# Integrated water resources and coastal zone management in European lagoons in the context of climate change

**Project partners**

- University of Aveiro (PT)
- Bioforsk- Norwegian Institute for Agricultural and Environmental Research (NO)
- Institute of Hydro-Engineering of the Polish Academy of Sciences (PL)
- Atlantic Branch of P. P. Shirshov Institute of Oceanology of Russian Academy of Sciences (RU)
- Sea Fisheries Institute in Gdynia (PL)
- University of Dundee (UK)
- Odessa State Environmental University (UA)
- Potsdam Institute for Climate Impact Research (DE)
- Universidad de Murcia (ES)

**THEME: Case study area description and end users**

## Case study –Tyligulskyi Lagoon(Ukraine)

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### Description of physical conditions (Tyligul River basin and Tyligulskyi Lagoon)

The Tyligulskyi Lagoon (its local name is Tyligulskyi Liman) is located at the north-western part of Black Sea coast between the Cape of Adzhiiask and Odessa Bay. It is separated from the sea by wide sandy isthmus with 6.6 km length and 0.2–4.1 km width. An artificial canal with 15–25 m width and 2 m deep joins the lagoon and the sea. However the canal functions occasionally because it is intensively filled with sand from the sea.

The basin of Tyligulskyi Lagoon with 5420 $km^2$ area is located within steppe seaside plain partitioned by many ravines. The Tyligul River is the main source defining water regime of the lagoon. The length of the river is 173 km, with the riverbed width of 10-20 m, the basin area of 3550 $km^2$ and the average water discharge near the mouth of 0.7–1.6 $m^3/s$. In the years with low atmospheric precipitation the river dries up in the upper and middle streams for 5–7 months. The river is used for irrigation and water supply of small reservoirs and fishery ponds.

The lagoon is narrow quasi-meridional reservoir. Subject to the water level, its length and width vary from 55 to 80 km and 1.3 to 4.5 km respectively; thereafter, the water surface area ranges from 150 to 175 $km^2$. The northern and the central parts are shallow with the average depth of less than 3 m, however the southern part is deeper – some depths exceed 10-15 m, with the maximum of 19 m. The lagoon shoreline is formed by the alluvium and has complex shape with many spits.

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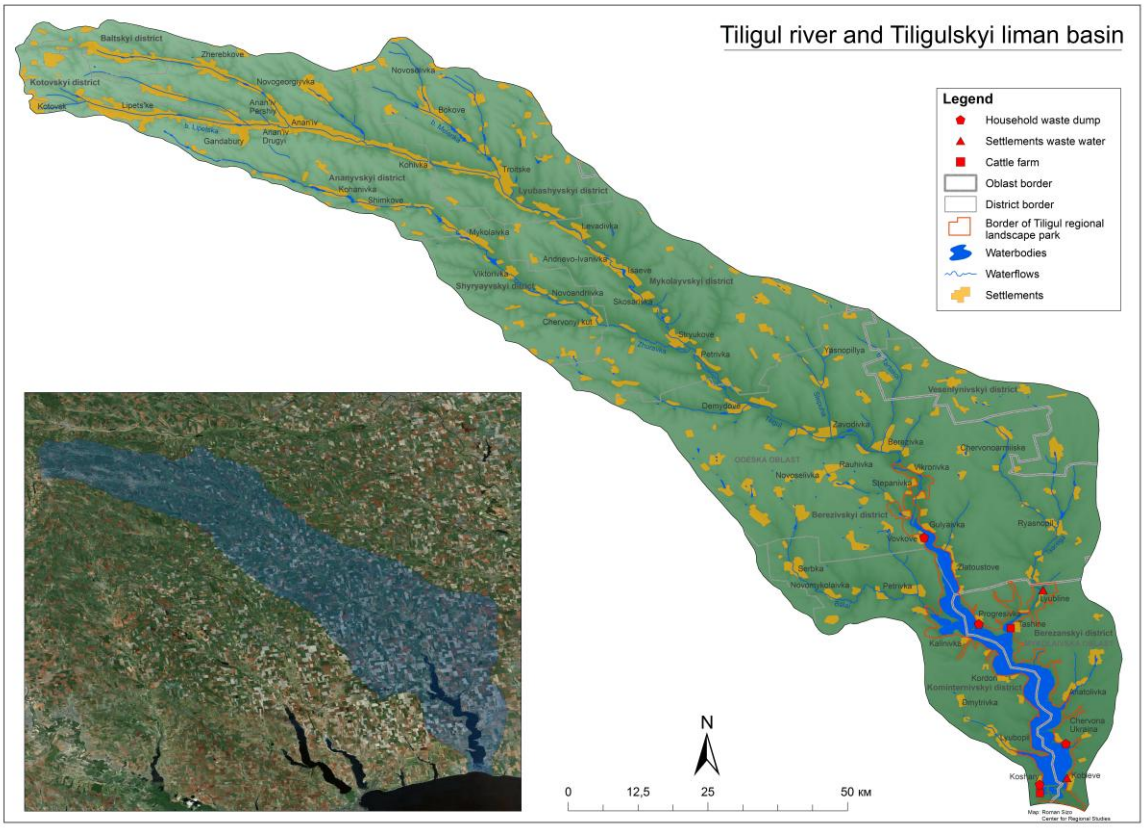
The basin of Tyligulskyi Lagoon is in the southern steppe zone with arid hot climate. From May to September, the evaporation almost three times exceeds the precipitation. As a result of anthropogenic transformation in the lagoon drainage basin, considerable withdrawal of the Tyligul runoff for economic purposes, in dry years the water surface in the lagoon during the summer isolation period is reduced by 0.5–1 m. Under the connecting canal being functional the intensity of water exchange with the sea depends on wind-induced short-period sea level fluctuations with the amplitude reaching 1 m.




The water temperature in the lagoon varies over a wide range: from 0.1–0.2 °C in winter to 32–35 °C in shallow water in summer. In cold winters the lagoon can be covered with ice for 1-2 months. The thickness of the ice cover can reach 0.5 m. The water salinity in the lagoon can vary from 5 $^{o}/_{oo}$ during the spring high water to 20 $^{o}/_{oo}$ in autumn. In the past, when the Tyligul River runoff made a substantial portion of the water balance of the lagoon, there existed a well-defined partition of the lagoon into the salty southern part (about 15 $^{o}/_{oo}$) and the demineralized (8.5 $^{o}/_{oo}$) northern one. Increasing frequency of dry seasons in the 1990th and sporadic functioning of the canal resulted in an overall increase of the lagoon salinity of up to 17 $^{o}/_{oo}$ in the northern part and to 21 $^{o}/_{oo}$ in the southern one. During the complete isolation of the lagoon in the 19th century, the salinity of its waters amounted to 40 $^{o}/_{oo}$.

**Main water management problems (ecological/environmental, social, economical etc)**

The major components of water management in the basin of Tyligulskyi Lagoon are the agriculture, recreation and transport.

The long distance pipelines – ammonia pipeline Togliatti–Gorlovka–Yuznoie, gas pipeline Shebelinka–Odessa, and oil pipeline Kherson–Snigirevka–Odessa – cross the basin of lagoon. The area is intensively used to cultivate cereal, vegetable, cucurbitaceous and industrial crops as well as for gardening, viticulture, aviculture and animal breeding.

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During the last decade, numerous country cottages were built on the shores of the lagoon. The summer resident size reaches 50 thousands during the summer holydays. However a centralized refuse collection and sewerage system are absent in the holiday villages resulting in the pollution of ravines and their slopes as well as lagoon's coastal zone and water area.

The sea-side of isthmus is used for the climatic health resort "Koblevo" that allows the health improvement for about 180 thousands recreation users per year. Important resource of recreation complex is the natural therapeutic muds with reserves of 14 millions tons. The muds can be used for the health improvement of 100 thousands patients. There is the base for the hang gliding close by Kalinovka village. Also, an ancient Greek settlement is excavated near Koshary village.

In 1995 the water area of the Tyligulskyi Lagoon and the part of adjacent territory in Mykolayiv region became the landscape regional park. In 1997 the similar status was conferred on the part of adjacent territory in Odessa region. The area of the landscape park at the western lagoonside is about 140 $km^2$ including 100 $km^2$ of water area.

The Tyligulskyi Lagoon is included in the international list of Ramsar Convention on Wetlands. The land covers 26,000 $km^2$ within the Mykolayiv and Odessa regions. It is one of a few wetlands, which nowadays preserved its natural seashore landscapes; its ecological system possesses unique conditions for life of the animal and vegetable world, the lagoon water area is of great value for maintaining biological balance of the region. The lower part of the lagoon is the place of fattening, nesting and rest of migratory birds, and that made for establishing here an ornithological reserve, as well as including the Tyligulskyi Lagoon in the list of "Important Bird Areas" (IBA). However the uncontrolled load on natural ecosystems due to the expansion of the holiday villages and free-wheeling holidaymaking expose to danger for the preservation of steppe rare species as well as violate conditions for the bird nesting.

**End users**

The groups of end users taking an interest in the preservation of viability and development of the Tyligulskyi Lagoon are as follows:

- Local, district, and regional authorities;
- Various economical subjects (population of coastal villages, country cottages, climatic health resort "Koblevo" etc.);
- Mykolayiv and Odessa landscape regional park;
- Recreation users (tourists, holidaymaker, fishermen, hunters etc.);
- Scientific and nature conservation institutions.

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