



EUROPEAN UNION
European Regional Development Fund



Interreg 
Mediterranean

 **EcoSUSTAIN**

Project co-financed by the European
Regional Development Fund

About EcoSUSTAIN

EcoSUSTAIN is a project with the full name Ecological sustainable Governance of mediterranean protected Areas via improved Scientific, Technical and Managerial Knowledge Base and is funded under the European Commission's Programme for Interregional cooperation in Mediterranean countries, Interreg MED. The project is co-financed by the European Regional Development Fund (ERDF) and by the Instrument of Preaccession (IPA).

Introduction

Tourism activities and increased presence of NGO's with conservation activities have enhanced in the last decade. Consequently, degradation of the water quality occurred whilst tourism activities have changed positively. Furthermore, usage of chemicals in agriculture, organic waste in the fields along with discharges from settlements facilities represent one of the main sources of pollution and contamination. That is why Ecological sustainable Governance of Mediterranean protected Areas via improved Scientific, Technical and Managerial Knowledge Base project (EcoSUSTAIN), represents joint transnational action towards maintenance of biodiversity and natural ecosystems. Joint actions are reached by means of stronger management and networking of protected areas which is obtained through capacity building, innovative technologies, improved management knowledge base and pilot implementation of innovative water quality monitoring solutions in several protected wetland locations across the programme area. Considering the above mentioned reasons, EcoSUSTAIN overall objectives are:

- *Improvements of management knowledge base*
- *Improvements of networking and harmonization*
- *Improvements of water quality monitoring by provision of live, early warning messages in short term monitoring (sensor-equipped buoys) and long term monitoring (satellite imagery processing) means.*



These actions are ones to hamper protection and promotion of Mediterranean natural resources, as well as maintenance of biodiversity and natural ecosystems.

The Mediterranean region leans massively on the natural ecosystems and the biodiversity protection when it comes to its inhabitants' quality of life, territorial attractiveness, tourism and the socio-economic development of each Mediterranean country. Essential natural resources, water in particular, are highly valuable. Expanding tourism activities, growing usage of chemicals in agriculture, industrial activities, organic waste in the fields along with discharges from settlements facilities, represent several sources of the pollution and contamination of the MED blue gold: **water**.

The fact that human actions and interactions endanger more and more our natural ecosystem, brings together several National Parks, Protected Wetlands, Universities, Development Agencies and private sector in a joint transnational action for the safeguard of natural ecosystems.

EcoSUSTAIN's Partners are working together on the:

- **Improvement of management knowledge base to be applied by any authority working with water quality in natural areas, parks, protected spheres;**

- **Improvement of networking between authorities managing these areas across the Mediterranean, and harmonization of different management systems;**
- **Improvement of water quality monitoring with live, early warning messages in short term monitoring (sensor-equipped buoys directly installed in natural parks) and long term monitoring (satellite imagery processing).**

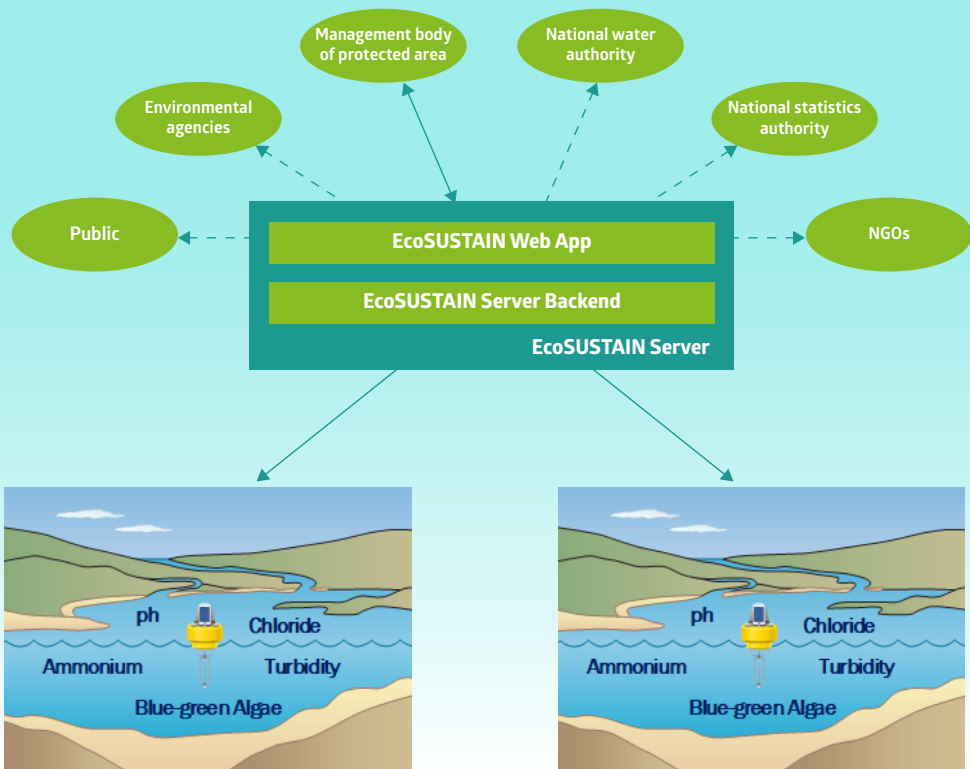
EcoSUSTAIN project works also on sharing its valuable results on the protected areas management know-how and harmonization, networking among MED Parks and installation of ICT tools, with potential stakeholders who could largely benefit from the project's experience. Several occasions to involve external participants have been set in place, such as Study Visits inside National Parks and Public Technical event.

Gain data and experience on a better way to manage one of the most precious natural resources Mediterranean has and share them widely to multiply positive effects, is what drive us, and the reason why we ask you to join our experience.

EcoSUSTAIN water quality monitoring solutions

The EcoSUSTAIN project has two pilot monitoring solutions – the STMS (short-term monitoring solution) and the LTMS (long-term monitoring solution). On the other hand, the LTMS incorporates remote monitoring of environmental indicators of water quality through the use of relevant open satellite data and presents them on a dedicated client application (installed in user's premises) over a GIS mapping of the area of interest.

The STMS incorporates in-situ continuous monitoring of the water quality parameters relevant to each location. Multiple water quality sensors are mounted on a single buoy, equipped with solar panels to provide the power and a device that logs the measurements and sends them over the internet to the EcoSUSTAIN server. The data from all four locations is collected on this server and used in various ways within the EcoSUSTAIN web application. The web application allows users to view interactive charts for each of the locations, create reports and analyse the data efficiently. In case any of the parameter values is outside of the acceptable range, an alarm is automatically sent to the responsible authority to hasten the calamity abatement process.



Croatian National Park Krka in the EcoSUSTAIN project

Krka National Park has an area of 109 square kilometres and is located in a highly inhospitable part of Dalmatia, one characterised by a great shortage of water, particularly in the summer. The course of the Krka River is specific, and the canyon appearance is the result of the geological structure and the stony terrain through which it flows. The fundamental feature of the Park is the tufa barrages that are constructed by the cascades. The higher the cascades, the slower the flow of the river, which in turn leads to the origin of numerous lakes, large and small. Visovac Lake is among the biggest, and was created by the rise of the travertine or tufa barrage called Skradinski buk. Visovac Lake, which has an area of about 10 square kilometres and depths down to 25 metres, is a reservoir of fresh water. The lakes are a closed

and unique aquatic sedimentation system closely connected with and dependent on the environment. Characteristic of lakes like Visovac, arising in the karstic regions, is the precipitation of a carbonate sediment. Dissolved carbonate precipitates as calcite, which forms the future tufa or travertine. Visovac Lake is a monomictic system featuring a high input of fresh water, and these freshwater increments are the basic factor in the eutrophication processes in the lake, and at the same time the main pathway for the introduction of various anthropogenic components.



The processes of eutrophication and the consequences they involve for the lake depend on hydrological and climatological conditions. The flow of the Krka is determined by how long it takes for water to be exchanged in the lake basin while the climatological cycle affects seasonal stratification and plays an important role in the dynamics of phytoplankton and the cycle of organic matter. Although Visovac Lake is located in a sparsely inhabited area, in the upstream part of the river there are important anthropogenic sources that affect the quality of water, and research has shown increased eutrophication because of the significant input of dissolved or suspended material.

A buoy put into Visovac Lake and long-term monitoring of the main ecological factors involved in the development and survival of the communities in the lake will enable better management of and prompt reaction to changes observed, for the upkeep of the quality of the water and a favourable flow are a priority task for the ecological protection of the area.

Spanish L'Albufera Natural Park in the EcoSUSTAIN project

L'Albufera Natural Park located 12Km south of the city with a surface of 21.120 hectares is Ramsar, Natura 2000 network, SPA for birds and home to different habitats where the predominance of water makes it a focal point for biodiversity. More than 350 bird species find here the ideal habitat to feed, rest during their migratory trips and breed. L'Albufera of Valencia lagoon is surrounded by thirteen municipalities and provides services to humans, who obtain benefits related to agriculture, landscape, tourism, fishing, or “green lung”.



L'Albufera Natural Park

Nevertheless, wetlands are very fragile and suffer great pressures caused by human population growth. The existing biodiversity in these spaces is endangered by the negative impacts they are experiencing due to the intensive rice farming or the uncontrolled discharges that reach the lake through diffuse pollution by channels and ditches. The STM system will test the water quality in the outlet of Tancat de la Pipa; Constructed Wetland (CW) designed to purify the Albufera water's; and its variations in parameter concentrations when the CW system doesn't work. This will allow knowing what is the positive impact of the Tancat de la Pipa effluent in the Albufera Lake and will help the managers to making decisions regarding the volumes of water to be treated to maximize the effectiveness of this CW.

National park Una in the EcoSUSTAIN project

Una National park is situated in the north-western part of Bosnia and Herzegovina and by being established in 2008 it is the youngest National Park in Europe. This area presents a unique natural whole, valuable for preserving the total terrestrial and biological diversity, especially due to its position, located at the interface of three climate zones, karst forms and hydrography which together with Korana and Krka river basin are unique on a European scale.

Una is almost with its entire longitudinal cascading river. It is special for its sedentary barriers, which are also the biggest value of the river Una. Sedentary barriers create waterfalls, riverside islands, cascades, beech trees and larger waterfalls associated with tectonic movements. The sediment sedimentation process, in pure natural waters is the result of certain physic-chemical and biological processes of calcite precipitation in karst waters, as a circuit process in strictly certain conditions of biotope, pH, and temperature, saturation of calcium carbonate, calcium and magnesium content. Sedentary barriers (tufa) are formed of soluble calcium carbonate in the waters of this karst river, where in the turbulence of pure and cold water, by the spillage and evaporation of calcium bicarbonate releases carbon dioxide, and precipitates calcium carbonate. Sedimentation of tufa is accelerated by the phytogenic processes which can be particularly pronounced in algae, which consume carbon dioxide from



National Park Una

the water. Habitats on sedentary waterfalls with their specific ecological conditions represent a special biotope, which is significantly different from all other habitats in freshwater. Except for tall plants and diatoms, a total of 42 species of plants were found on the waterfalls, 25 types of algae, 17 species of moss. Because of this, mosses are often called tufa makers. By disturbing the established natural balance, reducing water flows, climatic changes or water pollution, there may be disturbances in the natural process of sedimentation or even to the complete loss of tufa in the river Una.

We must protect and sustain the processes that depend on its survival by insuring that tufa creation processes stay maintained and undisturbed. With this pilot implementation of innovative solutions we will be monitoring water quality with state-of-the-art ICT technology that enables receiving information directly through the buoy that will be equipped with sensors and installed at certain location in Una National Park. The selected sensors will monitor parameters necessary for determining the quality of water which will provide us long-term tracking based on satellite data processing. Collected information will enable us to react promptly to any changes when it comes to water pollution and disturbance of natural processes. Upon completion of the project, the acquired knowledge and technology will be transferred to the relevant institutions and other interested partners for the comparison and future use.

Lake Karla in the EcoSUSTAIN project

The newly reconstructed Lake Karla situates in (39o26'49"-39o32'03"N and 22o46'47"-23o51'50"E) the lower part of the former natural lake. Features originally included in the design, along with other measures, for the best functioning of the lake are: a) Wetland buffer zones, in form of channels for drainage water with reedbeds and halophytic vegetation, b) Riparian zones, a "first line of defense" against farmland wash-out, c) Establishment of bird nesting areas on artificial islets, d) Fish-breeding sites with standard depth favoring carp reproduction to boost fishing potential resulted. Due to technical issues, budget flow and unfinished works, the lake is smaller and shallower than had been designed, with extremely long water retention time, suffering from water level drop, eutrophication and cyanobacterial blooms, and water quality deterioration.

The lake is protected by both National and International laws and treaties (Ramsar, Natura 2000 network, SPA for birds, Wildlife Shelter) and is characterized as a vital



Lake Karla

aquatic ecosystem in terms of biodiversity and values offered to society. Satellite imagery processing software will be installed in the management body premises and this remote monitoring solution will assist to ecological status assessment and to quantification of anthropogenic pressures in order to take the optimal management measures in long-term for achieving a better ecological potential.

Mincio Park in the EcoSUSTAIN project

Mincio Park, located in the eastern part of Lombardy, stretches from the regional confines in the north to the river Po in the south, embracing the valley of the River Mincio. The territory is varied and extends from the hills, to the terraced plains, from the area of meandering riverbeds to the complex of lakes of Mantua, with the exceptional wetlands of the Mincio valleys.

The places of the Mincio Valleys are characterized by a marked biodiversity originating from the harmonious meeting between the plain and the river waters, which in this point widen and divide into hundreds of branches and meanders, and is inhabited by rare animal and plant species, some of them endangered or protected. The valleys are also a Nature Reserve of international importance according to the Ramsar convention, one of the Natura 2000 Network Sites and Special Protection Area due

to the presence of many protected bird species. The Mincio Valleys Nature Reserve is characterized by the presence of hydrophilic grasslands and groves of reeds, namely endangered habitats because of the natural silting up process. There is a whole amount of 60 plant and flower species of conservation interest, and there are 55 ornithic species of community interest, such as colonial herons, diurnal birds of prey, grebes and ducks.

With EcoSUSTAIN, Mincio Park has activated water quality's monitoring actions through four multi-parametric probes, located in strategic places of Natura 2000 Network Site (Mincio Valleys Ramsar Nature Reserve, Vallazza and lakes of Mantua) for the analysis and the evaluation of the river's dynamics, in order to allow the implementation of an alert-system capable of detecting critical situations (anoxia, superheating, accidental dumpings) and activating remedial actions (increase of flows, specific survey shipments for the sites etc.). It's a further step toward a smart running of the River Mincio, in which different actors of the same "virtual table" offer targeted interventions to safeguard quality and quantity of the Mincio waters, in order to prevent the silting of the Valleys, conserve and protect biodiversity, flora and fauna and the several ecosystems connected. The system puts into effect one of the actions of the Governance Pact "River Mincio Contract" for the future of Mincio river.



**5 Protected
Areas** For
Biodiversity

Pilot Activities
for Water Quality
Monitoring

**Knowledge
Transfer**

1.753.226,36 €
Project budget

10 Project partners
from 5 countries

30 Months
Project duration

Project partners



University of Rijeka,
Faculty of Maritime studies



RGO
Communications Ltd.



ARATOS
Technologies S.A.



Regional Park of
Mincio



Development Agency of the
Una-Sana Canton



ALOT S.r.l.



Democritus University
of Thrace



Global Nature
Foundation



Nacionalni
park Una
Una National Park Ltd.
Bihac



National Park Krka



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