

CHANGES IN BRAILA ISLANDS LTER SITE

Structural and functional changes occurred in the socio-ecological complex Braila Islands caused negative impact on goods and services provided by the ecosystems to the human society.

During the last century the wetlands were considered as wastelands (Costanza, 1995; Arrow et al., 1995; Musters et al., 1998; Schot, 1999; Turner et al., 2000; Vadineanu, 1998; Vadineanu et al., 2003), based on neo-classic economic principles and lack of scientific informations regarding the multifunctional role of wetlands. The same happened with an area from Inner Danube Delta - the Braila Islands (Brl) LTSEr site.

The development and implementation of policies and management plans in the field of agriculture, civil engineering and water management conducted to the conversion of those areas into mono-functional (crop, fish or wood) and highly subsidized systems (Vadineanu et al., 1998; Vadineanu, 2001). Do to the agricultural policies in the 60's, major part of the former wetland systems had been drained, hydrophilic vegetation and riparian forests have been removed, and intensive agriculture started. The development of massive drainage schemes within the area led to soil salinization. The use of the pesticides and the fertilizers increased between 1970 and 1987 and caused pollution and eutrophications in the remaining natural systems. Historical data show the shift between different ecological structures, the most important being the removal of wetlands but also diminishing of freshwater and forest/meadow ecosystems (figure 1).

During 1957 – 1982 important hydro-technical projects have been implemented for the development of water reservoirs, embankments, new canals for water diversion and river stretch regulation witch led to minimizing the normal Danube flow oscillation, perturbing the hydrologic regime (figure 2).

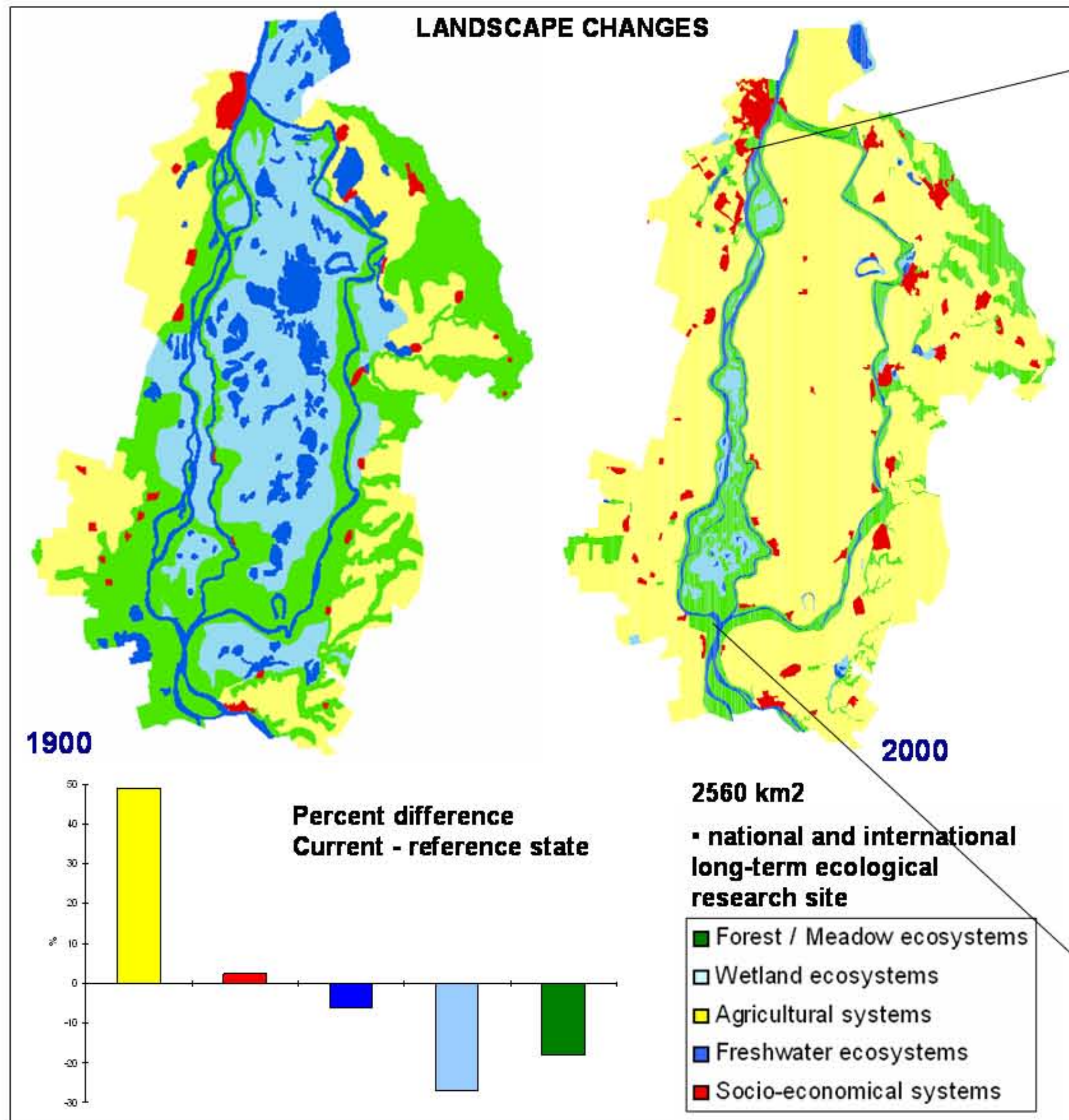


Figure 1. Landscape changes within Braila Island between 1901 – 2000.

Table 1. Goods and services provided by the Brl ecosystems (per year).

Brl REFERENCE STATE	Brl CURRENT STATE	SIB CURRENT STATE
<ul style="list-style-type: none"> -4 ktone of fish -30 km³ of timber -50 Ktone of vegetables and cereals -1,5 Ktone of animal products -habitats for spawning, breeding, nesting and feeding for a large number of fish and bird species -esthetic value -buffer area (nutrient retention; flood detention) <p>(Antipa, 1910)</p>	<ul style="list-style-type: none"> Input of concentrated energy (equivalent of 3 t crude oil per ha per year) -the yields per ha increased with a factor of 1.5 – 2 - fish yields similar or even below of those from natural water bodies - only 210 km² of natural areas <p>(Vadineanu & al, 2001)</p>	<ul style="list-style-type: none"> -650 tones of fish -10000 m³ of timber -600 tones of reed and rush -500 tones animal products -3 Ktone of vegetables and cereals -Nutrient retention – 3 Ktone total Nitrogen 170 tones total Phosphorous <p>(Vadineanu & al, 2001)</p>

Conclusions

1. Changes are a direct consequence of the intended human simplification of ecosystems structure and functions in a way that goods provided by the ecosystems have more weight comparing to services.
2. Structural and functional changes occurred in Braila Islands LTER site are cause specially by human intervention and regional climatic pattern changes.
3. Next step for preserving the remaining natural systems (SIB) and the goods and services provided by them is to study the influence of flow oscillation, climate and land use change on flooding regime (which is the main control factor in the area).

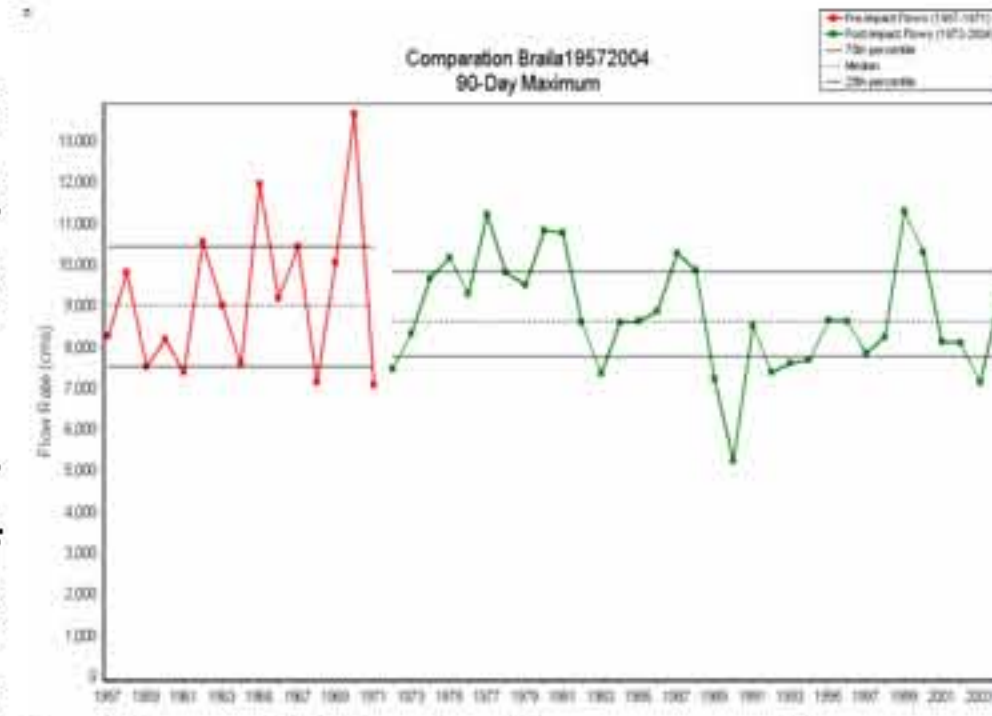


Figure 2. Danube flow comparison before and after the dams construction.

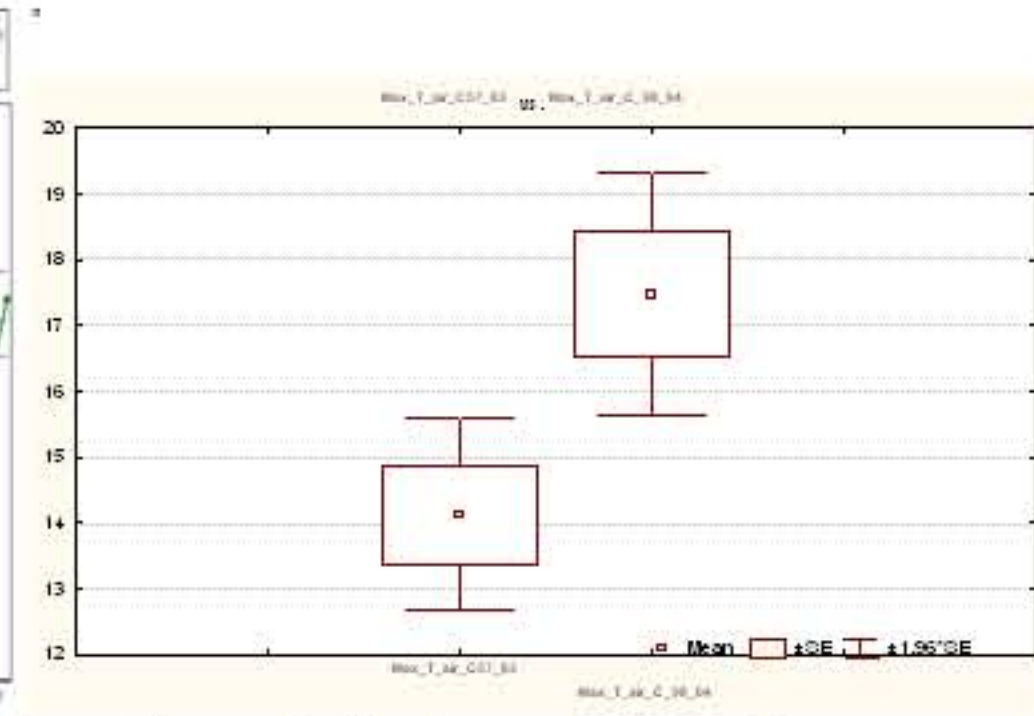


Figure 3. Maximum temperature comparison 1957-1963 and 1998-2004.

The analysis of the maximum temperatures recorded at Braila station for the interval 1957 – 1963 and 1998-2004 showed a significant 3 degree Celsius difference between the two means (figure 3).

All above mentioned changes occurred in the socio-ecological complex of Brl caused negative impact on goods and services provided by the ecosystems (table 1).

From the total area of 1923 square kilometers of natural wetlands formerly present in Brl, less than 31% have been maintained under natural and semi-natural condition. Among the remnant wetlands a compact and heterogeneous wetland system of 210.7 square kilometers, “Small Island of Braila (SIB)” (natural park, RAMSAR site and Special Protected Areas), have been preserved.

Table 2. SIB habitat types and areas (*not listed in HD).

Habitat type	Cod HD	Area (ha)
Natural eutrophic lakes	3150	2318
Forested marshes	91E1*	544
Riparian galleries and tickets	92D0	1710
Salix and Populus galleries	92A0	3181
Lowland hay meadow	6510	1589
Typha and reed beds and belts	7410*	2609
Riparian mixed forest	91F0	2238
Meadows an calcareous	6410	1604
Alluvial forest	91E0	46
Alluvial meadow of river valley	6440	60
River with muddy banks	3270	60
Channels and Danube arms	3280/3281*	5100
Antropic systems	-	15
Total area		21074

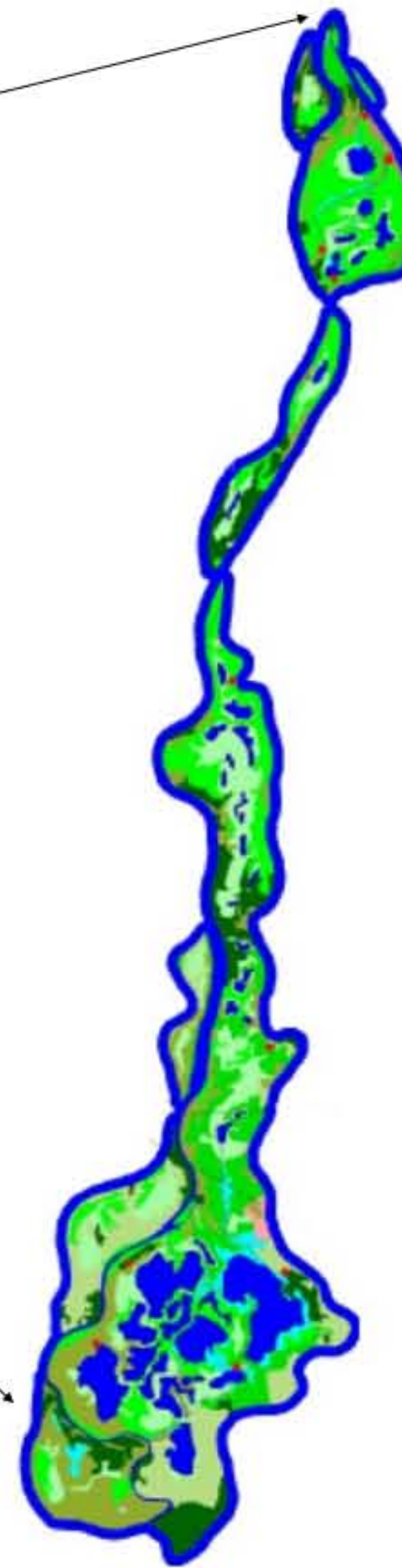


Figure 4. Small Island of Braila (SIB)

The SIB wetland systems consists in 10 islets established in a dynamic network of river arms, channels and lakes and strongly connected by longitudinal and lateral flows, under a natural hydrological regime (figure 4). SIB preserves, at a smaller scale, all types of habitats and ecosystems characteristics to Lower Danube River Plain (Antipa, 1910), with more than 50% natural ecosystems, 30% semi-natural ecosystems and less than 20% affected by direct human intervention - 13 types of habitats listed in EU-Habitats Directive 92/43/EEC (HD) (table 2).

Being a major node on bird's migration routes in South-Eastern Europe, SIB is significantly rich in birds: 136 species, from which 47 are listed on the annex of EU-Bird Directive and 34 are listed on the annex of Bern Convention, mammals (11 species), amphibians and reptiles (13 species), fish (65 species), terrestrial invertebrates (49 higher taxa), gastropoda and bivalvia (100 species), benthic organisms (60 species) (Vadineanu & al., 2001).

All this macro-structural, hydrological and climate changes put pressures on this fragile system, the main problem in the area being the siltation of shallow lakes and channels.