

Environmental Management Issues Prevailing in the Danube Delta Biosphere Reserve

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Abstract

The Danube Delta has been declared since 1990 as a biosphere reserve. It is administered by a Governor and a Board of trustees acting pursuant to a specific legislative system which has improved from time to time. After 1990, in this reservation there was renounced to industrial activities for exploitation of natural resources. Pressure on biodiversity is manifested by all anthropogenic activities, however. Compliance with legislation and the introduction of new measures, established in the Danube Delta Development Strategy until the year 2020 will be materialized in improved social and economic life, as well as in preserving the landscape and conservation of biodiversity.

Keywords: Danube Delta, biosphere reserve, biodiversity protection, Danube Delta Administration.

JEL classification: Q5, P28

1. Brief overview of the Danube Delta

The Danube delta is the territory situated between the first bifurcation of the Danube in the West (Ceatalul Chilieii village), the Black Sea coast to the East, Chilia channel to the North and the complex of Razelm-Sinoe lakes to the South. It is the second largest delta in Europe after the delta of Volga, but it is one of the best preserved delta in the world (Table 1) (<http://travel.descopera.ro/6435855-Celemai-impresionante-delte-ale-lumii>; Greenly Magazin).

Table 1. Some of the spectacular deltas of the world

River	State	Surface, km ²	Special Features
Okavango	Botswana	9000-16000	The surface depending on the season; 400 bird species, 200000 large animals
Rhone	France	1930	One of the most well-protected deltas in the world
Gange	India	105000	The largest in the world
Nile	Egypt	25000	Danger of erosion, extinct species

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River	State	Surface, km ²	Special Features
Volga	Russia	over 27200	New delta
Mekong	Vietnam	over 39000	In the rainy season; risk of flood
Yangtze	China		The main polluter of the Pacific Ocean because of population overcrowding, agriculture, industry
Niger	Niger	over 70000	Risk of destruction of biodiversity
Lena	Russia		Major importance for global climate
Danube	Romania, Ukraine	5762	The best preserved delta in Europa
Pad	Italy	380	Its surface extends continuously; well-developed tourism

The Danube delta has a total area of 5762 km², of which 3510 km² are delta itself in the sector (Gastescu et al, 2008; Posea et al, 2005; Popa et al, 2006). This biosphere reserve also encompasses:

- 1145 km² for complex of Razelm–Sinoe lakes;
- 1030 km² marine water up to 20 m isobath;
- 13 km² Danube river bed on Romanian territory;
- 102 km² meadow floodplains of the Danube.

The delta itself is the largest component of this reserve and has a total area of 4178 km² mostly on the territory of Romania, i.e. 3510 km² (about 82%), the rest being located on the left side of the Chilia branch, including its secondary delta, in Ukraine.

In the Danube Delta there are two major sectors: River delta and River-Sea delta. The River Delta is originated from an old Danube Bay and contains a relatively large area of river inland, river banks, small depression areas and small lakes, at an advanced process of clogging. The River-Sea delta comprises maritime banks and covers a major lake complex that has relevant changes on contact with the Black Sea. The maritime levees were formed 6000 years ago due to alluvial processes, influenced by the local hipsometry, vegetation, water relationship between the branches of the Danube river and inland areas, differences in climate as well as landscape variation.

Today, the Danube Delta appears as a low aluvional plain covered by the marshes and waters, made from a network of canals, lakes, forests, dunes, swamps that interconnected with each other. The climate is continental-marine, heavily influenced by the Russian Plain, where the winds cause frequent storms, especially during spring and fall. However, the Danube delta is the most droughty and sunny part of Romania.

In the Danube Delta there are 30 types of ecosystems, from which 23 are natural and 7 are anthropic. Their presence offers conditions for most species of birds living in Europe. For instance, over 320 bird species have been identified in summer, of which 166 species nestle in the delta, and 159 species are migratory. Various species of fish live in water, they having a high ecological and economic value. Biodiversity is also found on the ground in a form of large variety of birds

and wild animals. We mention that the Letea forest is the only place in Romania where wild horses live. On the whole, the biodiversity of Danube delta constitutes a natural gene bank of inestimable value for natural heritage. Regarding local population, the inhabitants are reduced in number, according to the last census from 2011 being 17563 persons, concentrated mostly in the town of Sulina harbour and in 27 villages. The ethnic distribution is listed in table 2 ((The population and housing census, Tulcea county 2011).

Table 2. Ethnic composition of the population %

Romanians	Lippovans	Ukrainians	Other ethnic groups (Roms, Greeks, Turks, Hungarians, Bulgarians, Germans, Armenians)	People with no ethnicity declared
86.8	6.0	3.3	0.5	3.4

The Danube Delta was declared by the Government in 1990, as a biosphere reserve, a decision confirmed by Romanian Parliament and submitted in accordance with the Law No. 82/1993. The universal value of the reserve was recognized by its inclusion in the international network of biosphere reserves (1990), in the framework of „The man and the Biosphere” already launched by UNESCO in 1970. Arguments that underlie this decision were overlapped with the required conditions of a biosphere, namely:

- the Danube Delta reserve protects diversity and preserve genetical diversity as well as biological heritage of the ecosystems;
- the Danube Delta administration provides sustainable economic and social development through the harvesting of natural resources available, in accordance with the requirements of local populations and within natural biological regeneration potential of these resources;
- the Danube Delta represents the logistic support for environmental education projects, research and monitoring at local, national and global issues related to conservation and sustainable development.

Therefore, the Danube Delta has been classified as a biosphere reserve in the taxonomy (classification system) of the International Union for Conservation of Nature (IUCN) in 1990 and joined the UNESCO World Heritage Site in 1991.

2. Pressure on biodiversity

The lack of effective mechanisms of protection and the absence of substantial amendments led to the pollution of Danube upstream waters and the occurrence of private concessions, illegal constructions, high-speed racing boats that bother the birds, poaching unlimited and burning reed chaotic surfaces. Thus, major and serious problems remain unresolved in the Danube Delta.

Now there is pressure on vegetation, fish, birds or wildlife. Pressure occurs directly through hunting, poaching, overfishing of some species, including during

breeding periods, the use of inappropriate fishing practices, discarding captured fish in water, etc.

Inadequate investments for this area, as was the case for investment in the exploitation of sand in Caraorman or extraction of some minerals in the seaside area, have resulted in disruption of the existing natural balance by the disappearance of natural reproduction areas of fish and other species, clogging of channels, eutrophication of lakes and swamps, etc.

Lack of appropriate environmental legislation and ridiculously low fines or unpaid fines, are also key aspects that contribute to the persistence and worsening destruction of ecosystems and biodiversity. Fortunately, after 1990 it dropped to the industrial activities. Also, a multidisciplinary study regarding the state of almost 300 riverine lakes situated in large wetland complexes was made relatively recently (Coops et al, 2008). This report comprises hydrological modelling, remote sensing and monitoring of water quality, plankton, aquatic vegetation and fish communities.

The Letea forest was declared by the Romanian Academy since 1938 as a protected area; this place is the second reserve in Romania after Retezat Mountains, being the only place in the country that houses wild horses. Their number is estimated to 2000-4000, plus 1000 horses belonging to locals. Equines affect both forest and agricultural areas. It must not slaughter horses, but the creation of a secured zone, to prevent the horses to leave the area, while allowing tourists to admire them.

Hydro-technical works undertaken to deepening, alteration and extension the Danube river bed, development of artificial channels, including on the territory of Danube Biosphere Reserve, increase the risk of flooding in the Delta. Floods affect ecosystems and villages. Romania has received complaints on behalf of Ukraine concerning the ecological effects of these hydro-technical works made in the last fifty years. The "invoice" flood of 2010 amounted to 36 billion lei in Tulcea County. In general, aquatic components of floodplains, including secondary channels, disconnected and temporary waters as well as marshes, have received little attention, despite their significant contribution to biological diversity (Buisje et al, 2002).

However, among useful works made in Danube delta, the improvement of the hydrological infrastructure for navigation and fish production purposes and an elevated nutrient load in the Danube river water should be included (Navodaru et al 2002).

Introduction of the industrial facilities producing electricity from unconventional sources (wind, solar, heat pumps) can seriously affect ecosystems in the delta. Wind turbines produce noise, disturbing to human settlements. The birds are either injured, having sometimes fatal collision with the blades, tower plant, and cables or are removed from their natural habitats. Solar parks cover large areas of land; therefore, these areas should to be released by human activities.

Regarding **tourism development**, even if it does not reach the level of Pad delta tourism in Italy, it may be increasingly developed through varied offerings

that include: fishing, hunting, bird watching, recreation, relaxation, boating, cruises with floating hotels and water ski. Simple rowing boats or boats with electric motors, even speed boats, catamarans equipped with attendants (sailors and / or specialized guides) can be used for transport and rides along the channels. The improper storage of waste, noise and bustle of boats and people bothering routes of fish, birds and their natural habitats in general.

Agriculture, represented by the growth of plants and animals, should be performed in traditional River delta and in the River-Sea delta, and even on land temporarily covered by water (flood platforms). Thus, the agriculture provides sufficient food for the population and income sources (besides fishing). In this case, agriculture is not a pressure for the environment because it does not appeal to chemical stimulants or the existence of high levels of production. It is estimated that a good management can boost production of agricultural ecosystems in river delta.

In the Danube Delta are only allowed the following activities: tourism, agriculture, recreational (not industrial) fishing, forestry and timber harvesting, obtaining electricity from solar and wind, reed harvesting and hunting (with restrictions on length of seasons).

3. Management issues in the Danube Delta Biosphere Reserve

3.1 EU Strategy for the Danube region

Danube Strategy (<http://www.mae.ro/strategia-dunarii>) is a European Union project developed in 2010 by the collaboration of 14 countries bordering the Danube. Of these, nine countries are EU members (Austria, Bulgaria, Czech Republic, Croatia, Germany, Romania, Slovakia, Slovenia, Hungary), and five are non-EU countries (Bosnia-Herzegovina, Montenegro, Moldova Republic, Serbia and Ukraine).

The four priority issues of the Strategy are:

- connectivity (in transport, culture, tourism, energy networks);
- environmental protection (water management, biodiversity protection, risk management);
- increasing prosperity of Danube region (through education, research, competitiveness);
- improvement of governance (i.e. institutional capacity and internal security).

This strategy resulted in a Plan of Action adopted in 2011, which includes a detailed analysis of the current situation and proposes the kinds of projects to be implemented in the short, medium or long term. The objectives of the Plan are regularly monitored by the European Commission in the light of changing economic and social trends in the region.

As a country bordering the Danube and EU member, Romania will implement the strategy and the Action Plan and will get the benefits related to the followings:

- improved quality of life by increasing competitiveness and attractiveness of cities and villages along the Danube;
- obtaining economic advantages through business partnerships and cooperation between public and private sectors;
- organizing annual economic forums;
- attracting investment in strategic areas such as transport infrastructure, environment and energy.

In particular the Master Plan of Danube Delta was developed, which is a framework for the future development of the Danube Delta (http://mmediu.ro/master_plan_delta.htm). It sets out in detail the stages of development for Danube Delta Biosphere Reserve (DDBR) and stakeholders in the region, aiming to preserve the natural heritage, keeping local traditions and improving living conditions of the population in the area.

3.2. The Danube Delta Biosphere Reserve Authority (DDBSRA)

Danube Delta Biosphere Reserve Authority is the institution to manage the natural heritage of the national interest of the Reserve, as well as the restoration and protection of the physical and geographical units within this area. Danube Delta Biosphere Reserve Authority is responsible for managing public lands, having the authority and duties of environmental protection, too.

DDBSRA is a public institution with legal personality, subordinated to the Ministry of Environment. The Authority is headed by a Governor appointed by the Romanian government.

The main tasks of the of the DDSBRA are:

- knowledge of the current state of natural heritage including the evolution of environmental parameters (evaluation, monitoring, impact assessment, implementation of legislation in force, coordination of research programs, etc.);
- developing and implementing the management plan of danube delta biosphere reserve, which is the official document that governs all activities carried out across the protected natural areas, as well as in its vicinity;
- developing and implementing of public awareness and environmental education;
- developing regional and international cooperation.

The activities are geared toward:

- conservation and management of natural heritage;
- regulation, licensing, development on legal basis, and the approval of public and private projects;
- ecological restoration, investments;
- inspection and ecological surveillance;

- environmental education, information and public awareness;
- cooperation and international relations;
- management of the economic, financial and human resources.

The key performance indicators of the budget in the period 2009-2012 are presented comparatively in Table 3.

- conservation and management of the natural heritage;
- self-regulation-allowing the development of the legal basis and the approval of projects, whether public or private;

Table 3. Main indicators of budget the DDBSRA
(indicators from reports or activity programs of the DDBSRA)

Indicator	Measure unit	2009	2010	2011	2012
Budgetary funds allocated	lei	10093048	28743000	21737000	19843000
Payments	lei	10085700	18911199	19547071	8972199
Budget implementation	%	96.94	65.79	89.93	45.22
The investment budget	lei	-	15299000	4014000	-

One can be seen that within 2009-2012 period, the largest budget funds were allocated in 2010, when also were the highest values of investments. Meanwhile, expenditures were higher in 2011. Non-achievements the proposed budget funding is due primarily to the lack of projects with funding from grants.

In terms of investments with integral or partial financing from the budget allocated for the Danube delta administration they have been oriented in percentage of about 80% for:

- improvement of access trails and ornithological observatories;
- hydrotechnical works for improved circulation of water;
- design for the improvement of environmental conditions in areas of natural reproduction of fish;
- ecological reconstructions in fishery arrangements;
- afforestation for consolidation of banks, fund forest restoration;
- works for desilting and to prevent clogging of the main canals and streams;
- projects for providing electricity from non-conventional sources of energy.

3.3 The Danube Delta's Strategy for the period 2014-2020

The purpose of the Strategy is the economic and social development of the Danube Delta area, following the lifting of living standards, valorization of

economic and cultural potential as well as environmental protection and sustainable exploitation of natural heritage. To achieve these objectives the following interventions are proposed:

- increasing the quality of life through training, medical assistance, education;
- conservation of biodiversity;
- development and modernization of shipping infrastructure;
- improving the system of information and management of traffic along to Romanian sector of the Danube;
 - prevention of water pollution from ships;
 - more efficiency of the management system;
 - developing partnerships in support of the Reserve management;
 - the protection and preservation of the built heritage already constructed in the Danube Delta area, as ancient and medieval fortresses, churches, etc.;
 - the development of cultural tourism, in addition to the leisure and sports;
- the development of transport infrastructure in rural areas;
- preserving traditional occupations known in the Danube Delta.

Specific legislation strengthens the management measures. It thus regulates the fishing (e.g. prohibition periods and areas of fishing, zones for protection of living aquatic resources, effort and quotas allocated annually, tools and fishing methods permitted commercially, etc.). Rules on access and movement for ships and boats along the canals and inland lakes, tourism-related services, promoting ecotourism, transportation, agriculture and the system of fines represent also regulatory objectives.

Conclusions

The Danube Delta, which is one of the spectacular deltas of the world, being the second largest in Europe, entered the UNESCO World Heritage Site in 1991. This delta is classified as a biosphere reserve, its role in the conservation and protection of biodiversity allowing sustainable economic and social development. This role is fulfilled by exploiting natural resources, in accordance with the consumption required by the local population and within natural biological regeneration potential of these resources.

The management activity is carried out by Governor of Danube Delta Biosphere Reserve supported by the other executive directors of Administration, by leading and monitoring the staff. The activities take place on specific legislative basis. It was launched an integrated Strategy for sustainable development of the Danube Delta area for 2014-2020 period.

To meet the objectives of the strategy of economic and social sustainable development and the conservation of biodiversity, an implementation of an

integrated management system is required in order to fulfill these two major goals. At the same time, it requires the implementation of a waste management, reducing pressure on biodiversity, development of tourism activities, education, solving some border problems, fundraising, organizing scientific meetings, educational or sport contests, etc.

The problems in the delta are multiple and complex, providing even basic research objectives. To solve them, all persons on hierarchical scale involved in the management of Danube Delta, including leaders from Environment Minister, have the obligation to comply with legal duties, to show local initiative in domains organizational, legislative, etc. It is very necessary to preserve the heritage of the Danube Delta, in parallel with economic and social development.

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