Areas and Rare or Sensitive Species Locations

3.66 The point locations of all known core areas important to bird conservation, including breeding, feeding, migratory, and wintering areas, and distribution data of rare or sensitive species in the Delta will be compiled in cooperation with Romanian scientists and incorporated into a Delta-wide data overlay. Maps all known locations of rare or sensitive plant, invertebrate and vertebrate species in the Delta will be produced.

Analyses

3.67 GIS analyses of data layers will be conducted at the University of Massachusetts using ARC/INFO software on the workstation. This will provide a broad assessment of protection priorities and management needs for the Biosphere Reserve. TM satellite data will be analyzed by the U.Mass Digital Image Analysis Laboratory (DIAL) using CDC XPLOR and locally developed (MACS) software and imported into ARC/INFO. TM images will be classified in ARC/INFO using a combination of supervised and unsupervised methods. Atmospheric corrections and band transforms will be applied to improve class separation. Image classification will also be enhanced by the availability of up-to-date ground information, recent aerial photography and ancillary cartographic information. Digital overlay maps will be edited on screen using ARC/INFO by professional interpreters from the U.Mass Resource Mapping/Land Information Systems Project and participating Romanian scientists, essentially photo interpreting the digital imagery.

Expected Products and Dissemination Plans

3.68 This project will provide a broad assessment of protection priorities and management needs for the Danube Delta Biosphere Reserve. This will be accomplished by a biodiversity analysis of the database and production of a variety of maps. Delta-wide digital maps of vegetation, wetland, and forest types, land-ownership status, land-use, and potential for reed production will be produced. Maps for special interest species, colony sites, and vegetation types (i.e. rare plant or animals, endemic taxa, and sensitive species) will also be produced. The identification of sensitive conservation target areas will be presented in the form of a report with supporting cartographic products. All of these products will be provided to the Danube Delta Institute and to cooperating American and Romanian institutions and interested groups. The GIS hardware, software, and database will be transferred to the Danube Delta Institute. A copy of the digital cartographic databases that are produced during the project will be archived at the University of Massachusetts Land Use Mapping Laboratory and will be provided to relevant private and public agencies upon request. A number of publications of the results in a variety of outlets is anticipated.

Data Management Coordination

3.69 The Dutch and UMass activities will be coordinated by the DDI and DDBRA to ensure there is not overlap of equipment and training. The UMass project is to occur during 1994-1995 while the Flevoland assistance should continue (yet with unidentified costs and

activity contribution beyond 1994) until 1999 in concept. It is hoped that the GEF input through UMass will build a solid data management capability on-site in the Delta, that will more clearly identify ongoing activities for potential support by Flevoland through 1999.

Costs

3.70 The cost tables outline the GEF contribution for the monitoring component, including equipment for the DDI, both survey and data management and the DDBRA. It is anticipated that the DDI will take the lead on monitoring and as the Natural Resources Assessment Department in DDBRA becomes operational, they will take in increasing role in directing monitoring for management purposes. Therefore, basic GIS-capability equipment is provided to the DDBRA in year three. The following summarizes the activities and costs of this component which are detailed in the cost table.

DDI Equipment and Training:

- (a) Vehicles and Boats - US\$43,500;
- (b) Field Monitoring Equipment - US\$57,200;
- (c) Biodiversity Center Office Equipment - US\$21,400;
- (d) Training and seminars, including conferences, short courses abroad, publication funds, Red Data Book Publication - US\$15,500;
- (e) GIS Technical Assistance and overseas training at UMass - US\$106,200;
- (f) GIS Equipment (UMass) - US\$84,000;

DDBRA Equipment and Training:

- (a) GIS equipment for the DDBRA/Natural Resources Department - US\$31,900;
- (b) GIS training at UMass - US\$22,000;
- (c) BirdLife technical assistance - US\$20,000.

3. HYDRAULIC MONITORING (US\$123,000)

3.71 Apele Romane's capability to continue monitoring discharges in the main Danube branches and selected interior water courses is seriously impaired by the deterioration of its stock of basic stream gauging equipment. The three hydrographic survey boats, on the other hand, are in good condition. The normal routine is to measure simultaneously the discharges in the three main branches and repeat this at three different, parallel north-south lines, 40 km apart, between the coast and the main upstream bifurcations, accounting for nine of the main

gauging sites. There are two more sites further upstream. The same poor state of equipment holds for its water level recording gauges, most of which are no longer operational. The project would provide Apele Romane with recording echo sounders, stream gauging, suspended sediment and bedload sampling equipment to re-equip its three survey boats as well as associated laser distomats and two-way radio equipment. Twelve new recording water level gauges would also be provided, to be powered by solar cells.

3 sets of current meters, sampling and surveying equipment	\$72,700
12 recording gauges, spare charts, solar panels plus batteries	\$40,300

COMPONENT 3: Pilot Polder Restoration to Natural Conditions, and Reed Restoration Research (US\$575,000)

Implementing Agency: DDI with DDBRA

3.72 Activities would have the following objectives:

- (a) Reinstatement of wetland areas previously destroyed or degraded as a result of hydrotechnical works and unsustainable and/or uneconomic land use;
- (b) Creation of access to restored wetlands to serve as a focus for ecotourism, thus relieving tourist pressure from key conservation areas;
- (c) Enhancement of water quality in the Delta to benefit natural habitats and also productive activities, including natural fisheries and reed harvesting; and
- (d) Reversing any adverse effects which may have resulted from the decreased silt deposition within reed beds and increased siltation of open waters.

3.73 There is a pattern of land use in the Delta that will have to continue: shipping and disposal of dredging spoil, and some other sustainable activities such as forestry, reed harvesting, some fish production and tourism. Upstream activities include power regulation, irrigation abstraction, flood plain reclamation and pollution.

3.74 The construction of polders for large scale reed production heralded the beginning of a major change in the Delta's environment. The failure of the mechanized reed production led to a conversion of the polders to agricultural, fish and forestry production. Many of the converted areas, in turn, have proved economically unsustainable. As a result of the 1989 revolution, the pressure to expand the commercial exploitation and the flow of subsidies to maintain uneconomic exploitation have ceased. In these circumstances, the era of intensive hydrotechnical works for exploitation purposes appears finished.

3.75 Prior to the results of pilot projects being available, the tentative rehabilitation strategy for polders and hydrotechnical works might be to return as large an area as possible of the Delta to its natural self-regulating ecological condition by:

- returning polders to wetlands;
- reducing the entry of sediments into naturally clear lakes;
- rehabilitating wetlands and open waters adversely affected by drainage and eutrophication.
- choice of areas for rehabilitation where commercial activities are no longer sustainable;
- assurance that people living in the area are consulted and wherever possible may benefit from restoration.

(i) Polder Restoration (US\$439,000)

3.76 If the principal objective is to re-establish a natural state that will also allow the harvesting of reeds and extensive fishing, the main need will be an adequate exchange of water, of which the desirable frequency and duration are uncertain. The essential purpose of the exchange is to provide oxygen and nutrients to encourage good reed growth and plankton yields.

3.77 Whatever the frequency of water exchange needed, the cheapest way to achieve it is by breaching the dykes. Since the cost of this is very low and the most critical need will be to avoid development of oxygen-deficient conditions in any part of the polder and make water exchange universal, many small openings should be made rather than a few large ones. This will complicate monitoring to some extent. There may also be a need to control the exchange of initially nutrient rich water between the newly inundated polder and the rest of the Delta.

3.78 A total of 16 polders covering 60,260 ha and listed in the Table below have been identified by DDBRA as abandoned in whole or in part and potentially suitable for restoration. The total abandoned area within these 16 polders is 26,430 ha. However, the abandoned empoldered land that is available for restoration is currently limited by a Protocol between the county of Tulcea and the DDBRA, dated 28 January 1993. This protocol defines which of the polders are to be retained for commercial production. The areas which are excluded from the protocol agreement (i.e. are available for restoration) total 11,425ha.

Agricultural and Fish Polders Identified for Restoration

A. Excluded from Protocol Agreement

<u>Reference on Map</u>	<u>Polder</u>	<u>Landuse</u>	<u>Total Area</u> ----ha----	<u>Abandoned Area</u> -----ha-----
1/10 (1)	Babina	AA	2,100	2,100
1/11 (2)	Cernovca	AA	1,580	1,580
1/21	Fortuna W and E	AA	<u>2,115</u>	<u>2,115</u>
		Total AA	5,795	5,795
8/7 (1)	Holbina I	AP	1,270	1,270
8/8 (2)	Holbina II	AP	3,100	3,100
8/9	Dunavat II (west)	AP	<u>1,260</u>	<u>1,260</u>
		Total AP	5,630	5,630
	Subtotal		11,425	11,425

B. Included under Protocol Agreement

2/1	Pardina	AA	<u>27,232</u>	<u>8,182</u>
		Total AA	27,232	8,182
3/5	Ceamurlia	AP	2,900	340
2/8	Chilia I	AP	2,230	420
8/15	Enisala	AP	420	180
8/19	6 Martie	AP	1,050	158
8/21	Lunca	AP	1,070	638
4/9	Murighiol	AP	2,235	500
2/6	Oberetin II	AP	2,683	617
1/12	Popina	AP	6,400	3,600
4/2	Rusca	AP	<u>2,615</u>	<u>280</u>
		Total AP	21,603	6,733
	Grand Total		<u>60,260</u>	<u>26,340</u>

Source: DDBRA

Key: AA = agricultural polder; AP = fish polder.

3.79 On the basis of a selection process that took also into account the likely availability of the land and the suitability to serve as pilot projects, the order of execution of the polder restoration program was determined. As a first phase, four polders were identified: Babina, Cernovka and Holbina I and II. Babina and Holbina I would be executed as the first step of 3,370ha, followed by Cernovca and Holbina II as the second step of 4,680ha. The results from the restoration efforts will be monitored before investments are made for the restoration of further polders from the list on Table that have all been grouped as phase II polders.

3.80 In the case of Babina polder, which is not flooded at the moment, flooding may result in a flush of nutrients from the soil into solution, in particular N. In course of time these high nutrient levels would diminish. Monitoring of the water quality may indicate a need to close the breaches once the flooding of Cernovca is complete and subsequently open them for a more gradual release of the nutrient rich water. Such a potential problem is not encountered in the fish polders.

3.81 The polder restoration program is relative inexpensive in civil works but expensive in surveying and monitoring, in particular for the four polders of the phase 1 first group. It is expected that the experience obtained with the phase 1 group will reduce the design, surveying and mapping and monitoring requirements for the polders under phase II. The same monitoring equipment as for phase 1 would serve phase II. The WWF/Auen Institute would assist in monitoring flora and fauna changes and mapping for Babina and Cernovka, while Rijkswaterstaat would assist with the Holbina polders. Surveyors would be contracted from outside, but the hydrologic and water quality monitoring would be performed by DDI.

Further Polder Restoration

3.82 From the list of 16 polders in the Table, it is expected that the project will be able to initiate restoration of four polders to wetland conditions during the first two years of the project. Of the remaining 12, Pardina is too large and the least likely to become available for restoration. As the perimeter dykes around Fortuna W and E are incomplete, no further action is proposed. What remains are the nine fish polders included under the protocol and Dunavat II west. Once agreement has been reached with the commercial companies concerned, wetland restoration should proceed. In each case a feasibility study would be required to draw up details of the required engineering works.

3.83 The equipment to be purchased for the monitoring by DDI in the restored polders amounts to \$52,700 for the hydrological monitoring, and \$113,600 for the water quality analysis. The latter consists for about 40% of portable equipment for in-situ standard tests. Before deciding on the purchase of the remainder of the chemical analysis equipment, three chemists from DDI would spend two weeks at the N.V. Waterwinningsbedrijf Biesbosch in Holland. This is the raw water supplier (from the Meuse river) for the S.W. Holland, with a first class laboratory and experience in providing in-service training to eastern European water chemists. The DDI delegation would take along some water samples and Cormoran eggs, which would be analyzed in Holland to determine the critical pollutants and this would

guide the choice of further equipment to be procured. The new equipment would serve not only the polder restoration program but DDI's general water quality monitoring program all over the Delta.

(ii) Reed Restoration Research (US\$136,000)

3.84 Determination of the hydrologic regime most favorable to successful wetland re-establishment is an important element in development of a long term program for wetland restoration. A research program with this goal has been prepared jointly by the Danube Delta Institute, the Braila Hydrobiological Section of the University of Bucharest, and the University of Georgia (USA). Replicated experimental plots would be established in a series of large earthen basins at the Uzline agricultural research station, and flooded according to various hydrological parameters of water depth and flow-through velocity (retention time). Each flooding treatment would be evaluated using ecosystem functions of nutrient and sediment retention, development of reed-dominated emergent plant assemblages, phytoplankton, macro-invertebrates and zooplankton habitat, with special attention to indicator species. Management guidelines for large scale restoration would be developed from the evaluation. The project would finance civil works for establishment of the earthen basins, research equipment, on-site training and travel costs for University of Georgia staff.

COMPONENT 4: Ecosystems Restoration (US\$1,176,000)

Implementing Agency: DDI with DDBRA

Eutrophication Flow Reduction into Lakes (US\$112,500)

3.85 The construction of canals to connect the clear water lakes with the major river branches of the Delta (eg lakes Merhei, Matita, Babina, Miazazi, etc) has resulted in increased sediment deposition as shown on recent satellite images, and will have introduced directly water rich in nutrients into these lakes. Such water might otherwise have been filtered by the surrounding reed beds before entering these lakes, and have its content in sediment and nutrients reduced as a consequence. There may well therefore be a good case to close some of these canals. Many canals are appreciated by the local population for transportation. Therefore blocking canals to force flood water to pass through reed fields before entering the lakes may have to be accompanied by providing the construction of link canals bypassing the lakes.

3.86 The project would finance two pilot projects to reduce the inflow of high nutrient/high sediment waters. DDBRA would be responsible for contracting out the civil works for both pilot projects, while DDI would carry out the "before and after" water quality testing under its normal monitoring program, using the new equipment acquired under the polder restoration program. The short southwestern canal connecting Lake Fortuna with the Dunerca Veche would be blocked, estimated to cost US\$39,900. Sufficient channels feeding

into Lake Fortuna would remain open to ensure its use for navigation by fishermen and recreational boats and the circulation of water.

3.87 The second pilot site selected for the reduction of flow from the Danube into Lake Lumina is the mouth of the Caraorman canal. The excessive size of this canal is due to its original purchase, which was to serve the abandoned zircon extraction factory at Caraorman. It now functions as the main direct conveyance of nutrient and sediment rich river water. The canal has to remain open for the taxi boat service connecting Caraorman village with the large boat landing site at Crisan and also for tourist boat traffic, as it is the only connection from the Sulina branch to the southern Delta before the Busurca canal near Sulina. Of the Y. shaped doubled inlet in the Sulina branch, the western inlet would be closed entirely and the eastern inlet top width would be reduced from 100 to 20 meters over a length southward of 100 meters. Rock protection would have to be placed along the closed section along the Sulina branch and along the 100 meters of narrowed eastern canal entrance section. The works would be contracted by DDBRA including 2 mm of engineering, and are estimated to cost US\$72,600. Results would be observed before making a decision to install a sluice gate to be kept closed during most of the time.

Establishment of Village Woodlots (US\$9,900)

3.88 The residents of the Delta traditionally harvest the natural vegetation for firewood, which diminishes habitat quality, particularly in the neighborhood of larger settlements. The project therefore would provide village woodlots for firewood supply for eleven larger settlements. Individual village lots would vary from 0.5 to 1 ha and DDBRA would try to have a local NGO organize this initiative and with assistance from Silvo Delta who successfully manage the poplar forest polders.

Willow Planting (US\$123,000)

3.89 Along about 24 stretches of channels totalling 123 km, willow cuttings would be planted to enhance the landscape in parts of the Delta where these have been destroyed or poorly established. DDBRA will plant the willows on alternating canal sides with preference for the north sides, so as not to create canals in densely shaded tunnels which impede the growth of subaquatic macrophytes.

Pilot Fingerling Protection (US\$48,000)

3.90 Along Lake Razim, which produces 50% of the Delta's fish production, there are about 8 intakes of large irrigation pumping stations and over 90 fish polder pumping sites. A very large number of small fish are sucked into the intakes and damage the irrigation sprinkler systems, or introduce alien species (predators) into the fish ponds. A study by DDI and one trial protection installations contracted by DDBRA for irrigation pumping station Sarichioi 2, with an installed capacity of 3.6 m³/sec, will be financed under the project. Study tours, to the UK, the US and to Russia are included and 6 man-months of surveying and engineering.

Landscape Enhancement (US\$60,000)

3.91 There are many sites in the Delta with very unsightly remains of unsuccessful commercial undertakings. The most spectacular of these is the Caraorman zirconium plant. The project would assist in lowering the height of the present skyline (visible from 10 km distance) by dismantling the towering cranes and steel structures. While this does not impact the biodiversity, it has a strong negative impact on the scenery and hence on tourist values. There exists a local offer to cut the structural steel into pieces and remove it to the Galatia smelters for US\$60/ton, exclusive of a possible resale value of up to 50%. As a first step the DDBRA would contract the removal of an initial 1,000 tons of steel for a cost of US\$60,000. If the resale value is attractive, a larger volume could be removed.

Sturgeon Propagation (US\$517,000)

3.92 The construction of the Iron gates dam cut off major sturgeon breeding grounds, while over-fishing by a strongly increased trawler fleet and the intensification of nets for shad fishing in the NW Black Sea and pollution/eutrophication have all contributed to the decline in sturgeon catches from almost 1,000 tons in Romania alone in the 1930s, to 200 t in 1945, and to 10 tons for all riparian countries in the lower Danube today. Out of six sturgeon species described in the lower Danube, *Acipenser sturio* and *A. nudiiventris* have become so rare that their presence is now doubtful. *Huso huso*, *stellatus* and *guldenstaedti* are not only more rare, but have declined in size. From the lack of young individuals (especially *Huso huso* and *A. guldenstaedti*) in accidental catches at the Deltaic Black Sea shore, DDI scientist concluded that no successful spawning has taken place in the last 4-5 years.

3.93 Without rapid intervention, it is feared that the Danube sturgeon population may become extinct before a long term chemical and hydraulic restoration program of the river will show its effect. At the upstream end of the Danube, the fishery extension service in Woellershof near Regensburg, Germany, has been conducting a successful restocking program with sterlet (*A. ruthenus*) into the Danube and it is carrying out experiments on the culture of *A. guldenstaedti*, *A. naccari*, *A. baeri*, *H. huso*, and their hybrids. With the available DDI ichthyologists with experience in population studies, handling and reproduction of other fish species, a study should be undertaken with the fishery extension service from Woellershof of the viability of artificial sturgeon propagation in the Danube Delta, using mostly the local sturgeon varieties. The study also investigate the relative costs and benefits of constructing the sturgeon hatchery, compared with rehabilitation of small tributaries to the Danube below the Iron Gates, which could eventually provide alternative natural spawning grounds. It would also review alternative sturgeon propagation approaches, especially those adopted in Russia. If the studies indicate sufficient promise after the end of the first year, a hatchery would be constructed with a annual capacity of 100,000 fingerlings of 20cm size. The cost of the hatchery, with associated laboratory and equipment is estimated at \$381,000. Design of the hatchery, to be located on the Sf. Gheorghe downstream from Tulcea, would be undertaken in year one as well, anticipating a positive outcome of the studies. A particular subject that also warrants close study is the annual power consumption of a

hatchery of this size, which has tentatively been estimated at 100,000kWh per year. A satisfactory arrangement about who will pay the power costs will have to be submitted to the Bank before construction of the hatchery with GEF funding would be initiated.

3.94 Costs have been developed for the hatchery, based on the existing German model. It is estimated that over the five year duration of the project, 6 man-months of TA from the German extension service would be required. Also, German assistance would be given for the design of the hatchery. Field studies of stock, migration and natural spawning from would be most intensive during the first year, but would continue using radiotelemetry to trace adult spawners.

Small Grants Research Fund (US\$200,000)

3.95 The project would fund US\$200,000 for financing applied research projects undertaken by Romanian scientists into natural resources management in and around the Delta. A particular focus of interest should be possible studies of alternative landuses for buffer zones around the Delta, such as the shores of Lake Razim and Crapina polder upstream of the Delta. The Fund would be held in trust by the PIU, but decisions as to its allocation would be made by a Research Grants Committee consisting of senior staff from DDBRA, DDI, MWFEP, the Romanian academic community and one international expert. GOR agreed on the composition of the committee at negotiations [para 6.01(a)].

COMPONENT 5: Public Awareness and Community Involvement

Implementing Agencies: DDBRA with NGOs
Total Cost: US\$156,000

3.96 Developing an understanding of the biosphere reserve concept and need for ecological protection for all of the Delta and the Romanian people is critical for the effective implementation of this project. This component supports the development of a public awareness function in the DDBRA through providing equipment for the planned Information and Education Department in the DDBRA, as well as resources for the Guiding Unit in the Warden Department and activities for selected NGOs active in the Delta.

3.97 It is especially important that the evolving process of establishing boundaries and zoning categories (e.g. core conservation areas and multi-purpose buffer or support zones) within the Delta be done in a participatory manner, between government, NGO and local communities, with mutual understanding of the need for maintaining the Delta's ecological processes. The component has the following objectives:

- To raise awareness of the local population and recreational and scientific visitors of the value of the Delta through establishing public awareness activities and centers and preparing environmental education materials, field courses, etc. which will encourage involvement.

- To encourage international support for protection of the Danube Delta and the Black Sea through international information exchange and coordination of action between the riparian countries.

3.98 The guiding wardens of the DDBRA will be the main link between the public and Biosphere reserve management. They will be the primary implementers of this component, with assistance from the other Wardens, the DDBRA staff of the Information Department, the DDI, NGOs and other organizations.

3.99 A public participation plan will be prepared based on identification of the resources users targeted from the EBRD and DDI activities, in order to plan appropriate activities for districts, age groups, national and international. Gathering information from maps, literature and interviews with a wide range of people will be the primary methods. This will form the baseline information for the Warden Guides to know what materials to produce, talks to present, etc. to the local population. This should take place after the Wardens have had the training courses outlined (Study tours and Warden Foundation) in Component One.

3.100 The following outlines sample activities to be developed in the plan:

- Design of exhibitions for visitors center, district centers, field observation posts;
- Local seminars, school courses, lecture series;
- Cooperation with the DDI in the preparation of scientific conferences;
- Newsletters, posters, brochures, T-shirts;
- Videos and slide shows, etc.;
- School programs, painting competitions; and
- Opportunities for community members and groups to participate in ecosystem monitoring activities (e.g. bird counts, vegetation surveys.), and land zoning plans are pilot wetland restoration programs.

The GEF project would support development of participation and public awareness support through the following activities:

(a) Training:

3.101 Training for the Warden Guides was presented at three levels in Component I (Warden Strengthening) through the Study Tours and On-site applications for the Section Leader, the Warden Foundation Course and In-Depth courses. The latter would cover exhibit design, promotional materials preparation, environmental education curriculum preparation as well as courses on historical and ecological subjects.

(b) Bird Life Technical Assistance (US\$20,000):

3.102 Bird Life (the International Council for the Preservation of Birds) has worked with DDI and DDBRA since 1991 on developing management plans, and provided conservation-related equipment for the DDBRA Wardens. They have drafts of plans on long-term public awareness needs (training and materials) and bird-watching tourism. These activities are integral to all aspects of the GEF project, especially the "participation plan", interpretive infrastructure, materials production and activities and NGO support described in this section. Therefore, Bird Life will provide a Public Awareness specialist to work in Romania twice a year for three weeks each time. His travel and accommodation costs would be met from the GEF project. He will help the guides and the new DDBRA Information/Education officer will provide a Public Awareness activity. He will also help facilitate good communication and interaction between monitoring needs (via the DDBRA, DDI and Romanian Ornithological Society) (ROS) and public awareness. They will help ProDelta and Romanian Ornithological Society in Tulcea carry out activities on a community level through non-governmental channels. He will also help bring ideas forward from similar wetland projects in the mediterranean, and ensure coordination with new initiatives of the GEF Black Sea Project.

(c) DDBRA Interpretive Infrastructure: (provisional US\$500,000, not included in Project Costs)

3.103 As stated in the Warden Strengthening, park infrastructure (signs, observation towers, border markers, information centers, etc. are essential to the success of the project, and must be established from the beginning. It is understood that such materials are being funded from the National Budget for 1994, at approximately 1 billion lei for 2,800 signs, 60 observation towers, 5 land observation posts, 88 exhibit signs, one information center in the center of the Delta and seven warden stations. If the GOR cannot fund the above, selected items should be provided through the project. Members of the community will be involved in helping to build much of this infrastructure as described in Component 1.

(d) DDBRA Public Awareness Activities, Production Equipment and Out of House Materials (US\$99,000)

3.104 The Information and Education Unit in the Visitor Center/Headquarters working with the Guide Wardens will use computers, printers, photocopiers, books, paper, projectors, purchase of prepared videos, posters, etc. and produce Information Bulletins, folders on regulations, color brochures of zones and flora/fauna, video, radio broadcasts, national and local newspaper articles, calendars, etc. (Note that at present DDBRA has no special staff for the information department, but that 2-3 will be brought on board with the EBRD proposed staffing structure.) In addition:

About 6 films have been made on the Delta; the TV rights for Romania should be purchased (US\$10,000 for one-time national showing), and the rights for local

screenings bought (US\$2,000). A Romanian video should also be made with NGO assistance (e.g. Royal Society for Protection of Birds): US\$5,000.

(e) 3 Year Support to ProDelta, ECOS, Friends of the Delta and Romanian Ornithological Society NGO: \$29,000

3.105 ProDelta is a local NGO which has worked in the Tulcea community and throughout the Delta with villages and school groups to develop a better understanding about the Delta's resources and need for realistic zoning and conservation. Friends of the Delta has a similar role. ECOS is a new NGO, whose membership is mostly teenagers. They are an effective partner with the Wardens in helping to develop community involvement and in particular planning process. The Romanian Ornithological Society (ROS) has a long history of nature conservation related to wetland habitat protection for birds throughout the country. Bird Life is supporting a full-time Romanian Ornithological Society staff person in Túlcea. The project will fund basic equipment to both ProDelta and ROS to work together on community involvement and to make them more operational including computer, jeep, audio-visual equipment and operating costs. ProDelta and ROS are preparing workplans for use of this equipment.

COMPONENT 6: Regional Initiatives, Coordination and Management Assistance
(US\$193,000)

Implementing Agency: DDBRA

3.106 As described earlier in the report, there is a parallel GEF project, targeted at pollution mitigation of the Black Sea, entitled Black Sea Environmental Management Program. One component of this project is the Black Sea Biodiversity Strategy which will emphasize wetland conservation. The Ukraine and Romania Danube Delta projects will serve as a valuable pilot effort for in-situ nature protection as part of this broader regional initiative. The Danube Delta can provide important lessons for the strategy, while DDI and DDBRA staff can also benefit from learning about related activities that other wetland organizations are implementing.

(a) Black Sea Biodiversity Strategy Cooperation (US\$15,000)

3.107 Toward this goal the project will fund the participation of DDBRA and DDI staff in a series of workshops that will be developed as part of the Black Sea Biodiversity Strategy. These include small, focused training workshops on:

(a) Public Awareness and Environmental Education for Black Sea Wetlands, to be held in Turkey in September 1994. One member of the DDBRA staff would be funded to attend the 1 week workshop.

(b) Bird Inventory and Monitoring Methods: This one week workshop is to be held in Russia in 1995. A DDI ornithologist would be funded to participate.

- (c) **Black Sea Planning Workshop:** this would also be part of the Black Sea Project - Biodiversity component. It would be held in Bulgaria. The Danube project will fund the participation of about 25 representatives from the Black Sea countries to attend the workshop. The DDBRA will present the Management Plan for the DDBR. The Bulgarian Government will present their experience in developing both a National Biodiversity Strategy and a National Wetlands Management Plan. This workshop will help the Danube Delta project experience initiate action for site-specific management plans in other Black Sea areas and help Romanian leaders consider national strategies on wetlands and biodiversity.
 - (d) **Cooperation with Ukraine GEF Danube Delta Project:** Many references to this parallel GEF Danube project have been made in this report. There will be an emphasis on continued cooperation and data exchange between these two projects to ensure the Delta is managed as an integrated ecosystem between the two countries. A lump sum of US\$3,800 is set aside here to reserve funds for future cooperative activities that are not yet detailed.
 - (e) **Other Initiatives:** There are several other regional initiatives and/or advisory groups that the Ukraine project staff need to have access to, again to both contribute and have new ideas. Examples include participation with the Man and Biosphere Program, IUCN's Wetland Advisory Board, Birdlife International activities through their Important Bird Areas and IWRB.
- (a) Procurement, Administrative and Programming Assistance (US\$165,000)

3.108 The project would finance a procurement advisor for one month in the first year of the project and two months in the second year, to assist with procurement of goods and works. He would assist both DDI and DDBRA with preparation of specifications and tender documents; with international and local shopping procedures, as well as ICB and LCB, and with evaluation criteria. It would also fund, for the first three years, an average of two months per year of an expert(s) who would be responsible for assisting with programme coordination and financial administration.

- (c) Advisory Committee (US\$15,000)

3.109 The PIU would be assisted by an Advisory Committee which would meet every six months to discuss and review project progress and advise on the orientation of development of monitoring, wardens and protected area management plans. It would be composed of prominent Romanian experts in protected area management, and one international expert, to be selected by GOR. GOR agreed on the composition of this Committee at Negotiations (para 6.01 (a)). The project would fund the transport and accommodation costs of experts participating in Committee meetings, which would be held in Tulcea, organized by the PIU.

IV. PROJECT COSTS

A. Project Costs and Financing

4.01 Project costs are summarized in Table 1 and detailed in Annex 1. They total US\$4.8 million, including physical and price contingencies. Foreign exchange costs are 48% of the total; civil works, mainly for pilot wetland and ecosystem restoration, represents US\$1 million; equipment and vehicles, US\$1.7 million, and technical assistance and studies US\$1.1 million. Base costs are US\$4.2 million, physical and price contingencies are US\$0.562 million. Local taxes on domestically produced items are estimated at US\$0.08 million. The proposed GEF grant would finance US\$4.5 million, or 94% of total project costs. It was confirmed at Negotiations that GOR has made adequate budgetary provision to fund its share of the project costs (para 6.01(f)). Exemption from import duties is being sought-for goods financed under the project. GOR would, in addition, make other contributions, including provision of signposts and land for buildings.

Table 1: Project Cost Summary

	<u>(US\$ '000)</u>			<u>% Foreign Exchange</u>
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	
1. Strengthening of the Wardens Department	966.8	516.0	1,482.7	35
2. Ecosystem Monitoring	97.1	544.4	641.5	85
3. Pilot Polder Restoration to Natural Condition	284.8	290.1	574.9	50
4. Pilot Wetland Restoration	805.1	371.5	1,176.6	32
5. Public Awareness/Community Involvement	21.5	134.2	155.7	86
6. Management and Coordination	<u>13.9</u>	<u>178.8</u>	<u>192.7</u>	93
Total Baseline Costs	2,189.1	2,034.9	4,224.0	48
Physical Contingencies	218.9	203.5	422.4	48
Price Contingencies	<u>87.7</u>	<u>51.6</u>	<u>139.4</u>	37
Total Project Costs	<u>2,495.8</u>	<u>2,290.0</u>	<u>4,785.8</u>	<u>48</u>

4.02 The financing plan is indicated below in Table 2. The GEF would finance 100% of foreign exchange costs and 94% of total project costs. GOR would finance 6% of total project costs, including local taxes, and a portion of local civil works, equipment and operating costs.

Table 2: Financing Plan (US\$ million)

	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
GOR	0.3	0.0	0.3
GEF	<u>2.2</u>	<u>2.3</u>	<u>4.5</u>
	2.5	2.3	4.8

B. Procurement

4.03 Procurement arrangements are outlined in Table 3 below. Equipment (US\$1.6 million) comprises a large variety of items and specialized research equipment which cannot easily be packaged in large lots and purchased through ICB (see Annex Tables). It includes radios, field equipment, clothing, specialized monitoring equipment, office equipment, hydrological equipment, reed restoration research equipment, sturgeon hatching equipment and audiovisual equipment. Goods will be packaged as far as possible and purchased either by international shopping on the basis of at least three quotes from three countries (totalling about US\$800,000, for items such as binoculars, radios, and office equipment), by local shopping on the basis of at least three quotes from qualified suppliers (totalling about US\$500,000 for clothing, tents, furniture, publishing) or direct purchase where there is only one supplier (US\$300,000, e.g., for the sturgeon hatching). Normally the maximum threshold for international shopping would be US\$100,000 and for local shopping US\$20,000. Vehicles and boats total about US\$400,000, in addition to equipment. Horses, a houseboat and small boats worth approximately US\$200,000 would be purchased by local shopping. The remainder, mostly 4-wheel drive vehicles, small rubber boats and engines totalling about US\$200,000 would be purchased by international shopping for contracts below US\$100,000, and by local shopping for contracts under US\$20,000. The aggregate amount for goods (equipment, vehicles and boats together) to be procured by local shopping is not expected to exceed US\$700,000 and by international shopping US\$1,000,000.

4.04 Civil works (US\$1.1 million) comprises small works scattered throughout the Delta. Items including construction of housing, the sturgeon hatching and canal dredging would be procured by LCB. For contracts above US\$100,000, estimated to total US\$600,000, LCB will be used. The recipient shall prepare a draft bidding document based on the Bank's SBD (standard bidding document) for civil works (smaller contracts) and submit to the Bank for review and clearance before use. When contracts are below US\$100,000 (e.g. for canal bidding or infrastructure within the Delta, estimated to total US\$340,000) local shopping based on at least three price quotations would be permissible. Some small expenditures, however, such as willow planting, and protection of fingerlings from the Lake Razim intake (estimated to total US\$160,000), would be undertaken through force account or negotiated contract.

4.05 Training, technical assistance and studies total US\$1.2 million. Details are described in the project components. Much training (US\$0.3 million) comprises the local

transport and per diem costs of locally organized in-service training for wardens, including technical language training. Foreign study tours (US\$0.1 million) would be selected based on a review of reasonable alternatives.

4.06 Some TA would be sole sourced, with the TA provided free of cost and the transport and training costs financed through the project. This would include TA and training for GIS for reed restoration research, for pilot polder restoration and for bird monitoring/public awareness. A firm(s) would be internationally recruited to assist with design of training, procurement and financial management/programming using Bank guidelines for procurement of consultants (US\$230,000). Local TA would be recruited for language training, design of polder restoration works and for preliminary studies associated with the sturgeon hatchery. Should the decision be made to proceed with the sturgeon hatchery, TA would be sole-sourced to Regensburg together with associated training. Other items under TA and training include the organization of local and international conferences and the local purchase of publishing and printing services. The reason for the sole-source method is that, where it is used, the institutions have already provided similar assistance to the DDI and DDBRA, have developed particular technical approaches in which the DDI and DDBRA desire their staff to be trained, and have agreed to continue to provide services at cost or with no cost for fees of key staff.

4.07 Incremental operating costs (US\$0.5 million) include incremental salaries (funded by the government) and fuel for operating vehicles and boats, the operating costs of the sturgeon hatchery (if it is built) and the operation and maintenance costs of equipment financed by the project (financed under the Grant). These would be purchased according to procedures agreed to by the Bank. All contracts, for TA/training, civil works or goods, above US\$100,000 would be subject to Bank prior review. At negotiations, GOR agreed on the above procurement procedures [para 6.01(b)].

Table 3: Procurement (US\$ million)

	<u>ICB</u>	<u>LCB</u>	<u>Other</u>	<u>Total</u>
Equipment & Supplies (Financed by GEF)	-	-	1.6 ^{1/}	1.6
Vehicles & Vessels (Financed by GEF)	-	-	(1.5)	(1.5)
Civil Works (Financed by GEF)	-	0.6	0.4 ^{2/}	0.4
TA, Training (Financed by GEF)	-	(0.5)	(0.4)	(0.4)
Operating Costs (Financed by GEF)	-	-	0.5 ^{3/}	1.1
	-	-	(0.5)	(1.0)
	-	-	1.2 ^{4/}	1.2
	-	-	(1.2)	(1.2)
	-	-	0.5 ^{5/}	0.5
Total	-	0.6	<u>(0.4)</u>	<u>(0.4)</u>
	-	(0.5)	4.2	4.8
	-	(0.5)	(4.0)	(4.5)

^{1/} International shopping US\$0.8 million, local shopping US\$0.5 million, direct purchase US\$0.3 million.

^{2/} Local shopping (US\$0.2 million) and international shopping (US\$0.2 million).

^{3/} LCB (US\$0.6 million), force account (US\$0.16 million) and local shopping (US\$0.34 million).

^{4/} IBRD guidelines.

^{5/} Procedures acceptable to the Bank.

C. Disbursements and Accounts

4.08 The disbursement rates are indicated in Table 4 below:

Table 4: Disbursements

<u>Category</u>	<u>GEF Grant Allocation</u>	<u>Amount (US\$ M equivalent)</u>
Goods	100% of foreign expenditures; 100% of the exfactory price of domestically produced goods, 90% of other goods purchased locally	1.8
Civil Works	90% of expenditures	0.9
TA Training	100% of expenditures	1.1
Recurrent Costs	80% of expenditures	0.4
Unallocated		0.3

4.09 Disbursements would be made against statements of expenditures for incremental operating costs, civil works, goods procured through direct purchases, force account, or prudent shopping, and training and technical assistance locally and abroad. Use of SOE would be limited to contracts below US\$100,000. Implementing agencies would retain support documentation for these items for review by IBRD and external auditors. At negotiation, GOR would agree to these disbursement arrangements [para 6.01(c)].

4.10 The project is expected to be completed and the grant funds disbursed over five years. Project completion is expected by December 31, 1999 and Grant closing by June 30, 2000. The disbursement schedule is indicated in Table 5:

Table 5: Disbursement Schedule (US\$ million equivalent)

<u>IBRD Fiscal Year</u>	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>
Annual	1.6	1.1	1.0	0.5	0.3
Cumulative	1.6	2.7	3.7	4.2	4.5

4.11 A special account would be opened at a commercial bank acceptable to the World Bank, to facilitate project expenditures, and GOR would initially withdraw from the GEF and deposit US\$200,000 in it. The Implementation Unit would be authorized to withdraw funds from it. The account would be opened in accordance with arrangements for existing Bank-assisted projects, and would be used for most disbursements except those in excess of US\$100,000. GOR agreed at Negotiations to open this account [para 6.01(d)].

4.12 A consolidated expenditure report would be prepared annually by MOE, within 2 months of each calendar year. In addition, an annual audit would be carried out by the Count of Accounts, including specific reference to, and comments on, SOEs and supporting documents and disbursements from the special account, and submitted to the Bank within nine months of the end of each fiscal year. It was agreed with GOR at negotiations that the implementing agency would follow these accounting and auditing practices [para 6.01(g)].

V. ORGANIZATION AND IMPLEMENTATION

A. Implementation

5.01 The project would be implemented jointly by DDBRA and DDI, through an Implementation Unit staffed by professionals from DDBRA, DDI and MWFEP. DDBRA would have primary responsibility for the components for wardens strengthening, public awareness (together with local NGOs), and regional coordination, while DDI, under contract to DDBRA, would have primary responsibility for ecosystems monitoring, and pilot polder

and wetland restoration. DDI would purchase specialized water quality monitoring equipment on behalf of Apele Romane, which will undertake the water sampling and analysis. DDBRA would contract for civil works connected with wetland restoration on behalf of DDI. The Implementation Unit would assure participation of other departments of DDBRA and DDI in implementation of the various components. DDBRA and DDI have both agreed to allocate staff for project implementation.

5.02 Assistance in implementation of certain components would be provided by a variety of specialized agencies; WWF would assist in polder restoration in Cernovka and Babina and in public awareness. "Birdlife" (International Council for Bird Preservation) would assist in bird monitoring and public awareness. The Dutch Flevoland Institute would assist in polder restoration in Holbina, and in vegetation mapping (the restoration costs are included in the project costs, but not the Dutch assistance costs). The University of Massachusetts in USA would assist in training in use of GIS, and development of an integrated database using GIS. The University of Georgia in the USA would assist in research into reed restoration. The extension service of Regensburg in Germany would assist in sturgeon propagation. All of these organizations have established contacts with the DDI and DDBRA and the GEF project would build on these. A research grants committee has been established to review research proposals and assess their suitability for qualifying for funding. The PIU would also maintain close coordination with the Ukrainian authorities on protection and management of the Delta. GOR agreed at Negotiations on the proposed staffing of the Implementation Unit and Research Grants Committee [para 6.01(a)].

5.03 A Project Advisory Committee, composed of senior DDBRA and DDI staff, a senior staff member of MWFEP, senior Romanian protected-area management specialists and an international expert with experience in wetland-detailed management, would meet periodically to review project progress and advise on future plans. GOR provided the proposals for staffing this committee at Negotiations [para 6.01(a)].

5.04 MWFEP would provide overall guidance on project coordination. It would assure linkages between the Black Sea and Danube River GEF projects, and would ensure participation by other Romanian environmental institutes as necessary.

5.05 GOR agreed at Negotiations to follow these arrangements for project implementation [para 6.01 (a)].

B. Monitoring, Reporting and Supervision

5.06 The PIU would produce a short quarterly report summarizing project progress, including physical achievement indicators and project expenditures, and a longer report every six months, which would be translated into English. Reports would highlight emerging issues, propose solutions and be completed within four weeks at the end of the reporting period. The Bank would supervise the project on average twice every year: specialist skills would include a national parks manager/planner, and environmental monitoring expert and a hydrologist/wetland rehabilitation engineer. A project launch workshop would be held

shortly after project approval. Supervision would require about 15 staff weeks per year. In addition, the Bank would carry out a project mid-term review jointly with GOR at the end of the second year of implementation. Component 2 describes in detail the monitoring arrangements to be established under the project: improved ecosystem monitoring would be a major project output. Impact monitoring is also built into the pilot wetland restoration activities. GOR agreed to these arrangements at negotiations [para 6.01 (h)].

C. Public Awareness/Community Participation

5.07 As indicated in the project background and description, local communities are being closely involved in the elaboration of the management plans under preparation with EBRD/IUCN assistance. The ecosystem monitoring proposals (component 2) which assist management in landuse planning, establishment of sustainable harvesting levels and methods have been designed to involve local populations. The project also includes a component for public awareness and ecological education in which local NGOs play a key role.

D. Project Benefits and Risks

5.08 The project should improve management of the Delta considerably, leading to an improvement in its biodiversity, an increase in habitats for wildlife and improvements in the hydraulic regime. Strengthening the wardens/rangers department, together with support for public awareness and local participation, will lead to better protection of the Delta ecosystems, while increasing the understanding by the local population of the importance of conserving the natural resources of the Delta. Better protected area management should in the medium term increase the potential for sustainable tourism activities and the income earning opportunities of the local population. The monitoring program will increase understanding of the natural processes of the Delta and will help guide management strategies, further supported by research. The pilot wetland restoration component and its monitoring will provide the base for more extensive ecosystems restoration and recovery of the natural role of the Delta, as a unique series of ecosystems.

5.09 The main risk is the limited experience of DDBRA, DDI and MWFEP in administering projects according to World Bank procedures. There may be implementation delays, yet there is sensitivity to recruiting foreign technical assistance. This risk has been dealt with by focusing TA on assistance with procurement, by financing low-cost TA with whom the Romanians have already worked, and by providing substantial training. Project activities consist of a number of small interventions, for most of which preparatory work has already been undertaken and this further minimizes implementation delays. The second major risk concerns the difficulties of recruiting sufficient additional wardens at the government salaries offered. This risk will be mitigated by improving working conditions, and providing housing and training for staff. The risk of limited impact due to poor quality of Danube river water is largely beyond the reach of this project; however, in the long run implementation of the ongoing Danube Basin Environment Program should improve water quality and river basin management.

VI. AGREEMENTS REACHED

6.01 At Negotiations, GOR agreed to the following:

- (a) The organizational arrangements for project implementation, including the structure and functions of the Project Implementation Unit, the Project Advisory Committee and the Research Grants Committee, the division of responsibility between DDBRA and DDI, cooperation with the Ukrainian Danube Plavny authority, but also the role of the MWFEP and of the other agencies (paras 5.01-5.05);
- (b) The procurement arrangements outlined in paras 4.03 to 4.07;
- (c) The disbursement arrangements outlined in para 4.09;
- (d) The opening of a Special Account as outlined in para 4.11;
- (e) Recruitment of a training, public awareness and natural resources assessment specialist to DDBRA by March 31, 1995, and recruitment of 20 wardens for years 1995-1999 (paras 3.04-3.05);
- (f) Adequate budgetary allocation to fund its share of project costs including local taxes and import duties, signposts in the Delta, and land for new buildings to be financed by the project (para 4.01);
- (g) The auditing arrangements outlined in para 4.12; and
- (h) The reporting, monitoring and review arrangements summarized in para 5.06.

Romania
Danube Delta Biodiversity Project
Project Components by Year
(US\$ '000)

	Totals Including Contingencies					Total
	1994	1995	1996	1997	1998	
Strengthening of the Wardens Department	640.9	330.2	330.8	199.3	181.0	1,682.2
Ecosystem Monitoring	529.3	49.4	73.4	32.0	33.5	717.7
Polder Restoration	281.9	129.1	102.9	84.5	52.1	650.4
Ecosystem Restoration	120.2	508.9	385.6	194.8	133.3	1,342.9
Public Awareness/ Community Involvement	66.9	48.3	21.6	19.5	20.1	176.4
Management and Coordination	99.9	61.1	43.4	5.9	6.1	216.3
Total PROJECT COSTS	1,739.1	1,127.0	957.7	535.9	426.1	4,785.8

Mon Feb 14 17:55:07 1994

Romania
Danube Delta Biodiversity Project
Expenditure Accounts by Years
(US\$ '000)

	Totals Including Contingencies					
	1994	1995	1996	1997	1998	Total
Investment Costs						
Civil Works	236.0	404.7	338.7	106.6	44.7	1,130.7
Vehicles and Boats	280.1	71.7	38.8	4.1	2.4	397.2
Equipment and Supplies	613.9	368.0	319.9	129.6	104.6	1,536.0
Technical Assistance and Studies	317.2	71.7	38.3	51.2	49.0	527.4
Training	244.0	147.0	118.2	88.3	65.3	662.9
Total Investment Costs	1,691.2	1,063.1	854.0	379.8	266.0	4,254.1
Recurrent Costs						
Operating costs	47.9	64.0	103.8	156.0	160.0	531.7
Total Recurrent Costs	47.9	64.0	103.8	156.0	160.0	531.7
Total PROJECT COSTS	1,739.1	1,127.0	957.7	535.9	426.1	4,785.8

Mon Feb 14 17:55:12 1994

Romania
Danube Delta Biodiversity Project
Expenditure Accounts by Components - Totals Including Contingencies
(US\$ '000)

	Strengthening of the Wardens Department	Ecosystem Monitoring	Polder Restoration	Ecosystem Restoration	Public Awareness/ Community Involvement	Management and Coordination	Total
Investment Costs							
Civil Works	342.0	-	172.5	616.1	-	-	1,130.7
Vehicles and Boats	324.9	54.0	2.8	-	15.5	-	397.2
Equipment and Supplies	241.4	450.7	262.4	450.8	130.6	-	1,536.0
Technical Assistance and Studies	50.9	137.1	145.9	153.2	23.0	17.3	527.4
Training	369.4	41.5	52.9	-	-	199.0	662.9
Total Investment Costs	1,328.7	683.2	636.6	1,220.1	169.1	216.3	4,254.1
Recurrent Costs							
Operating costs	353.4	34.5	13.8	122.7	7.3	-	531.7
Total Recurrent Costs	353.4	34.5	13.8	122.7	7.3	-	531.7
Total PROJECT COSTS	1,682.2	717.7	650.4	1,342.9	176.4	216.3	4,785.8
Taxes	33.1	2.4	10.5	35.3	0.4	-	81.7
Foreign Exchange	578.2	609.9	326.4	423.3	152.0	200.3	2,290.0

Mon Feb 14 17:55:02 1994

Romania
Danube Delta Biodiversity Project
Table 1. Strengthening of the Wardens Department
Detailed Costs
(US\$ '000)

	Quantities										Unit			Base Cost			Total
	1994	1995	1996	1997	1998	1998	Total	Cost	1996	1997	1998	1996	1997	1998			
Investment Costs																	
Civil Works																	
Housing Flats	10	5	5	-	-	-	20	10.0	100.00	50.00	-	-	-	-	200.00		
Field Stations	2	1	1	-	-	-	4	20.0	40.00	20.00	-	-	-	-	80.00		
Youth Teams /a	1	1	1	1	1	1	5	5.0	5.00	5.00	5.00	5.00	5.00	5.00	25.00		
Subtotal Civil Works									145.00	75.00	75.00	5.00	5.00	5.00	305.00		
Vehicles and Boats																	
Four Wheel Drive (Romanian)	2	1	1	-	-	-	4	5.5	11.00	5.50	-	-	-	-	22.00		
Sand Tractors	1	1	1	-	-	-	3	5.0	5.00	5.00	-	-	-	-	15.00		
Rubber Boats and Engines (6 hp)	6	2	2	-	-	-	10	5.0	30.00	10.00	-	-	-	-	50.00		
Boat Hulls	5	2	2	1	-	-	10	1.5	7.50	3.00	1.50	-	-	-	15.00		
Engines	5	2	2	1	1	1	11	2.0	10.00	4.00	4.00	2.00	2.00	22.00			
Hydroglide Boats	1	1	1	-	-	-	3	20.0	20.00	20.00	-	-	-	-	40.00		
Jet Boat	1	-	-	-	-	-	1	10.0	10.00	-	-	-	-	-	10.00		
Mobile Trng. Center (boat)	1	-	-	-	-	-	1	100.0	100.00	-	-	-	-	-	100.00		
Motorbikes (150-200cc)	6	2	2	-	-	-	10	1.5	9.00	3.00	3.00	-	-	-	15.00		
Horses / Equipment	6	2	2	-	-	-	10	0.3	1.50	0.50	0.50	-	-	-	3.00		
Subtotal Vehicles and Boats									204.00	51.00	31.00	3.50	2.00	2.00	291.50		
Equipment and Supplies																	
Portable 2 way 20 km range radios	20	20	20	-	-	-	60	0.8	16.00	16.00	-	-	-	-	48.00		
Base Station Radios 100 km range	6	3	4	-	-	-	13	1.5	9.00	4.50	6.00	-	-	-	19.50		
Radio Installation/ Service	1	-	-	-	-	-	1	5.0	5.00	-	-	-	-	-	5.00		
Video Camera	1	1	1	-	-	-	3	1.0	1.00	1.00	1.00	-	-	-	3.00		
Underwater video	1	1	1	-	-	-	3	1.0	1.00	1.00	1.00	-	-	-	3.00		
Video Recorder	1	1	1	-	-	-	3	1.0	1.00	1.00	1.00	-	-	-	3.00		
Color TV (portable)	1	1	1	-	-	-	3	1.0	1.00	1.00	1.00	-	-	-	3.00		
Night Binoculars	1	1	1	-	-	-	3	1.0	1.00	1.00	1.00	-	-	-	3.00		
Day Binoculars	6	6	6	-	-	-	18	0.5	9.00	3.00	-	-	-	-	12.00		
Portable Battery Lights	30	10	10	-	-	-	50	0.1	3.00	1.00	4.20	-	-	-	8.20		
35mm camera/ accessories	15	15	10	-	-	-	40	0.3	4.50	4.50	3.00	-	-	-	12.00		
Spotting Scope tripods	3	3	4	-	-	-	10	0.5	1.50	1.50	2.00	-	-	-	5.00		
Slide Projector/Screen	4	3	3	-	-	-	10	0.2	0.80	0.60	0.60	-	-	-	2.00		
Fax machine	1	1	1	-	-	-	3	0.4	1.20	0.40	0.40	-	-	-	2.00		
Photocopier	1	1	1	-	-	-	3	0.4	1.20	0.40	0.40	-	-	-	2.00		
Answerphone	1	1	1	-	-	-	3	0.4	1.20	0.40	0.40	-	-	-	2.00		
Desk top computer	1	1	1	-	-	-	3	0.4	1.20	0.40	0.40	-	-	-	2.00		
Lap top computer	1	1	1	-	-	-	3	0.4	1.20	0.40	0.40	-	-	-	2.00		
Laser Printer	1	1	1	-	-	-	3	0.4	1.20	0.40	0.40	-	-	-	2.00		
Field Guides	1	1	1	-	-	-	3	0.4	1.20	0.40	0.40	-	-	-	2.00		
Waterproof Clothing Gear	100	45	45	-	-	-	190	1.0	190.00	67.50	67.50	-	-	-	325.00		
Uniforms (summer/winter)	100	100	100	-	-	-	300	0.2	60.00	1.35	1.35	-	-	-	62.70		
Tents - 2 to 4 persons	20	10	10	-	-	-	40	0.3	12.00	3.00	3.00	-	-	-	18.00		
Sleeping Bags	20	10	10	-	-	-	40	0.1	4.00	3.00	3.00	-	-	-	10.00		
Global Position Indicator (GPS)	1	1	1	-	-	-	3	2.0	6.00	0.50	0.50	-	-	-	7.00		
Diving Equipment	1	1	1	-	-	-	3	2.0	6.00	0.50	0.50	-	-	-	7.00		
Miscellaneous office Supplies	1	1	1	-	-	-	3	1.2	3.60	1.20	1.20	-	-	-	6.00		
Tape recorders etc.	3	2	2	-	-	-	7	0.5	3.50	0.50	0.50	-	-	-	4.50		
Training Materials	1	1	1	-	-	-	3	0.5	1.50	1.00	1.00	-	-	-	3.50		
Subtotal Equipment and Supplies									95.20	48.35	65.15	1.00	1.50	0.50	210.70		
Technical Assistance																	
Training Officer	3	-	-	-	-	-	3	13.5	40.50	-	-	-	-	-	40.50		
Per diem	3	-	-	-	-	-	3	1.5	4.50	-	-	-	-	-	4.50		
Ticket	1	-	-	-	-	-	1	1.0	1.00	-	-	-	-	-	1.00		

Subtotal Technical Assistance Training	46.00	-	-	-	-	-	-	-	-	-	-	46.00
Overseas Study												
Tickets /b												
Per diem	8	-	-	-	-	8	1.0	8.00	-	-	-	8.00
Tuition Fee /c	8	-	-	-	-	8	3.0	24.00	-	-	-	24.00
Tickets	8	-	-	-	-	8	1.5	12.00	-	-	-	12.00
Per diem (expatriate)	1	-	-	-	-	1	1.0	1.00	-	-	-	1.00
Subtotal Overseas Study	1	-	-	-	-	1	0.3	0.30	-	-	-	0.30
Section Head Internship												
Tickets								45.30	-	-	-	45.30
Per Diem		4	-	-	-	4	1.0	4.00	-	-	-	4.00
Tuition Fees /d		2	-	-	-	2	8.4	16.80	-	-	-	16.80
Subtotal Section Head Internship		4	-	-	-	4	1.5	6.00	-	-	-	6.00
Warden Foundation Course /e								26.80	-	-	-	26.80
Transport	2	2	2	2	2	10	1.0	2.00	2.00	2.00	2.00	10.00
Per diem	2	2	2	2	2	10	2.0	4.00	4.00	4.00	4.00	20.00
Fees	2	2	2	2	2	10	0.8	1.50	1.50	1.50	1.50	7.50
Materials	2	2	2	2	2	10	0.5	1.00	1.00	1.00	1.00	5.00
Subtotal Warden Foundation Course								8.50	8.50	8.50	8.50	42.50
Patrol Induction Year												
Romania Field Trip /f	-	10	10	10	10	40	1.0	-	10.00	10.00	10.00	40.00
Ukraine field Trip	-	10	10	10	10	40	1.0	-	10.00	10.00	10.00	40.00
Subtotal Patrol Induction Year								20.00	20.00	20.00	20.00	80.00
Section Specialization Courses												
Materials/ Course /g	-	-	1	1	1	3	2.0	-	2.00	2.00	2.00	6.00
Per diem and transportation fees	-	-	1	1	1	3	3.0	-	3.00	3.00	3.00	9.00
Subtotal Section Specialization Courses								5.00	5.00	5.00	5.00	15.00
Indepth Courses												
Travel, Materials and per diem	-	-	12	-	-	12	1.5	-	-	-	18.00	18.00
Local teacher fee	-	-	12	-	-	12	0.2	-	-	2.40	-	2.40
Subtotal Indepth Courses								2.40	2.40	18.00	-	20.40
Language lab and Skills												
Warden per diem	1	1	1	1	1	5	12.0	12.00	12.00	12.00	12.00	60.00
Warden travel costs	1	1	1	1	1	5	1.2	1.20	1.20	1.20	1.20	6.00
Trainer fee	1	1	1	1	1	5	2.4	2.40	2.40	2.40	2.40	12.00
Trainer per diem	1	1	1	1	1	5	1.6	1.60	1.60	1.60	1.60	8.00
Tape recorders set of 10	1	-	-	-	-	1	1.5	1.50	-	-	-	1.50
Materials	1	1	1	1	1	5	0.5	0.50	0.50	0.50	0.50	2.50
Subtotal Language lab and Skills								19.20	17.70	17.70	19.20	93.00
Construction Skills												
Subtotal Training	1	1	1	1	1	5	0.7	0.70	0.70	0.70	0.70	3.50
Total Investment Costs								73.70	73.70	54.30	71.40	326.50
Recurrent Costs								563.90	248.05	225.45	81.40	60.90 1,179.70
Operating Costs												
4 WD Vehicles (2500 litre/car/yr)	-	17.5	17.5	17.5	17.5	70	0.3	-	5.25	5.25	5.25	21.00
(10)Boats (1500 litre/car/yr)	-	27.5	27.5	27.5	27.5	110	0.3	-	8.25	8.25	8.25	33.00
Training Boat	10	10	10	10	10	50	0.3	3.00	3.00	3.00	3.00	15.00
Increased Staff Costs	20	50	80	120	120	390	0.6	12.00	30.00	48.00	72.00	234.00
Total Recurrent Costs								15.00	46.50	64.50	88.50	303.00
Total		578.90	294.55	289.95	169.90	149.40						1,482.70

\a US\$5000 per year.
 \b 8 participants for 30 days, 1 foreign expatriate to visit Tulcea for one week.
 \c 8 participants for a month.
 \d 4 participants for a month.
 \e 20 wardens per course
 \f 10 trips a year with 12 participants.
 \g once a year for 2 weeks.

Mon Feb 14 17:46:10 1994

Romania
Danube Delta Biodiversity Project
Table 2. Ecosystem Monitoring
Detailed Costs
(US\$ '000)

	Quantities					Base Cost						
	Unit	1994	1995	1997	1998	Total	1994	1995	1996	1997	1998	Total
Investment Costs												
Flora & Fauna Monitoring DDI												
Vehicles and Boats												
4 wheel drive	no.	1	-	-	-	2	7.0	7.00	-	-	-	14.00
Sand Tractors	no.	1	-	-	-	1	5.0	5.00	-	-	-	5.00
Rubber Boats (6 hp) and engine	no.	1	-	-	-	1	4.0	4.00	-	-	-	4.00
Wood Boats and 6 hp engines	no.	3	2	-	-	7	1.5	4.50	3.00	-	-	10.50
Aluminium boats and 25 hp engines	no.	1	-	-	-	1	4.0	4.00	-	-	-	4.00
Trailer	no.	1	-	-	-	2	3.0	3.00	-	-	-	6.00
Subtotal Vehicles and Boats							27.50	13.00	3.00	-	-	43.50
Equipment and Supplies												
Portable radio Phones	no.	6	-	-	-	6	0.8	4.80	-	-	-	4.80
Stationary radio phones	no.	1	-	-	-	1	3.0	3.00	-	-	-	3.00
Global Positioning System	no.	2	1	-	-	3	3.0	6.00	-	-	-	9.00
Rechargeable lights	no.	10	-	-	-	10	0.2	2.00	-	-	-	2.00
Chargeable batteries, charger sets	no.	1	-	-	-	1	0.1	0.10	-	-	-	0.10
Cameras	no.	1	-	-	-	1	1.0	1.00	-	-	-	1.00
Day Binoculars	no.	8	-	-	-	8	0.2	1.60	-	-	-	1.60
Night Binoculars	no.	2	-	-	-	2	0.5	1.00	-	-	-	1.00
3 person tent	no.	3	-	-	-	3	0.3	0.90	-	-	-	0.90
Sleeping Bags, camp gear	no.	10	-	-	-	10	0.2	2.00	-	-	-	2.00
Waterproof clothing	no.	15	-	-	-	15	0.5	7.50	-	-	-	7.50
Generators	no.	1	-	-	-	1	1.0	1.00	-	-	-	1.00
Video Cameras	no.	1	-	-	-	1	0.5	0.50	-	-	-	0.50
Plant Transect Equipment	no.	0.5	-	-	-	0.5	5.0	2.50	-	-	-	2.50
Bird Spotting Scopes	no.	2	-	-	-	2	0.3	0.60	-	-	-	0.60
Waterproof paper, pencils	no.	0.5	-	-	-	0.5	1.0	0.50	-	-	-	0.50
Waterproof clothing sets	no.	8	-	-	-	8	0.3	2.00	-	-	-	2.00
Fish nets set	no.	1	-	-	-	1	0.6	0.60	-	-	-	0.60
Fish computer software	no.	1	-	-	-	1	1.0	1.00	-	-	-	1.00
Fish Scale Set	no.	1	-	-	-	1	2.0	2.00	-	-	-	2.00
Fish / depth echosounder	no.	1	-	-	-	1	1.0	1.00	-	-	-	1.00
Plankton filters	no.	5	-	-	-	5	0.10	0.10	-	-	-	0.10
Chlorophyll Membrane filters	no.	2	2	2	2	10	0.04	0.04	0.04	0.04	0.04	0.20
Slide Film and Processing	no.	130	130	130	130	650	1.30	1.30	1.30	1.30	1.30	6.50
Video tapes - set of 5	no.	5	5	5	5	25	0.15	0.15	0.15	0.15	0.15	0.75
Plant presses, archiving	no.	0.5	-	-	-	0.5	1.0	0.50	-	-	-	0.50
Mist nets	no.	10	-	-	-	10	0.30	-	-	-	-	3.00
Flora/ Fauna field guides	no.	10	-	-	-	10	0.20	-	-	-	-	2.00
Bird ringing sets	no.	4	-	-	-	4	1.0	4.00	-	-	-	4.00
Subtotal Equipment and Supplies							48.19	4.49	1.49	1.49	1.49	57.15
Equipment for DDI Biodiversity Center												
Furniture sets	set	5	-	-	-	5	1.0	5.00	-	-	-	5.00
Desktop computers and printers	no.	2	-	-	-	2	3.0	6.00	-	-	-	6.00
Photocopiers	no.	1	-	-	-	1	2.5	2.50	-	-	-	2.50
Laptop computer/printer	no.	1	-	-	-	1	3.0	3.00	-	-	-	3.00
Ansaphones	no.	1	-	-	-	1	0.1	0.08	-	-	-	0.08
Fax machine (BD center)	no.	4	-	-	-	4	0.1	0.40	-	-	-	0.40
Telephones (BD center)	lp	0.5	-	-	-	0.5	5.0	2.50	-	-	-	2.50
Tape recorder, tapes, head phones	no.	1	-	-	-	1	0.5	0.50	-	-	-	0.50
Books, Paper, Flip charts	no.	1	-	-	-	1	0.5	0.50	-	-	-	0.50
TV sets, Video Recorder	no.	1	-	-	-	1	0.5	0.50	-	-	-	0.50
Slide Projector, screen	no.	1	-	-	-	1	0.4	0.40	-	-	-	0.40

Subtotal Equipment for DDI Biodiversity Center										21.38				21.38
Bird Life Ornithologist														
Ticket /a														
Per diem /b														
Subtotal Bird Life Ornithologist										2.00	2.00			2.00
Subtotal Flora & Fauna Monitoring DDI										2.00	2.00			2.00
Hydrological Monitoring										4.00	4.00			4.00
Currentmeters										101.07	21.49			8.49
15m Suspension Cables										3	4.0			12.00
Winches										4	0.2			0.92
Weights 30 lbs.										3	1.5			4.50
Weights 50 lbs.										3	0.2			0.60
Distomats										3	0.4			1.20
Reflectors										3	7.7			23.10
Level, Staff, Tripod										3	1.2			3.60
Recording gauges										2	3.0			6.00
Susp. Sediment Samplers										12	2.5			30.00
Thermometer (electric)										3	0.6			1.80
Bedload Samplers										3	1.2			3.60
Recording Echo Sounders										3	1.8			5.40
Radio Telephones										3	3.0			9.00
Boat										3	2.0			6.00
OB motor 25 hp.										1	2.0			2.00
Extra Charts (pack of 54)										1	3.0			3.00
Solar Panel, Battery										12	0.8			9.60
Subtotal Hydrological Monitoring										122.32	0.36			0.36
Training/Seminar - DDI														
Conference Production Cost										0.2	10.0			2.00
Short courses abroad										2	5.0			10.00
Funds for Publications, Journals										0.3	5.0			1.50
Publication DDR Red Data Book										0.2	10.0			2.00
Subtotal Training/Seminar - DDI										15.50				15.50
Data Management /GIS														
Technical Assistance and Training -DDI														
Principal Investigator- Univ. of Mass.										8	0.6			4.80
Project Coordinator										8	2.5			20.00
GIS Specialist /c										4	3.0			12.00
Satellite Spec.										2	1.5			3.00
Per diem (Specialist in Romania) /d										6	1.2			7.20
Airline Tickets										12	2.0			24.00
Per diem (for 2 Romanians in the U.S) /e										16	2.0			32.00
Subtotal Technical Assistance and Training -DDI										103.00				103.00
Equipment - DDI														
GIS Workstation, ARC/INFO										1	25.0			25.00
GPS Unit										1	6.3			6.30
GPS Base Station										1	11.0			11.00
ARC View										1	6.30			6.30
Disk Storage										1	11.00			11.00
Tape Back up										1	0.80			0.80
PC Station										1	3.00			3.00
Power Supply										1	2.50			2.50
Digitizing Tablet										1	3.00			3.00
Laser Printer										1	1.00			1.00
Large Plotter										1	5.00			5.00
Small Plotter										1	1.20			1.20
Ether Net										1	2.00			2.00
Satellite data										1	2.00			2.00
Computer Maintenance Contract										1	0.50			0.50
Tapes, Plotter, Supplies										1	6.30			6.30
Shipping										1	2.40			2.40
Publication charge										1	0.80			0.80

	no.	10.30	20.50	20.50	20.50	20.50	20.50	10.30
University of Mass. Overhead on T.A		91.20						173.20
Subtotal Equipment - DDI								
Equipment and Materials (NRA Dept.) /£								
Computer								
Monitor	no.		1		3.30			3.30
Laser Printer	no.		1		1.60			1.60
Inkjet Plotter	no.		1		1.80			1.80
Software and Network	no.		1		1.00			1.00
Data from the Institute	lp		1		2.00			2.00
Digitizer	no.		1		10.00			10.00
Plotter	no.		1		2.70			2.70
Read writable disk	no.		1		6.50			6.50
Subtotal Equipment and Materials (NRA Dept.)			1		31.90			31.90
Training -DBRA								
Per diem in U.S.	month		8		16.00			16.00
Airline Tickets	no		3		6.00			6.00
Subtotal Training -DBRA								
Subtotal Data Management /GIS		22.00						22.00
Total Investment Costs		216.20			52.40			20.50 20.50 310.10
Recurrent Costs		455.09			61.25		25.99	26.35 610.67
Operating Costs								
Equipment Operating Cost	amount	23.00			3.10		1.10	1.10 30.80
Total Recurrent Costs		23.00			3.10		1.10	1.10 30.80
Total		478.09			64.35		27.29	27.65 641.47

\a Twice a Year.
 \b Twice a Year.
 \c Includes fringe Benefits.
 \d 2 specialists in Romania (DDI)
 \e for 8 months for 2 Romanians.
 \f NRA- Natural Resources Assessment Department in DBRA

Mon Feb 14 17:46:51 1994

Romania
Danube Delta Biodiversity Project
Table 3. Polder Restoration
Detailed Costs
(US\$ '000)

	Quantities						Base Cost					
	1994	1995	1996	1997	1998	Total	1994	1995	1996	1997	1998	Total
Investment Costs												
Polder Restoration - Civil Works												
Phase 1 Polders												
Babina	23	-	-	-	23	0.3	6.90	-	-	-	-	6.90
Holbina 1	47	-	-	-	47	0.3	14.10	-	-	-	-	14.10
Cernovca	-	24	-	-	24	0.3	-	7.20	-	-	-	7.20
Holbina 11	-	99	-	-	99	0.3	-	29.70	-	-	-	29.70
Subtotal Phase 1 Polders							21.00	36.90	-	-	-	57.90
Phase 2 Polders												
Enidala, 6 Martie, Murighiol, Rusca	-	33	33	-	66	0.3	-	-	9.90	9.90	-	19.80
6 other Polders	-	20	40	63	123	0.3	-	-	6.00	12.00	18.90	36.90
Subtotal Phase 2 Polders							21.00	36.90	15.90	21.90	18.90	56.70
Subtotal Polder Restoration - Civil Works							21.00	36.90	15.90	21.90	18.90	114.60
Hydrological Equipment												
4 wd vehicle	1	-	-	-	-	1	10.0	10.00	-	-	-	10.00
Recording gauges	5	-	-	-	5	2.5	12.50	-	-	-	-	12.50
Staff gauges	20	-	-	-	20	0.1	2.00	-	-	-	-	2.00
Current meter	20	-	-	-	20	0.4	8.00	-	-	-	-	8.00
Level Tripod, staff	2	-	-	-	2	3.0	6.00	-	-	-	-	6.00
10 hp out board motor	2	-	-	-	2	2.5	5.00	-	-	-	-	5.00
Rubber boat	2	-	-	-	2	1.2	2.40	-	-	-	-	2.40
Boat Trailer	2	-	-	-	2	0.5	1.00	-	-	-	-	1.00
Fluorescent dye	1	-	-	-	1	1.0	-	1.00	-	-	-	1.00
Laptop computer	2	-	-	-	2	2.4	4.80	-	-	-	-	4.80
Subtotal Hydrological Equipment							51.70	1.00	-	-	-	52.70
Field Water Analysis Equipment												
Water Analysis Kit	2	-	-	-	2	3.0	6.00	-	-	-	-	6.00
Refill Packages	20	-	40	-	60	0.5	10.00	-	-	20.00	-	30.00
Turbidity Meter	2	-	-	-	2	0.7	1.40	-	-	-	-	1.40
Water Sampler	2	-	-	-	2	0.5	1.00	-	-	-	-	1.00
Van Veen Grab Dredge	1	-	-	-	1	1.8	1.80	-	-	-	-	1.80
Subsurface Grab Sampler	2	-	-	-	2	1.0	2.00	-	-	-	-	2.00
Dissolved Oxygen meter	2	-	-	-	2	1.4	2.80	-	-	-	-	2.80
pH Meter	2	-	-	-	2	0.4	0.80	-	-	-	-	0.80
Bomb Sampler	1	-	-	-	1	0.6	0.60	-	-	-	-	0.60
La Motte Sampler	1	-	-	-	1	0.2	0.20	-	-	-	-	0.20
Miscellaneous Supplies	-	-	1	-	1	3.0	-	-	3.00	-	-	3.00
Gaschromatograph	1	-	1	-	1	35.0	-	-	35.00	-	-	35.00
Spectrophotometer	1	-	-	-	1	24.0	-	24.00	-	-	-	24.00
Analytical Balance	1	-	-	-	1	3.0	3.00	-	-	-	-	3.00
Distiller	1	-	-	-	1	2.0	2.00	-	-	-	-	2.00
Subtotal Field Water Analysis Equipment							31.60	24.00	38.00	20.00	-	113.60
Engineering and Technical Assistance												
Phase 1 Topo Survey	3.37	4.68	-	-	8.05	5.0	16.85	23.40	-	-	-	40.25
Phase 1 Mapping	3.37	4.68	-	-	8.05	1.0	3.37	4.68	-	-	-	8.05
Flood level study phase 1	2	2	-	-	4	0.2	0.40	0.40	-	-	-	0.80
Baseline Soil, Veg. water quality	8	8	-	-	16	0.2	1.60	1.60	-	-	-	3.20
Annual Monitoring	8	16	16	16	72	0.2	1.60	3.20	3.20	3.20	3.20	14.40
Faunal Surveys	1	2	2	2	9	0.2	0.20	0.40	0.40	0.40	0.40	1.80
Transport 80 hrs/Polders/yr	0.16	0.32	0.32	0.32	1.44	9.0	1.44	2.88	2.88	2.88	2.88	12.96
WHF	2	1	-	-	3	-	-	-	-	-	-	-
WHF Travel roundtrip	4	2	-	-	6	0.6	2.40	1.20	-	-	-	3.60
WHF Printing Mapping	-	2	-	-	2	1.6	-	3.20	-	-	-	3.20

Romania
Danube Delta Biodiversity Project
Table 4. Ecosystem Restoration
Detailed Costs
(US\$ '000)

	Quantities						Base Cost						
	Unit	1994	1995	1996	1997	1998	Total Cost	1994	1995	1996	1997	1998	Total
Investment Costs													
Sturgeon Hatching													
Civil Works													
Buildings	each	-	0.5	0.5	-	-	1	40.0	-	20.00	-	-	40.00
Ponds	each	-	1	3	-	-	4	5.0	-	5.00	15.00	-	20.00
Piping Installed	ls	-	0.5	0.5	-	-	1	30.0	-	15.00	15.00	-	30.00
Tanks and Basins	each	-	15	31	-	-	46	1.9	-	28.50	58.90	-	87.40
Power line	km.	-	8	-	-	-	8	1.0	-	8.00	-	-	8.00
Transformer	each	-	1	-	-	-	1	2.0	-	2.00	-	-	2.00
Subtotal Civil Works													
Goods													
Generator	each	-	1	-	-	-	1	15.0	-	15.00	-	-	15.00
Heating System	each	-	1	-	-	-	1	30.0	-	30.00	-	-	30.00
Heat Exchanger	each	-	4	-	-	-	4	7.5	-	30.00	-	-	30.00
Pumps	each	-	4	-	-	-	4	1.5	-	6.00	-	-	6.00
Air Pumps	each	-	2	-	-	-	2	4.0	-	8.00	-	-	8.00
Control Panel	each	-	1	-	-	-	1	20.0	-	20.00	-	-	20.00
Water Conditioning Tanks	each	-	2	-	-	-	2	2.5	-	5.00	-	-	5.00
Autom. Water Control	set	-	1	-	-	-	1	25.0	-	25.00	-	-	25.00
Heater Solar Panel	mm	-	100	-	-	-	100	0.1	-	10.00	-	-	10.00
Lab Equipment	set	-	1	-	-	-	1	20.0	-	20.00	-	-	20.00
Electric Fishing Equipment	no.	-	2	-	-	-	2	12.5	-	25.00	-	-	25.00
Subtotal Goods													
Technical Assistance & Training													
Design	Year	2	-	-	-	-	2	12.0	-	24.00	-	-	24.00
T.A. (Foreign)	mmts	3	1	0.5	1	0.5	6	10.0	10.00	5.00	10.00	5.00	60.00
T.A. Travel	trip	2	1	1	1	1	6	2.0	4.00	2.00	2.00	2.00	12.00
Inservice Training	mmts	20	-	-	-	-	20	2.0	40.00	-	-	-	40.00
Subtotal Technical Assistance & Training													
Subtotal Sturgeon Hatching													
Rust Removal	'000 t	-	200	400	400	-	1,000	0.1	-	12.00	24.00	-	60.00
Cut and move Steel to Galati	km.	10	20	40	40	13	123	1.0	10.00	20.00	40.00	13.00	123.00
Willow Planting	ha	-	11	-	-	-	11	0.9	-	9.90	-	-	9.90
5 rows Double sided													
Village woodlots													
Fuel Wood Plantation													
Eutrophication Flow Reduction													
Civil Works													
L. Fortunal Channel fill	'000m	-	19	-	-	-	19	2.1	-	39.90	-	-	39.90
Caraoaman Entrance Fill	'000m	-	20	-	-	-	20	2.1	-	42.00	-	-	42.00
Caraoaman Rock Riprap	'000 t	-	1.5	-	-	-	1.5	20.0	-	30.00	-	-	30.00
Subtotal Civil Works													
Technical Assistance	mmts	2	-	-	-	-	2	0.3	-	111.90	-	-	111.90
Caraoaman Engineering													
Subtotal Eutrophication Flow Reduction													
Pilot Fingerling Protection													
Civil Works													
Escape Channel	'000m	-	10	-	-	-	10	0.3	-	3.00	-	-	3.00
Submerged Screen	'000m	-	60	-	-	-	60	0.3	-	15.00	-	-	15.00
Electric Barrier	ls	-	1	-	-	-	1	15.0	-	15.00	-	-	15.00
Subtotal Civil Works													
Technical Assistance	each	-	3	-	-	-	3	5.0	-	15.00	-	-	15.00
Study Tour													

Engineering

Mon Feb 14 17:47:40 1994

4-2 Ecosystem Restoration

Romania
Danube Delta Biodiversity Project
Table 5. Public Awareness
Detailed Costs
(US\$ '000)

	Quantities						Base Cost					
	Unit	1994	1995	1996	1997	1998	1994	1995	1996	1997	1998	Total
Investment Costs												
Equipment and Supplies - DDBRA /a												
Lap top computer/printer	no.	1	-	-	-	-	1	3.0	3.00	-	-	3.00
Desktop computers and printers	each	1	1	-	-	-	2	3.0	3.00	3.00	-	6.00
Black and White Photocopiers	no.	1	-	-	-	-	1	2.5	2.50	-	-	2.50
Color Printer	no.	1	-	-	-	-	1	2.0	2.00	-	-	2.00
Tape recorders, tapes, head Phones	no.	3	2	-	-	-	5	0.5	1.50	1.00	-	2.50
Books, paper, flip charts	lp	0.5	0.25	0.25	-	-	1	5.0	2.50	1.25	1.25	5.00
TV set, Video Recorder	each	1	-	-	-	-	1	0.5	0.50	-	-	0.50
Slide projector, screen	each	1	-	-	-	-	1	0.4	0.40	-	-	0.40
Overhead projector	no.	1	-	-	-	-	1	0.3	0.30	-	-	0.30
Purchase of videos, books, posters	lp	0.2	0.2	0.2	0.2	0.2	1	10.0	2.00	2.00	2.00	10.00
Out house production costs-printing	lp	10	10	10	10	10	50	1.0	10.00	10.00	10.00	50.00
Video Purchase rights	lp	-	1	-	-	-	1	10.0	-	10.00	-	10.00
Video Local screenings	lp	-	1	-	-	-	1	2.0	-	2.00	-	2.00
Video Local production	lp	-	1	-	-	-	1	5.0	-	5.00	-	5.00
Subtotal Equipment and Supplies - DDBRA							27.70	34.25	13.25	12.00	12.00	99.20
Pro Delta NGO equipment and ROS												
Computer Equipment	set	1	-	-	-	-	1	5.0	5.00	-	-	5.00
Photocopier	set	1	-	-	-	-	1	2.0	2.00	-	-	2.00
Jeep	no.	2	-	-	-	-	2	7.0	14.00	-	-	14.00
Out house production	no.	1	1	1	-	-	3	1.0	1.00	1.00	-	3.00
Video camera set	set	2	-	-	-	-	2	1.0	-	2.00	-	2.00
Camera & accessories	no.	2	-	-	-	-	2	1.0	2.00	-	-	2.00
Slide Projector/screen	no.	2	-	-	-	-	2	1.0	2.00	-	-	2.00
Subtotal Pro Delta NGO equipment and ROS							26.00	3.00	1.00	-	-	30.00
Technical Assistance												
Bird life PA specialist /b	year	2	2	2	2	2	10	1.0	2.00	2.00	2.00	10.00
Per diem /c	mmts	2	2	2	2	2	10	1.0	2.00	2.00	2.00	10.00
Subtotal Technical Assistance							4.00	4.00	4.00	4.00	4.00	20.00
Total Investment Costs							57.70	41.25	18.25	16.00	16.00	149.20
Recurrent Costs												
Operating Costs	amount						2.62	1.87	0.72	0.60	0.60	6.46
Total Recurrent Costs							2.62	1.87	0.72	0.60	0.60	6.46
Total							60.39	43.12	18.97	16.60	16.60	155.67

/a For information and education department and guide wardens.
/b Twice a year.
/c Twice a year

Mon Feb 14 17:49:49 1994

Romania
Danube Delta Biodiversity Project
Table 6. Management and Coordination
Detailed Costs
(US\$ '000)

	Quantities					Base Cost						
	Unit	1994	1995	1996	1997	1998	1994	1995	1996	1997	1998	Total
Investment Costs												
Black Sea Workshop												
Public Awareness (Turkey)- Airfare	no.	1	-	-	-	-	1.0	1.00	-	-	-	1.00
Per diem	no.	1	-	-	-	-	0.7	0.70	-	-	-	0.70
Planning Workshop (Ukraine)- Ticket	no.	1	-	-	-	-	0.1	0.10	-	-	-	0.10
Per diem	no.	1	-	-	-	-	0.4	0.40	-	-	-	0.40
Bird inventory - Russia- ticket	no.	1	-	-	-	-	0.1	0.10	-	-	-	0.10
Per diem	no.	1	-	-	-	-	0.4	0.40	-	-	-	0.40
Subtotal Black Sea Workshop							2.70	2.70	-	-	-	2.70
Regional Activities												
Coop/ Ukraine GEF	no.	1	1	1	1	1	1.3	1.25	1.25	1.25	1.25	6.25
Procurement and Financial Management Assistance	month	3	1	1	1	1	0.8	0.75	0.75	0.75	0.75	3.75
Financial MGT/Program Coordination	month	2	2	1	-	-	16.5	49.50	16.50	16.50	-	82.50
Scientific Advisory Committee	lp	1	1	1	1	1	3.0	3.00	3.00	3.00	3.00	12.00
Total							90.20	54.50	38.00	5.00	5.00	192.70

Mon Feb 14 17:52:02 1994

THE LAW REGARDING THE ESTABLISHMENT OF THE DANUBE DELTA BIOSPHERE RESERVE

No. 82 / 7 December 1993

Article 1

The Danube Delta Biosphere Reserve (hereinafter the Reserve) is hereby established as an area of national and international ecological importance which comprises the following physical geographical units:

- (i) Danube Delta;
- (ii) Murighiol-Plopu, an area of high salinity;
- (iii) the Razim-Sinoie complex of lakes;
- (iv) the navigation channel to Cotul Pisicii;
- (v) the Isaccea-Tulcea flood zone;
- (vi) the Black Sea coast from the Chilia branch to the Midia cape;
- (vii) the internal navigation channels and the Black Sea waters to a depth of 20 metres.

The continental limit of the reserve follows the margin of the wetland areas along the base of the Dobrogea hills.

Article 2

For the purposes of this law, the Biosphere Reserve shall mean the geographical zone with dry lands and waters including those which are permanently inundated in which exist physio-geographic features, or species of flora and fauna which have a special biogeographical, ecological or aesthetic importance with national and international natural heritage value, and having a special administrative structure with the object of protecting and conserving this zone by the development of human settlements and by the organisation of economic activities in accordance with the carrying capacity of the deltaic environment and its natural resources.

Article 3

The territory of the Reserve is delimited as shown in the Annex by the zones (i) strictly protected areas; (ii) buffer zones in which certain human activities are permitted; (iii) transition zones or economic zones with ecological reconstruction measures in which traditional economic activities are permitted.

Strictly protected areas must be surrounded by buffer zones.

Article 4

To administer this natural heritage contained within the nationally important public lands of the Reserve and to protect and rehabilitate the physio-geographic units described in Article 1, the Reserve Administration is hereby established, a public institution with a legal identity with headquarters in Tulcea and under the subordination of the Ministry of Water, Forestry and Environmental Protection.

The Reserve Administration is lead by a Scientific Council that supervises an Executive Board which implements the decisions of the Scientific Council, the President of the Scientific Council and the Chairman of the Executive Board being the Governor of the Reserve. The Scientific Council shall include three persons nominated by Tulcea Judet Council. The Governor and members of the Scientific Council are appointed by the government of the recommendation of the Ministry of Water, Forestry and Environmental Protection, and with the approval of Tulcea Judet Council and of the Romanian Academy.

The function of the Governor is equivalent to Under-Secretary of State.

The Scientific Council shall decide upon measures concerning fundamental aspects of the Reserve.

The Corps of Inspection and Wardens shall be included within the Reserve Administration. The Corps of Inspection and Wardens shall supervise the whole territory of the Reserve and shall enforce the protection measures established in the Reserve bye-laws.

Article 5

The organisation and function of the Reserve Administration shall be established under its bye-laws that shall be approved by the Ministry of Water, Forestry and Environmental Protection and the Romanian Academy and thereafter the Government within 30 days of the date of enactment of this law. The bye-laws must be in line with the international demands concerning environmental protection and restoration, as well as with the international conventions of which Romania is a Contracting Party, regarding the waterways of the Danube River and maritime sector of the Reserve.

In accordance with proposals from the Reserve Administration, the Ministry of Water, Forestry and Environmental Protection shall establish technical standards to prevent pollution and deterioration of the ecological balance from economic activities, tourism and recreation within the Reserve.

Article 6

The Reserve Administration has the following objects:

- (a) assessing the ecological status of the natural heritage, organising scientific research, taking necessary measures for conservation and protection of genetic resources and biodiversity;
- (b) establish and implement those measures required for the ecological reconstruction of the deltaic ecosystems;

- (c) identify, delimit and propose to the Ministry of Water, Forestry and Environmental Protection for declaration the functional zones of the Reserve;
- (d) evaluate the status of natural resources and their level of exploitation in accordance with their potential for regeneration and ecosystem support capacity;
- (e) to authorise the ways and means of the organisation of the economic, productive, tourism and recreation activities by individuals and legal entities in accordance with the requirements for conservation of biodiversity and specific ecosystems;
- (f) to enforce the authorisations permitted under paragraph (e);
- (g) to support the traditional economic activities of the local inhabitants;
- (h) with regard for ecosystem protection, to approve proposals for land use planning and urban developments in the Reserve in accordance with the law;
- (i) to establish, with the landowner, the places where and the conditions under which hunting and sport fishing can be carried out;
- (j) to promote scientific research and international co-operation;
- (k) to promote public information and education concerning ecological issues;
- (l) to cooperate with the autonomous authority of Romanian Waters to implement necessary hydraulic works;
- (m) to cooperate with inter-Ministerial and District commissions to mitigate potential calamities and catastrophes;
- (n) to cooperate with local public administrations to defend the interests of local inhabitants and to improve their quality of life and standards of living;
- (o) to establish together with the Ministry of Transport the regulations for circulation and access on the river branches for boats, motorboats, river and sea-going ships;
- (p) to enforce regulations concerning environmental protection in harbours and at harbour facilities within the Reserve.

Article 7

The expenditure of the Reserve Administration will be met by an allocation from the budget of State, from grants and from its own revenue.

Article 8

The local population within the Reserve have the right to continue local and specific traditions and economic activities.

The Reserve Administration will ensure where appropriate and if necessary by compensation the continuance of traditional economic activities.

Article 9

Within 30 days of the enactment of this law the government will approve, on basis of the permit given by the Tulcea Judet, the boundaries of the functional zones described in Article 3.

Article 10

The terrestrial and aquatic surfaces including the land overlain by water which comprise the Reserve together with their associated natural resources and natural heritage within nationally important public lands under the direct administration of a sole lead organisation for the reserve.

Notwithstanding the provisions of the previous paragraph, private property belonging to individuals or legal entities or belonging to local or district authorities are exempt.

The individuals or legal entities owning lands within the Reserve are required to manage them according ecological or traditional means permitted by the scientific authorities.

In order to utilise the terrestrial and aquatic resources within the economic zones the Reserve Administration may, according to the provisions of this law, award concessions or lease land and waters to legitimate companies, local population having the right of pre-emption.

Article 11

The scale of charges for licensing economic, tourism and recreation activities within the Reserve are made by the Tulcea Judet according to recommendations made by the Reserve Administration.

Economic, tourism and recreation activities of individuals and legal entities, other than those mentioned in Article 10, paragraph 4, shall be licensed by the District Council of Tulcea on the basis of and environmental permit issued by the Reserve Administration.

Article 12

The following activities are prohibited within the Reserve:

- (1) undertaking any land management or building works without a permit from the Reserve Administration;
- (2) sport fishing other than in designated areas within the permitted season;
- (3) collection or breaking of birds eggs, or destruction of nests, or destruction of nesting sites;
- (4) making excessive noise within designated bird nesting areas;
- (5) entry by boat into closed areas;
- (6) taking photographs or making films for commercial purposes without a licence;
- (7) hunting birds (a) without payment of the licence fee, (b) outside of designated areas, (c) outside the permitted season or in excess of the permitted level set by the Reserve Administration;
- (8) breaking the speed limits;
- (9) the disembarkation of passengers or tourists outside of permitted areas except by force of circumstances;
- (10) dumping or jettisoning waste, litter or other materials;
- (11) camping outside of designated areas;
- (12) grazing livestock on the territories of the Reserve without a permit from the Reserve Administration;

- (13) harvesting or burning reeds, club rush and hay within area comprising the natural heritage of the Reserve without a permit from the Reserve Administration, except the harvesting of reed, club rush and hay for the requirements of the local population;
- (14) trapping or hunting of small mammals (a) without a permit from the Reserve Administration, (b) outside of designated areas, (c) outside the open season or in excess of the level permitted by the Reserve Administration;
- (15) cutting trees within areas comprising the natural heritage of the Reserve without a permit from the Reserve Administration;
- (16) commercial collection of forest fruits, mushrooms, medicinal plants or aquatic organisms other than fish without a permit from the Reserve Administration;
- (17) grazing in the strictly protected zones;
- (18) using within the Reserve chemicals and equipment for agricultural or forestry purposes without a permit from the Reserve Administration or without respecting the permitted conditions, irrespective of the owner of the land;
- (19) damaging natural or artificial embankments or vegetation through moving equipment or other works;
- (20) cutting or damaging trees designated as nature monuments or within the strictly protected areas, or dumping equipment in non-designated areas irrespective of the owner of the land;
- (21) collecting species of flora which are designated as monuments of nature;
- (22) hunting of deer does and wild boar (a) without a permit from the Reserve Administration, (b) outside of designated areas, (c) outside the open season or in excess of the permitted level;
- (23) hunting of birds and mammals protected by law;
- (24) using poisoned baits;
- (25) entry of high- or medium-powered boats in strictly protected areas;
- (26) leakage of fuel, oil or other effluents from boats except that dangerous effluents are penalised according to Article 13 para (h);
- (27) industrial fishing within areas comprising the natural heritage of the Reserve without a permit from the Reserve Administration, or breaking the conditions imposed by the permit;
- (28) fishing from trawlers within the navigation channels less than 20 metres deep;
- (29) failure to notify immediately to the competent authorities all accidental pollution incidents by the persons concerned, as well as not taking possible measures for limiting their consequences;
- (30) industrial fishing outside of the permitted season;
- (31) fishing of sturgeon in the Danube within the Reserve territory without a permit from the Reserve Administration or breaking the conditions of the permit;
- (32) the transport, dumping, burying or treatment of dangerous waste in the territory of the Reserve;
- (33) organising and carrying out of economic, tourism and recreation activities within areas comprising the natural heritage of the Reserve without a permit from the Reserve Administration;
- (34) pollution of water and lands within the Reserve leakage of wastes from economic activities;

Article 13

The penalties for the offences listed in Article 12 are as follows:

Article 14

The offences are established and penalties set by those empowered by the Reserve Administration and by the Ministry of Internal Affairs.

Article 15

Unless provided herein, the provision of Law No. 32/1968 shall apply.

Article 16

This law shall come into force 30 days after publication in the official gazette.

Article 17

All previous legislation in conflict with this law is annulled.

* This is a non-authorized translation of the Romanian text made by the Danube Delta Environmental Management Programme, Tulcea, for information only and may not be as a basis for any legal action whatsoever

THE DANUBE DELTA BIOSPHERE RESERVE AUTHORITY AND THE DANUBE DELTA INSTITUTE

This annex provides details of these two organisations which are both exclusively concerned with the Danube Delta.

The Danube Delta Biosphere Reserve Authority

The present structure, which in May was awaiting approval by the MWFEP is shown in Figure 1. The total staff complement is said to be 225 of which 110 staff are in the Corps of Guards and Inspection. The EBRD (Euroconsult, 1993b) Staff Profile (Table 1) shows a staff of 220 with 95 vacancies for April 1993. Vacancies have not been filled because the DDBRA law has not been approved (causing uncertainty regarding the Authority's future function), and there is also a lack of accommodation. Funds for the total complement are said to be available but whether these are matched by a larger equipment and transport budget is not known. The present budget is summarized in Table 2. Current expenditure is therefore about US\$250 000 a year. The capital budget of some US\$947 000 is for the Authority's new headquarters building.

Proposals to Strengthen the DDBRA: These proposals, presented by the EBRD (Euroconsult, 1993b), are said to have been approved by the MWFEP. However, it is not known whether they have been endorsed, following the cuts in government numbers announced in mid May. The proposed new structure is shown in Figure 2, from which it will be seen that the enlarged Authority would be divided into eight departments, and the total staff would be increased to 335, as detailed in Table 3. The largest increase would be in the Wardens' Department, which would be expanded from 110 to 240 staff. A budget for the strengthened Authority has not been made public, but it is said that the increased costs would be balanced by income from fees and licences granted by the Authority. The EBRD report has therefore recommended that "the DDBRA should be given the status of an autonomous agency responsible for its own staff structure and pay scheme. It should also have the ability, within government guidelines to take commercial loans to promote investments in sustainable use of natural resources."

The proposed expansion of the Guards' (Wardens') Department and the creation of a Natural Resources Assessment Department, with a Monitoring Section, are the two elements in the EBRD proposals of importance in connection with the present report. The relevant extracts from the EBRD Inception Report (Euroconsult, 1993b) are therefore produced below:

¹ The accommodation problem was resolved in July 1993.

Natural Resources Assessment Department

This department provides information, analysis and advice on the status and trends of the natural resources within the DDBRA, including impacts from activities in the vicinity and upstream of the reserve. It also identifies gaps in knowledge which require further research and will organise the environmental monitoring system in the DDBR, taking account of the national environmental monitoring requirements now being developed. Most of its field activities will be done through external contracts with Romanian institutions (for example, the Danube Delta Research Institute), or if necessary by seeking international assistance. The department will ensure that all original research is properly written up and published in the scientific literature.

The director of the department will be a highly experienced environmental scientist (seconded), probably with a doctorate degree in an appropriate topic such as environmental management, ecology or biometrics. He will be supported by a personal assistant. The department will have two sections, supported by clerical assistants and junior staff such as recent postgraduate students.

(i) Monitoring Section

The main scientific staff complement will be employed in this section, responsible for the routine in-house environmental monitoring, research, data archiving and information analysis activities. All of them will be computer literate and possess degrees in their specialities, preferably to Masters level. With regard to environmental monitoring, it will be important to define its objectives so that effort expended on data collection and analysis is directly relevant to management requirements, and that monitoring is not carried out simply for its own sake. It is expected that the World Bank/GEF Biodiversity Project Preparation team, whose brief includes this subject, will be able to give guidance on objectives, which can then be incorporated in the future management plan. For planning purposes, however, it seems likely that the staff complement will comprise at least the following specialists, with the hydrologist probably serving as the first section head:

- Hydrologist (seconded)
- Ecologist
- Agriculturist
- Chemist
- Geo-morphologist
- Geographic Information System Officer

(ii) Research Contract Section

This section will supervise the specification, tendering, award and follow-up of external research contracts. The director will also serve as section head, and the staff will comprise:

- Contract Manager
- Ecologist/Environmental Manager

5.2.9 Wardening Department

Although this department comes at the end of the list, it should be regarded as perhaps the most important of all. It will have by far the greatest number of people, a large proportion of whom will be recruited from inhabitants of the DDBR itself, and exert the most visible presence of the DDBRA in the reserve. The role of the department as a major employer and skill enhancer of local people is a demonstrable benefit provided by the existence of the DDBRA, which should not be overlooked.

It is important to understand that the staff of the wardening department, like those of similar services elsewhere in the world, has a particular culture. For example, they share a view of themselves as being at the sharp end of site protection and management, exposed to the climate and abuse from other people, yet they have little status, low pay, poor living conditions, and hardly any opportunity for self-advancement. On the other hand, for many of them the department will be regarded as place for lifetime employment; such loyalty can serve the DDBRA well if sensitively managed.

It is recommended that the needs of the departmental staff, and the efficient operation of the DDBRA, can both be met by concentrating all operational activities within the DDBR under various sections of the department. The career development strategy (see 5.2.6 iii) will ensure that wardens are encouraged to move around the sections (and perhaps other DDBRA departments) to acquire new skills, and because of the number of staff, a clear hierarchy of promotional stages can be instituted (see below). At the same time, multifarious activities with the reserve would be coordinated by a single department, reducing the potential for conflicts and inadvertent damage to habitats or disturbance to wildlife.

With regard to the number of staff especially wardens, it is apparent that the current levels are much too low given the difficulty (and indeed inadvisability) of rapid movement around the DDBR. The result is that people realise that the likelihood of any individual being caught breaking DDBRA regulations is slight, so poaching and other illegal activities are widespread. Thus, the wardens often encounter illegal activities on their patrols and have tended to be seen as a para-police force. This image is not favourable to the DDBRA and needs to be addressed.

It is therefore recommended that the number of wardens is systematically increased over the next three years to provide a level of coverage of about one per 2,000 ha, i.e. to some 220 wardens (excluding supervisors and ancillary staff). This would give a sufficient presence to deter most casual illegal activities, so allowing the wardens more time for training to carry out more specialised tasks. The task of law enforcement could then become a matter for a dedicated unit dealing with serious events. The recruitment will need to be accompanied by investment in warden stations, small powered boats and accommodation.

The proposed increase in the number of wardens from about 80 at present to 220 or so provides a unique opportunity for planning and implementing optimum approaches to their recruitment and training. Intelligent men and women are required, committed to the environmental management and sustainable economic development of the DDBR. Through well-planned initial and service-long training, and carefully scheduled work rotation and career development, each warden will develop general capabilities, specialist skills and an ethic of service to match the challenges of this key department.

The director will be a very experienced environmental manager, with special training in planning, administration and personnel management. He should clearly have the personality to lead, motivate and maintain the morale of his wardens. He will be supported by a deputy director, a personal assistant, a small secretariat, and have a motor boat for his own official use.

The department will be organised under six sections, as described below. It will be apparent that several ranks are already clear:

- Warden (three or four grades) 220
- Senior Warden (two or three grades) 13
- Section Head 5
- Deputy Director 1
- Director 1

(i) Patrol Section

This section will work closely with the Legal and Licensing Departments. Wardens will check licenses and permits and report infractions to the relevant department for follow-up, or impose spot fines as required. It will comprise the bulk of the wardens (including all new recruits), distributed between the 12 districts as at present, with each district led by a senior warden. In addition, one group of wardens and a senior warden would form a mobile unit capable of responding to emergencies and serious events which infringe the DDBRA regulations. The deputy director will serve as section head.

(ii) Communications and Logistics Section

This section, which will work closely with the Administration Department, will be responsible for installing and maintaining mobile and static radio communications within the DDBR and to the DDBRA HQ; this should be done in conjunction with equipping all boats with a Global Position System receiver. It will also service all boats and vehicles used by the department, and provide boatmen for the common pool of motor and house boats used by other sections and departments. The section head should have engineering qualifications. For the time being, the staff will remain more or less at the currently envisaged level, comprising:

Boat mechanic	2
Deckhand	6
House boat captain	1
Helmsman	4
Navigator	1
Radio operators	3

(iii) Infrastructure Section

This section will work closely with teams from the Corporate Planning and Policy Department. It will monitor contractors or actually carry out itself all works in the DDBR organised by the DDBRA. Projects will range from erecting signposts, observation hides and warden stations (done by the section) to water engineering and polder restoration (monitoring of contractors). The purpose is to ensure that works are carried out with minimum disturbance to habitats and wildlife. The section head will be qualified in engineering, architecture or construction. He will be supported by up to 20 wardens on vocational training. Additional specialists may be contracted in as required.

(iv) Survey and Recording Section

This section will liaise with the Natural Resources Assessment Department. It will gather basic data on wildlife status and distribution, water samples, meteorological data and so on. The section head will have sound ecological and fieldcraft skills. It will have a small staff of about 15 wardens on vocational training who will carry out specific projects (e.g. international waterfowl census, pelican colony monitoring), while more extensive, ongoing projects will be organised through the general warden corps, using those already trained by the section.

(v) Guiding Section

This section will provide support for the Information Department and also the business liaison officer in the Corporate Planning and Policy Department. It has a significant role as a means for spreading information to and gathering reactions from visitors to the DDBR. It will be responsible for providing guides to accompany all organised parties of tourists or other visitors to the DDBR. The staff will require training in languages and public communication. The section will therefore provide a high profile for the DDBRA, and ensure that tour operators do not infringe the regulations. The section head will have qualifications in communication skills and be able to speak at least English and one other foreign language to a reasonable level of fluency. It will have a staff of about 30 wardens on vocational training.

(vi) Facilitation Section

This section will provide support for the External Relations Department by coordinating visits in the DDBR by scientists and others on official business. It will also respond to requests for help from local people (e.g. for communications or transport where these are not otherwise available) when these are compatible with the planned operations of the department. The section head will be experienced in planning and coordination. The staff will comprise about five wardens on vocational training.

The Danube Delta Institute

The DDI which was incorporated as the Research Division of the DDBRA reverted to its previous independent status as an Institute of the MWFEP in January 1993. As such, its staff receive which are somewhat higher than those of the DDBRA: senior research workers salaries ranging from 53,000 to 74,000 lei/month.

The Institute comprises two departments covering Design and Research. The former, now much reduced in size was concerned with polder design under the Complex Plan for the Economic Exploitation of the Delta. The latter is now responsible "for providing the scientific basis for the formulation of government policy and activities pertaining to the conservation and management of nature and natural resources of the DDBR" (DDI. 1993). The staff complement is 229, there are 197 staff in post and 32 vacancies as detailed in Table 4. The Institute has three cars, one truck and five boats: a five bunk research vessel, an 8 person jet boat, (no bunks), one tug and two cabin research boats.

The total 1993 annual budget is 270.8 million lei or about US\$420,000, made up as follows:

	Lei ('000)
Research Department	82,000
Design Department	34,190
Agriculture and fish production Research (Min of Agri)	<u>54,610</u>
	270,800

The main budget heads are **salaries** lei 105.67 millions, and **equipment** lei 28.93 million, the balance being specific research projects which include items for transport and travelling. The latter in 1993 are funded as follows by the MWFEP: Lei 160 million, and the MOA Lei 22 million, plus subventions in kind from the collaborating institutes.

The research project, with details of their total budgets are listed in Table 5.

Table 1: DDBRA staff profile: schedule of personnel in post and vacancies in April 1993.

FUNCTION/EXPERTISE	IN PLACE	VACANCIES	TOTAL
Administration			
Biologist	2	4	6
Engineer	3	1	4
Economist	2	5	7
Geologist		1	1
Chemist	1	5	6
Chemical technician		2	2
Fish scientist	2	4	6
Forester		3	3
Agronomist		2	2
Land rehabilitation specialist	1		1
Hydrologist	1	2	3
Technician	1		1
Sociologist		1	1
Computer manager		1	1
Computer programmer		4	4
Bookkeeper	2	2	4
Legal advisor		1	1
Secretary	2		2
Deputy	1	5	6
Translator		1	1
Technician	6	8	14
Labourer		3	3
Watchman		3	3
Caretaker		2	2
Maintenance/mechanic	6	1	7
Librarian		1	1
General assistant		1	1
Sailor/drivers etc.	13	7	20
Radio operator		1	1
Storekeeper	1		1
Subtotal	44	71	115
Corps of Guards			
Biologist	2		2
Eco-tourism specialist		1	1
Veterinarian	2		2
Naval engineer	1		1
Forester	2	1	3
Chemist	1		1
Civil engineer	1		1
Secretary	1		1
Fish scientist		1	1
Guards	71	21	92
Subtotal	81	24	105
TOTAL	125	95	220

Source:
DDBR Environmental Management Programme Inception Report

Table 2 DDBRA BUDGET 1993
(’000 Lei)

	CODE	1-st QUARTER	2-nd QUARTER	3-rd QUARTER	4-th QUARTER	ANNUAL EXPENSES
TOTAL EXPENSES A+B		94,000	217,860	247,610	219,530	779,000
A.RUNNING COSTS	1	24,000	37,860	47,610	53,530	163,000
I. EMPLOYEE COSTS	2	16,610	26,360	53,530	33,860	106,750
Salaries payable to employees	10	12,200	17,200	18,400	54,560	70,000
-Salaries	10	10,000	14,900	16,000	19,600	60,500
-Overtime	10	200	200	200	200	800
-Other rights	10	2,000	2,100	2,200	2,400	8,700
Social security (pensions)	11	3,050	4,300	4,600	5,550	17,500
Unemployment	12	610	860	920	1,110	3,500
Travels, temporary transfers	13	750	4,000	6,000	5,000	15,750
II.EXPENSES FOR MATERIALS & SERVICES	20	7,390	11,500	17,690	19,670	56,250
Food	22	400	700	900	1,000	3,000
Medicines & sanitary materials	23	0	30	40	30	100
Maintenance & cleaning	24	1,000	3,570	5,550	7,650	17,770
-Heating	24	100	0	0	700	800
-Light & electricity	24	50	300	500	650	1,500
-water, litter & sanitation	24	10	100	200	240	550
-postage,telephone,telex	24	100	250	300	350	1,000
-office materials	24	230	400	500	670	1,800
-cleaning materials	24	10	20	50	40	120
-other materials and services	24	500	2,500	4,000	5,000	12,000
Materials & services for functioning	25	4,390	5,000	5,500	6,290	21,180
Equipment ,spare parts & other	26	100	400	500	500	1,500
Overhauling	27	700	800	800	700	3,000
Major overhauling	28	0	0	0	0	0
Books & periodicals	29	100	150	150	200	600
Sundries	30	700	850	4,250	3,300	9,100
-training	30	200	400	500	350	1,450
-entertainment	30	0	50	50	50	150
-labour protection	30	0	200	200	100	500
-other authorised expenses	30	500	200	3,500	2,800	7,000
-helicopter renting		0	0	2,200	1,100	3,300
-audio & video promotion		0	0	1,000	1,000	2,000
B. CAPITAL COSTS	70	70,000	180,000	200,000	166,000	616,000
Investments of public institutions	72	70,000	180,000	200,000	166,000	616,000

Source: Euroconsult Team

Table 3: DDI Staff Profile: personal in post and vacancies May 1993.

<u>Function</u>	<u>In Post</u>	<u>Vacancies</u>	<u>Total</u>
<u>Direction/Administration</u>			
Directors	2	-	2
Scientific Secretary	1	-	1
Financial Officer	1	-	1
Senior Administrators	2	-	2
Support Staff (Secretaries, bookkeepers, cashiers, watchmen etc).	15	-	15
<u>Research Department</u>			
Graduate Research Staff	35	21	56
Research Technicians	4	3	7
Field staff (labourers)	42	-	42
Casual labour (provision for)	40	-	40
<u>Design Department</u>			
Graduate staff (Civil engineers, architects hydro technicians)	11	6	17
Field staff (labourers)	6	-	6
Driver	1	-	1
Storekeeper	3	-	3
<u>Transport</u>			
Boat Captain	3	-	3
Helmsman (hotel boats)	3	-	3
Sailors	5	-	5
Navys	4	-	4
Drivers	2	1	3
Chief boat mechanic	1	-	1
Mechanics	2	-	2
	<u>197</u>	<u>32</u>	<u>229</u>

Source: DDI

TABLE 4 : RESEARCH PROJECTS AT THE DANUBE DELTA INSTITUTE IN 1993

<u>Project Leader</u>	<u>Reference Number</u>		<u>Cost in lei'000</u>
V.Otel	1/1	Assessment and protection of the genofond in the DDBR	30000
C.David	1/2	The characterisation of the ecological factors which define the diversity of natural ecosystems in the DDBR	21000
I. Navodaru	2/1	The study of DDBR fish populations and establishment of the conditions for sustainable use through fishing	17000
J. Hanganu	2/2	The assessment of reed resources in the DDBR and establishment of the conditions for their sustainable use	18000
G. Gheorghiu	2/3	The assessment of vegetable resources in the DDBR and establishment of their sustainable use by traditional pasturing	8000
M. Suciu	2/4	The establishment of ecological conditions for the use of the deltaic landscape for tourism	7000
M. Filat	2/5	Researches for the assessment of game resources and the conditions for their sustainable use	10000
C. Ulvoczki	3/1	Researches for the reduction of the impact of economic activities in the antrophic ecosystems on the natural ecosystems in the DDBR	18000
D. Bandacu	4/1	Amelioration of the ecological state of the natural ecosystems and restoration of some polders in the DDBR	14000
V. Savulescu	5/1	The study of economic and social issues in the Danube Delta and their inclusion in the ecological management of the DDBR	7000
I. Grigoras	6/1	The assessment of the informatic system of the DDBR Authority including remote sensing and GIS Authority including remote sensing and GIS	10000
		TOTAL COST	160000

Source: DDI

ROMANIA

DANUBE DELTA BIODIVERSITY PROJECT

Implementation Plan

Explanation of Numbered Critical Events

<u>Number</u>	<u>Event</u>	<u>Explanation</u>
1	Mid Term Review	Reviews Progress in Project Execution Elimination of subcomponents with poor progress
2	New Wardens	If no sufficient number of new wardens appointed, reduction in warden equipment procurement
3	Establishment five Warden Sections	If not, no section specialization courses
4	GIS digital database for maps	If not ready, discontinue support for U. Mass
5	Obtain land for Phase II polders	If not, do not proceed with Phase II
6	Complete sturgeon hatchery study	If not, do not initiate hatchery construction
7	Obtain agreement for respon- sibility recurrent cost	If not, do not construct hatchery
8	Do not delay rust contract	If no contract by late 1995, drop component from project
9	Contract NGO	If no NGO can be found, find timely other solution
10	Obtain canal closure permit	If no permit can be obtained, drop component from project
11	Locally produce delta video	If not yet done, suggest contract with German TV
12	Contract specialist for bird life public awareness specialist	If not found, contract foreign specialist
13	Contract procurement specialist	If not, inform that disbursement will be suspended if specialist is not appointed by mid-1995

ROMANIA

DANUBE DELTA BIODIVERSITY PROJECT

TECHNICAL ASSISTANCE

1. The project funds technical assistance for a variety of activities. Much is provided free, the project financing only the transport and per diem. This is the case for the assistance provided by the WWF, University of Georgia, University of Massachusetts and "Birdlife." The table below summarizes technical assistance, and terms of reference follow.

TECHNICAL ASSISTANCE FOR WARDEN STRENGTHENING TRAINING SPECIALIST

Qualifications and Experience

2. The Training Specialist should have qualifications (educational training) and work experience in environmental education and ecology targeted to protected area management, in particular with temperate delta ecosystems. He should have familiarity with institutional strengthening, protected area legislation and its enforcement, approaches to patrolling, flora/fauna monitoring for ecosystems, habitats and species, wetland restoration, and public awareness needs of wetland protected areas. He should have experience in the design of curricula for training park warden in protected area management.

Scope of Work

3. The contractor will design specific curriculum and course descriptions for all of the different on-site courses that will be taught through the project, both by local and foreign expertise. The courses will provide hands-on experience with focus on organizational management, waterfowl management, wetland restoration and legislative aspects of wetland restoration, and public awareness. While there will be some classroom and lecture components, the emphasis should be on field and site-based activities. The contractor will ensure the courses cover the necessary skills to implement the project components. They should build upon successful practices from other wetland conservation areas and offer training opportunities that are also compatible with ongoing work in the parallel GEF Ukraine Danube Delta Project and throughout the Black Sea through the Black Sea GEF project.

Place/Duration of Duty

4. The position would be in Tulcea for 3 months, mostly in the early part of the project.

<u>Technical Assistance</u> (Staffweeks)								
<u>Expertise</u>	<u>Local/Expatriate</u>		<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>	<u>Year 5</u>	<u>Total</u>
<u>Warden Strengthening</u>								
Trainer	expatriate		12					12
Wetland Management Trainer ^{1/}	expatriate		1					1
Language Trainer	local		52	52	52	52	52	510
<u>Monitoring</u>								
Ornithologist (Birdlife) ^{2/}	expatriate		6	6	6	6	6	30
Wetlands Ecologists ^{3/}	expatriate		8					8
Database Expert ^{3/}	expatriate		8					8
GIS Specialist ^{3/}	expatriate		4					4
Bird Awareness Specialist ^{2/}	local		6	6	6	6	6	30
<u>Polder Restoration</u>								
<u>Polder Restoration Phase I</u>								
Surveyors and Mapping	local	ha ^{4/}	3,370	4,680	-	-	-	8,050
Hydrologist	local	mm	2	2	-	-	-	4
Baseline Surveys	local	mm	8	8	-	-	-	16
Annual Monitoring	local	mm	8	16	16	16	16	72
Faunal Surveys	local	mm	1	2	2	2	2	9
Supervise Baseline Surveys (WWF/Auern Inst.)	expatriate	mm	2	1	-	-	-	3
<u>Polder Restoration Phase II</u>								
Surveyors and Mapping	local	ha ^{4/}	-	-	8,000	8,400	8,000	24,400
Hydrologist	local	mm	-	-	3	4	3	10
Baseline Surveys	local	mm	-	-	12	16	12	40
Annual Monitoring	local	mm	-	-	12	28	40	80
Faunal Surveys	local	mm	-	-	1.5	3.5	4	10
<u>Chemists Training</u>								
DDI Chemist Training	expatriate	sw	6	-	4	-	-	10
Veg. mapping WWF/Auern	expatriate	sw	4	-	4	-	-	8
Autoanalyzer-Reed Restoration Research	expatriate	sw	4	-	-	-	-	4
<u>Ecosystems Restoration</u>								
<u>Sturgeon Hatchery</u>								
Design of Hatchery	expatriate	manyyears	2	-	-	-	-	2
TA to DDI	expatriate	mm	3	1	0.5	1	0.5	6
<u>Caraorman Canal Closure</u>								
Engineering	local	mm	2	-	-	-	-	2
<u>Pilot Fingerling Protection</u>								
Three TA Study Tours	expatriate	mm	-	3	-	-	-	3
Engineering	local	mm	-	6	-	-	-	6
<u>Management</u>								
Procurement Advisor	expatriate	mm	3	1	1			5
Financial/Program Advisor	expatriate	mm	2	2	1			5

1/ Will then host Romanian section leader with other wetland experts for one month training course in his home country.

2/ Salary costs contributed by "Birdlife"; GEF project pays for transport and per diems only.

3/ Wetland ecologist by WWF, database expert and GIS expert by University of Massachusetts.

4/ One month (i.e. 3 man-months) for 1,000 ha.

**TECHNICAL ASSISTANCE FOR WARDEN STRENGTHENING
OVERSEAS WETLAND STUDY TOUR**

Qualifications and Experience

5. The tour trainers and host organization should have qualifications (educational training) and work experience in protected area management, in particular with temperate delta ecosystems, including experience with institutional strengthening, protected area legislation, flora/fauna monitoring for ecosystems, habitats and species, wetland restoration, public awareness needs of wetland protected areas. The host area(s) should provide examples of different wetland management strategies focusing on nature protection and ecosystem restoration, but with techniques that are applicable to the Romanian Danube Delta. The host must be comfortable with both process/planning oriented components and implementing technical, on-site activities in wetland conservation areas. They should have specific experience in Romania with the Danube Delta and familiarity with the relevant local and national institutions (governmental and non-governmental) in the region.

Scope of Work

6. The contractor will primarily direct the study tour for 8 lead DDBRA Warden staff, including the Director, 2 warden leaders and 6 section heads. The tour will focus on waterfowl management, wetland restoration and legislative aspects of wetland restoration, and public awareness primarily. But the contractor should be familiar with the overall GEF project goals and design the tour to best fit these needs. While there will be some classroom and lecture components, the emphasis should be on field and site-based activities. The host will be expected to visit Romania before the DDBRA study to tour in order to better understand the needs of the DDBRA and Danube Delta conservation situation.

7. The contractor will ensure the tour is multi-disciplinary and builds upon successful practices in other wetland systems and will be compatible with ongoing work in the parallel GEF Ukraine Danube Delta Project and throughout the Black Sea through the Black Sea GEF project. The contractor also needs to make translation arrangements.

Place/Duration of Duty

8. The Contractor will first visit Tulcea (delta region) for a one week period during the first year the project. The Romanians will then visit the overseas study area(s) for a one month period during the first year of the project, during which time the host will accompany them.

**TECHNICAL ASSISTANCE FOR WARDEN STRENGTHENING
LANGUAGE TRAINERS POSITION**

Qualifications and Experience

9. The Language Trainer(s) should have qualifications (educational training) and work experience in teaching English, as a second language for Romanian residents, together with experience in organizing the teaching of French and German. They should also have experience with setting up a language lab, e.g. as in a university setting, designing formal and intense courses as well as ongoing, continuing education activities.

Scope of Work

10. The contractors will primarily with the DDBRA, but also other community leaders and DDI as necessary in instructing a formal training program in English, and organizing training in German and French. The emphasis in the first three years will be English, and French and German if the touristic demand warrants it. The courses are being taught so that the Romanians, in particular the Guide Warden Section, can interact with foreign visitors and colleagues in the implementation of the project. The Trainer(s) will be responsible for setting up the Language Lab, arranging the course structure, overseeing the lab equipment in conjunction with the DDBRA procurement staff, providing ongoing courses that are intense for 6 weeks at a time and arranged through the year in coordination with the staffing needs of the DDBRA, but also must provide course arrangements and curriculum for students to continue at their own pace after the formal courses.

Place/Duration of Duty

11. The Contractor will work in Tulcea, Romania full time throughout the project.

TECHNICAL ASSISTANCE FOR BIRD MONITORING (BIRDLIFE)

Qualifications and Experience

12. BirdLife (hereafter, Contractor) should have qualifications (educational training) and work experience in bird inventoring and monitoring techniques that are appropriate with temperate delta ecosystems. They should have specific experience in Romania with the Danube Delta and familiarity with the relevant local and national institutions (governmental and non-governmental).

Scope of Work

13. The contractor will work with the DDBRA, the DDI and the ROS in enhancing the existing activities related to bird monitoring and wetland management for the protection of species and habitats. They will work with the Survey Wardens of the DDBRA, the Biodiversity Research Group of the DDI and the local ROS person. They will help to

implement the ornithological aspects of the DDBRA Management Plan that is in first draft stage by Birdlife. They will help to ensure these aspects are implemented by appropriate institutions identified above and is compatible with other components of the GEF project, in particular Data Management and Public Awareness. They will coordinate with the Flevoland Institute (Netherlands) and the University of Massachusetts (USA) on integrating monitoring activities into GIS and mapping activities. They will ensure that the monitoring activities build upon successful practices in the Mediterranean and will be compatible with ongoing work throughout the Black Sea through the Black Sea GEF project.

Place/Duration of Duty

14. The Contractor will work throughout the Danube Delta, based in Tulcea, Romania, for three weeks, two times per year, for the total project period of 5 years, 1994-1998. The Contractor will contribute the staff time and the GEF project will cover all travel and related board/lodging expenses during this period.

TECHNICAL ASSISTANCE FOR PUBLIC AWARENESS (BIRDLIFE)

Qualifications and Experience

15. BirdLife (hereafter, Contractor) should have qualifications (educational training) and work experience in public awareness activities to promote nature conservation, specifically birds, and bird-related tourism that are appropriate with temperate delta ecosystems. They should have specific experience in Romania with the Danube Delta and familiarity with the relevant local and national institutions (governmental and non-governmental).

Scope of Work

16. The contractor will work with the DDBRA, the DDI, ROS and ProDelta in enhancing the existing activities related to bird monitoring and wetland management for the protection of species and habitats. They will work with the Survey Wardens of the DDBRA, the Biodiversity Research Group of the DDI, Prodelta NGO and the local ROS person. They will help to implement the Public Awareness and Ecotourism aspects of the DDBRA Management Plan that is in first draft stage by Birdlife. They will help to ensure these aspects are implemented by appropriate institutions identified above and is compatible with other components of the GEF project, in particular Monitoring and guiding activities by the DDBRA Wardens and the establishment of an Information and Education Department in DDBRA. They will ensure that the Public Awareness activities build upon successful practices in the Mediterranean and will be compatible with ongoing work throughout the Black Sea through the Black Sea GEF project.

Place/Duration of Duty

17. The Contractor will work throughout the Danube Delta, based in Tulcea, Romania, for three weeks, two times per year, for the total project period of 5 years, 1994-1998. The Contractor will contribute the staff time and the GEF project will cover all travel and related board/lodging expenses during this period.

TECHNICAL ASSISTANCE FOR PUBLIC AWARENESS (BIRDLIFE)

Qualifications and Experience

18. BirdLife (hereafter, Contractor) should have qualifications (educational training) and work experience in public awareness activities to promote nature conservation, specifically birds, and bird-related tourism that are appropriate with temperate delta ecosystems. They should have specific experience in Romania with the Danube Delta and familiarity with the relevant local and national institutions (governmental and non-governmental).

Scope of Work

19. The contractor will work with the DDBRA, the DDI, ROS and ProDelta in enhancing the existing activities related to bird monitoring and wetland management for the protection of species and habitats. They will work with the Survey Wardens of the DDBRA, the Biodiversity Research Group of the DDI, Prodelta NGO and the local ROS person. They will help to implement the Public Awareness and Ecotourism aspects of the DDBRA Management Plan that is in first draft stage by Birdlife. They will help to ensure these aspects are implemented by appropriate institutions identified above and is compatible with other components of the GEF project, in particular Monitoring and guiding activities by the DDBRA Wardens and the establishment of an Information and Education Department in DDBRA. They will ensure that the Public Awareness activities build upon successful practices in the Mediterranean and will be compatible with ongoing work throughout the Black Sea through the Black Sea GEF project.

Place/Duration of Duty

20. The Contractor will work throughout the Danube Delta, based in Tulcea, Romania, for three weeks, two times per year, for the total project period of 5 years, 1994-1998. The Contractor will contribute the staff time and the GEF project will cover all travel and related board/lodging expenses during this period.

TECHNICAL ASSISTANCE FOR DATA MANAGEMENT (UMass)

Qualifications and Experience

21. UMass (hereafter, Contractor) will provide experts with qualifications (educational training) and work experience in data management and GIS activities to promote nature conservation, specifically flora and fauna aspects, that are appropriate to temperate delta ecosystems. They should have specific experience in Romania with the Danube Delta and familiarity with the relevant local and national institutions (governmental and non-governmental).

Scope of Work

22. The contractor will work primarily with the DDI, but also the DDBRA in the establishment of an operational GIS system to incorporate the monitoring activities into computer-generated data and maps that can be used for management purposes. They will prepare equipment for the DDI/DDBRA. They will help to ensure these aspects are implemented by appropriate institutions identified above and are compatible with other components of the GEF project, in particular the inventory and survey monitoring activities, carried out by the DDI and the DDBRA. The contractor will coordinate activities with the ongoing assistance by the Flevoland Institute of the Netherlands, in conjunction with the DDI and DDBRA. They will ensure that the data management/GIS activities build upon successful practices in other wetland systems and will be compatible with ongoing work in the parallel GEF Ukraine Danube Delta Project and throughout the Black Sea through the Black Sea GEF project.

Place/Duration of Duty

23. The Contractor will work initially at UMass (USA) with 3 Romanian trainees, ten 1 month in Romania, 3 months again in USA and a final month in Romania. The Contractor will handle all procurement of equipment, shipping, etc. as outlined in the Project Document. Wetlands ecologist (principal investigator) would work for 8 months, the database management specialist (coordinator) would work for 8 months, and the GIS specialist for four months.

TERMS OF REFERENCE FOR POLDER RESTORATION
SURVEYING AND MAPPING OF POLDERS TO BE RESTORED (PHASES I AND II)

Scope of Work

24. The contract will be between DDBRA and local surveyors to survey the to be restored polders, and provide maps scale 1:10,000 with contour lines at 50 cm intervals. Mapping will take place after permission is obtained to restore the polders. Length profiles of the

principal existing drains will be indicated at the same horizontal scale as the map scale and a vertical scale of 1:10.

Place/Duration of Duty

25. For the polders of Phase I it is expected that surveyors will be lodged on board of the hotel boat. For the polders of Phase II, it is expected that surveyors can be lodged at the nearest new warden field station. Duration of field work is about 1 month per 1000ha. Fieldwork to take place during the summer low water period: July through October.

TERMS OF REFERENCE FOR POLDER RESTORATION HYDROLOGIST

Qualifications and Experience

26. The hydrologist should have experience in streamgauging and the installation of staff and recording gauges.

Scope of Work

27. For all polders to be restored the hydrologist should, on the basis of water level data to be supplied by Apele Romane, determine the present high and low water elevations outside the polder circumference. On the basis of the polder maps, he will determine the locations for the opening of the dykes so as to achieve a maximum inundation over the polder surface and through a through-flow avoid the occurrence of stagnant water pockets, making maximum use of already constructed or natural drainage channels. He will determine the location of and install staff and temporary recording gauges and correct their zeros to a common base. He will observe water levels after dyke breaching and determine discharge rates of in- and outflow, while at the same time DDI water quality team should analyse water samples of in- and out flow and record changes over time. For each polder, he should keep a map indicating the locations of the dyke breaches and gauges and keep a log of the observations.

Place/Duration of Duty

28. The observations should be made before and immediately after breaching of the dykes, a work that is expected to be carried out during the summer low water season. This is expected to require no more than two weeks per polder. After that, as part of the annual monitoring program, water level and discharge observations should be made during the high water spring inundation period when about two times a one week observation period per polder would be needed.

TERMS OF REFERENCE FOR POLDER RESTORATION:
BASELINE SURVEYS, ANNUAL SURVEYS, FAUNAL SURVEYS

Qualifications and Experience

29. A team of biologists with specializations in wetland vegetation, ornithology, ichthyology, microbiology, and also a soil chemist, is required. Highly specialized individuals will not be necessary. Because of the temporary nature of the work, it is suggested that for the most part graduate students from nearby universities be recruited who should work under guidance of more experienced professionals from DDI and during the first and second year also under technical assistance from the WWF/Auern Institute.

Scope of Work

30. The baseline survey serves to determine the "before" situation with respect to fauna and vegetation that exists in the to be restored polders, and compare this to the changes in animal and plant populations that occur as a result of exposing the polders to the alternating inundation regime once the dykes have been breached: the "after" situation. Obviously, greater changes are expected to occur in the agricultural polders than in the fish polders. In particular, a danger exists in the release of a high nutrient discharge from agricultural polders that are for the first time inundated. The water quality of the outflow from the agricultural polders should be monitored and also the content of nitrogen and phosphorus in the top 30cm of the soil before and after the first and second inundation cycle. On the basis of experience with the first two polders, it may have to be decided to temporarily block the outflow and create ponding, and then slowly release the drainage water to avoid occurrence of a nutrient shock in the surrounding wetlands.

Place/Duration of Duty

31. The baseline survey should take place around June/July and again during the autumn and those two baseline surveys combined would require about a month's work per polder for a team consisting of four scientists, or four manmonths per polder. The later annual monitoring could be partially carried out by the wardens, e.g. the faunal monitoring. Still, it is expected that the annual monitoring will require about 4 manmonths per year. As a result of the experience obtained with monitoring of the phase I group of two fish and two agriculture polders, it may be decided to change the monitoring program for the phase II polders. It would seem that after an initial period of four years, diminishing returns can be expected and in that case the monitoring effort should be curtailed accordingly.

TERMS OF REFERENCE FOR POLDER RESTORATION
WWF/AUEN INSTITUTE - TECHNICAL ASSISTANCE

Qualifications and Experience

32. The Auen Institute will make available an experienced geo-botanist and a wetland restoration hydrologist.

Scope of Work

33. The two members of the Auen Institute team will assist in the setting up of the baseline surveys of the first and second agricultural polders and the first annual survey of the first agricultural polder to be inundated. Together with DDI professional staff they will establish protocols for transects for vegetation monitoring and for water discharge and quality monitoring.

Place/Duration of Duty

34. During the first year, two visits of half a month duration are foreseen for the team of two: before the inundation, and after the breaching of the dykes. During the second year, the team will return during the inundation period.

TERMS OF REFERENCE FOR POLDER RESTORATION
CHEMISTS TRAINING

Qualifications and Experience

35. Two of DDI's water quality chemists and the scientific secretary of DDI with foreign language capability.

Scope of Training

36. The team from DDI will be trained in using the new in-situ water quality testing equipment. They will familiarize themselves with the new testing techniques that have been developed using selective enzymes for testing the presence of organic pollutants. They will bring along about a dozen water samples from different parts of the delta and also frozen Cormoran eggs, to have these tested for residus of toxins. On the basis of the test results, the need and type of more refined testing equipment will be determined in the light of the available supplies in Tulcea of support facilities, such as helium gas for gas-chromatography. A possible later return visit for the two chemists is foreseen to obtain further hands-on experience with more sophisticated equipment.

Place/Duration of Training

37. The N.V. Waterwinningsbedrijf Brabantse Biesbosch has offered to serve as host for the training visit. A two week first stay is foreseen during which also visits will be made to a laboratory in Ghent, Belgium, specialized in testing for organic pesticides and herbicides.

TERMS OF REFERENCE POLDER RESTORATION - TRAINING
VEGETATION MAPPING AT AUEN INSTITUTE, GERMANY

Qualification and Experience

38. Two recently graduated DDI vegetation biologists, who will participate in the baseline vegetation mapping and the annual vegetation monitoring of the polders that will be restored.

Scope of Work

39. In-service training in the Auen Institute in Germany to learn the setting up of vegetation transects and mapping techniques.

Place/Duration of Duty

40. Two weeks early in year 1 and another 2 weeks in year 3 of the project.

TERMS OF REFERENCE FOR REED RESTORATION RESEARCH - TRAINING
AUTOANALYZER WATER ANALYSIS

Qualifications and Experience

41. A water quality analysis expert from the University of Georgia with experience in operating and maintaining continuous auto-analyzers.

Scope of Work

42. Instruct three graduate students, who will be working in the Reed Restoraton Research program, in the operation, calibration and maintenance of the continuous water autoanalysis equipment that will be installed by the University of Georgia under its research agreement with DDI.

Place/Duration of Duty

43. The DDI research station at Uslina on the Sf. Gheorghe. Four weeks of instruction giving hands-on experience during year 1 of the project.

**TERMS OF REFERENCE FOR ROMANIA ECOSYSTEMS RESTORATION
STURGEON HATCHERY - TECHNICAL ASSISTANCE**

Qualifications and Experience

44. Ichthyologists, hatchery operators and water chemists from the Regensburg fish extension service and the Woellersdorf sturgeon hatchery.

Scope of Work

45. The German team will assist their DDI counterparts in setting up and accompanying the basic research into sturgeon behaviour. They will review alternative methods of restoring the sturgeon population, including restoration of spawning grounds in small tributaries of the Danube in Romania. If a hatchery in Romania appears the most appropriate solution, they decide on which types of lower Danube sturgeons may be suitable for propagation in the proposed hatchery. They will advise on location and operation of the proposed hatchery.

Place/Duration of Duty

46. It is foreseen that the German experts will spend three manmonths in and near Tulcea during the first year, while for subsequent years between half and one manmonth per year are foreseen for follow-up assistance.

**TERMS OF REFERENCE FOR ROMANIA ECOSYSTEMS RESTORATION
STURGEON HATCHERY - DESIGN OF HATCHERY**

Qualifications and Experience

47. The team that designed the Woellersdorf (Germany) sturgeon hatchery, plus surveyor and draughtsmen.

Scope of Work

48. Anticipating a positive outcome of the DDI studies of spawning and migration of Romanian sturgeons, the German design team will prepare the design drawings for the new sturgeon hatchery.

Place/Duration of Duty

49. Field work at the site for the hatchery, to be selected on the Sf. Gheorghe downstream from Tulcea. Most office design work to be carried out in Germany. About two manyears of combied different specializations will be required. Designs and specifications, including those for the laboratory and equipment, to be completed by the end of the first project year.

50. Important is to estimate, on the basis of the German experience, the requirements in staff, chemicals and other recurrent consumables and in particular the annual power consumption of the proposed Romanian hatchery, so that DDI and DDBRA can request their Ministry to decide about the availability of funds to sustain the operation of the hatchery, and whether construction is to proceed or not.

TERMS OF REFERENCE FOR ROMANIA ECOSYSTEMS RESTORATION
STURGEON HATCHERY - IN-SERVICE TRAINING FOR FISH HATCHERY
OPERATORS
(To be selected by DDI)

Qualifications and Experience

51. Two fish hatchery operators with experience in operating hatcheries of species different from sturgeon.

Scope of Work

52. In-service training at the German sturgeon hatchery. Familiarization of typical problems associated with breeding of sturgeons in captivity, including maintenance of water quality standards.

Place/Duration of Duty

53. The Regensburg fish extension service sturgeon hatchery in Woellersdorf. Two persons during a ten month period.

TERMS OF REFERENCE FOR ECOSYSTEMS RESTORATION
CARAORMAN CANAL CLOSURE - ENGINEERING

Qualifications

54. Hydraulic engineer with experience in river protection and canal construction in the lower delta.

Scope of Work

55. Design closure of the Caraorman canal inlet in the Sulina river branch, leaving a narrow opening for local traffic by small boats. Determine size of rock riprap protection against erosion from shipping waves in the Sulina channel at the site of the proposed closure. Prepare cost estimate of proposed works.

Place/Duration of Duty

56. Design to be carried out in Romania, preferably in Tulcea. Two manmonths are foreseen.

TERMS OF REFERENCE FOR ECOSYSTEMS RESTORATION
PILOT FINGERLING PROTECTION - STUDY TOURS AND ENGINEERING

Qualifications and Experience

57. Mechanical and pumping station design engineer.

Scope of Work

58. Visit constructions and devices used at the intakes of large pumping stations to prevent the entry of fish in the pumps. Design a fish protection for the Sarichioi 2 irrigation pumping station.

Place/Duration of Duty

59. Visits would be made to the Ukraine, Russia and the UK to inspect installations and recommended solutions. Surveys, civil and mechanical design work by local engineers is estimated to require about 6 manmonths. Study tour and design would take place in year two.

TERMS OF REFERENCE FOR PROCUREMENT ADVISOR (EXPATRIATE)

Qualifications and Experience

60. He should have qualifications and experience in procurement procedures, including World Bank procurement procedures, for goods, works, technical assistance and training.

Scope of Work

61. The Contractor will assist DDI and DDBRA with preparation of tender documents, including technical specifications for the goods and works to be procured under the project. He will advise on local and international shopping procedures and on criteria for bid evaluation, and will train local staff in these matters. He will leave computerized documentation behind him. He will also advise on payment procedures for overseas training courses.

Place/Duration of Duty

62. The expert will be in Romania for 3 months in year 1, 1 month in year 2 and 1 month in year 3, mainly in Tulcea but also in Bucharest as needed. The foreign expert may be supported by local TA if necessary.

TERMS OF REFERENCE FOR PROGRAMME COORDINATOR/FINANCIAL ADMINISTRATOR

Qualifications and Experience

63. He would have practical experience in protected area management and administration, together with qualifications in finance/accounting, and, preferably, ecology.

Scope of Work

64. The Program Advisor/financial administrator would design the establishment of financial recording systems for project expenditures, together with a simple programming system to assure that the appropriate "critical paths" in project implementation are followed. He would work closely with and train DDI and DDBRA staff in these procedures. He would have understanding of World Bank project disbursement procedures and financial reporting requirements.

65. He would also work with local staff to design simple project achievement monitoring indicators, and would ensure that the results of the ecosystems monitoring and impact monitoring of pilot wetland restoration activities incorporated into these monitoring indicators.

Place/Duration of Duty

66. The expert would be based in Tulcea Romania, for 2 months in the first year of project implementation, 2 months in the second year, and 1 month in the third year. The foreign expert may be supported by local TA if necessary.

ROMANIA
Danube Delta Biodiversity Project
Inflation and Exchange Rates

	Up to		Up to		Up to		Up to	
	Negotiation		Project		1995		1996	
	Start	1994	Start	1995	1996	1997	1998	1998
Inflation (in %'s) /a								
all								
Annual rates								
Local	0.0	0.0	0.0	1.3	1.2	2.4	3.2	3.4
Foreign	0.0	0.0	0.0	1.3	1.2	2.4	3.2	3.4
Compounded rates								
Local	0.0	0.0	0.0	0.6	1.9	3.7	6.7	10.2
Foreign	0.0	0.0	0.0	0.6	1.9	3.7	6.7	10.2
Exchange rates (Local/Foreign) /b								
all								
Rates actually used	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Constant purchasing parity rates	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
± deviation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

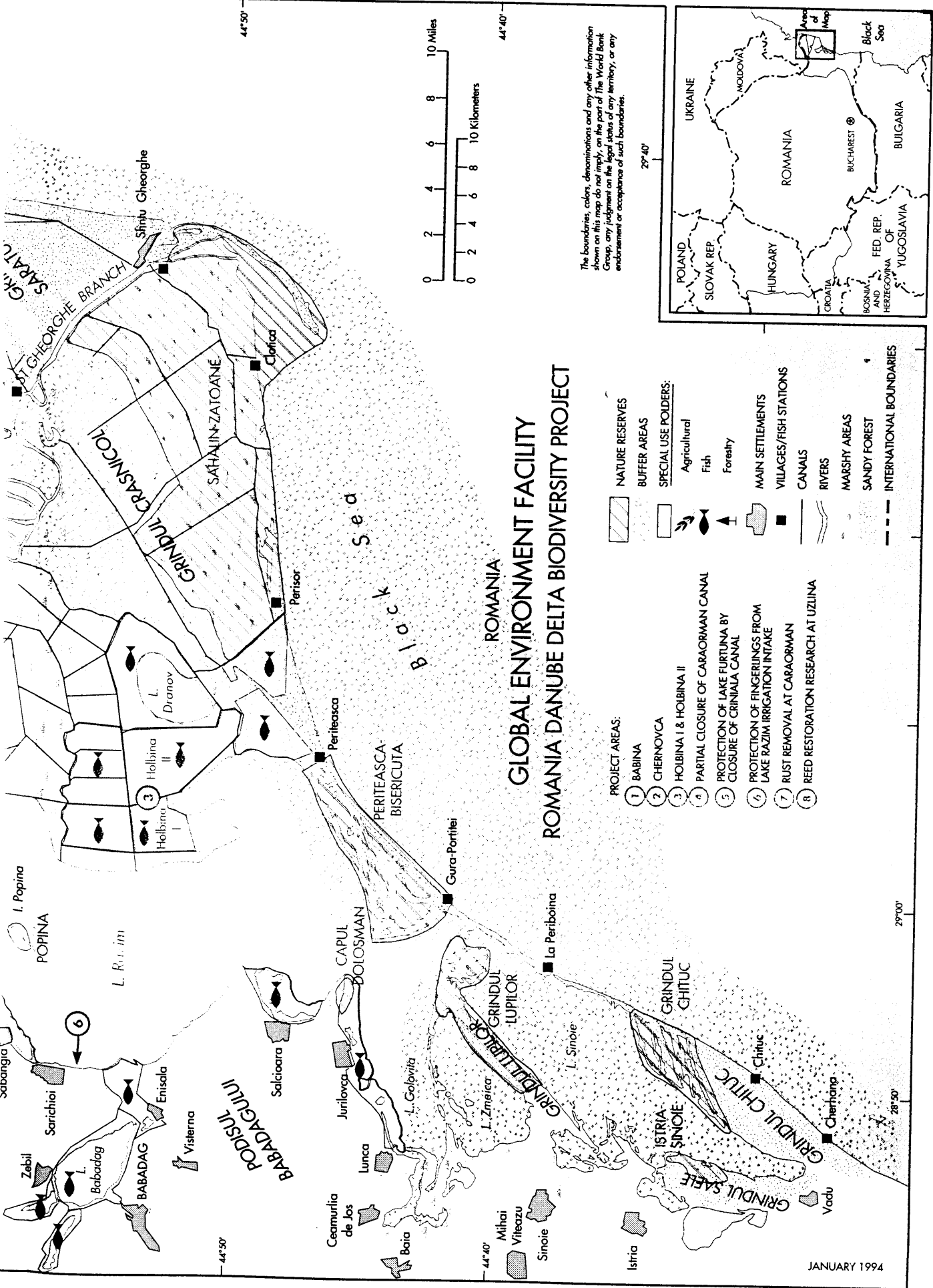
\a Yearly values are within Each Project Year
\b Yearly values are at Project Year Midpoints

Wed Nov 17 20:21:09 1993

ROMANIA
DANUBE DELTA BIODIVERSITY PROJECT

Documents Available in Project File

1. Danube Delta Biodiversity Project, Field Preparation Report, Huntings & Binnies, August 1993.
2. Environmental Status Report, Conservation Status of the Danube Delta, IUCN 1992.
3. EBRD Draft Inception Report, Technical Cooperation Project, Euroconsult/IUCN, April 1993.
4. Danube Delta Management Objectives, DDBRA, IUCN, September 1991.



The boundaries, colors, denominations and any other information shown on this map do not imply, on the part of The World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.

