Project INHABIT

Local hydro-morphology, habitat and RBMPs: new measures to improve ecological quality in South European rivers and lakes

surface waters | eutrophication | fertilizers | water pollution

PROJECT DESCRIPTION

The **Water Framework Directive 2000/60/CE** (WFD) is a key legal instrument of the European legislation to prevent deterioration of water quality, protect and improve the status of water bodies (rivers and lakes) and ensure sustainable use of water resources. In the same vein the project INHABIT focused on the **habitats as the key to understand the functionality and the ecological status of water systems**. The project had the objective to integrate information on local hydromorphological characteristics and on habitat conditions into practical measures aimed at **improving the River Basin Management Plans** (RBMP) - the operational instrument through which the EU member states implement the WFD at local level -, and at ensuring reliability of the ecological status assessment of water bodies in South-Europe. The initiative focused on the analysis of **rivers and lakes** in two selected Italian areas: **Piedmont** (Alpine and plain areas) and **Sardinia** (Mediterranean area), covering a wide range of environmental characteristics and water body types. The approaches used for lakes and rivers were similar, with some specific difference related to the type of water body.

OBJECTIVES

The project objectives were to:

- quantify and understand the natural variability in undisturbed conditions of selected hydromorphological, habitat and physico-chemical features, which are known to have a significant effect on biological communities, the Biological Quality Elements (BQEs);
- evaluate and describe the range of variability of the anthropogenic disturbance factors in relation to the variability of natural factors in order to have a more accurate classification of ecological statuses;
- put into practice, disseminate and eventually update the latest approaches and methods for the collection of biological and habitat data compliant with the WFD, the classification of ecological status and the technical implementation of management plans in the study areas;
- understand if, how and for which aspects habitats can globally affect the assessment of the ecological status and can cause the uncertainty of such assessment, whether it depends on methodological or measurement errors, or on the hydromorphological and habitat characteristics;
- integrate the produced information with a view to update existing management plans with measures related to hydro-morphological and habitat conditions, so that the good ecological status of rivers and lakes can be reached with less expenses and in less time and with a prior, objective estimation of the effectiveness of the possible measures.

PROJECT PHASES

The project was composed of the following phases of both demonstrative and innovative characters:

- **Preparatory phase – revision of approaches, methods, and selection of methods, procedures and study sites.** Activities performed in this phase were mainly related to the analysis of the approaches and methods of the management plans; selection of suitable study sites (stretches of rivers and lakes); and review and selection of operational procedures related to habitat information.
- **Assessment of the environmental and biological conditions and variability**. Activities of this phase were mainly focused on data collection and their preliminary assessment. On the basis of the preliminary phase's results field investigations were carried out including collection of biological, physico-chemical and hydromorphological data in the different selected river and lake stretches in both interested Regions.
- **Relationship between nutrients, biotic communities and environmental conditions**. Interactions between nutrients, hydromorphology, habitat conditions and biological communities were investigated. Three main ways, through which anthropic nutrients can reach surface water, were considered: point sources, diffuse sources of agricultural origin and atmospheric depositions of nitrogenous compounds. For lakes long-term, for rivers short-term data analysis was performed, with the aim to evidence the relationship between nutrients and the ecological quality of water bodies and to define strategies to be included in the Management Plans in order to reduce the pollution of aquatic ecosystems.
- **Proposal of innovative measures for River Basin Management Plans (RBMP)**. Actions were aimed to understand how the information on habitats can be included in innovative restoration measures and/ or can enhance the effectiveness of existing measures in order to improve the RBMPs.
- **Demonstrative actions of ecological classification and uncertainty**. In this phase the available most updated methods of classification of the Italian aquatic ecosystems were applied in the study areas. Moreover, a common set of key statistic metrics was defined, based both on scientific literature and on the Water Framework Directive, comparing the results of different techniques for uncertainty estimation and assessing the influence of uncertainty on the Management Plans and Programs of measures.
- **Demonstrative actions in Regions not directly involved in the project**. Pilot application of the general approaches, developed in the frame of the project, in Regions outside the project's study area.

PROJECT RESULTS

INHABIT has **developed an innovative approach, based on the habitats, of the ecological status assessment of rivers and lakes in South-Europe**. The project has developed tools allowing a more effective management of the river and lake ecosystems, through the quantification of uncertainties, improvement of classification systems, and creation of practical tools to assess the effectiveness of the ecological quality restoration measures. In the **Guidelines "Indications on how to implement new measures to promote the achievement of good ecological status in 2015"** (for lakes and rivers) some key concepts (developed as operational indications), emerged from the project activities, are presented, that may result important in the assessment of ecological status and implementation of management plans. In particular, some of them should be considered in planning and applying possible management and restoration measures, especially with a view to assessing their effectiveness.

The approach used is transferable to other geographical contexts, as demonstrated by the results achieved in the frame of the **project replicated in Cyprus**, where the INHABIT approach has been successfully applied in collaboration with the island's Water Development Department.

Main results were:

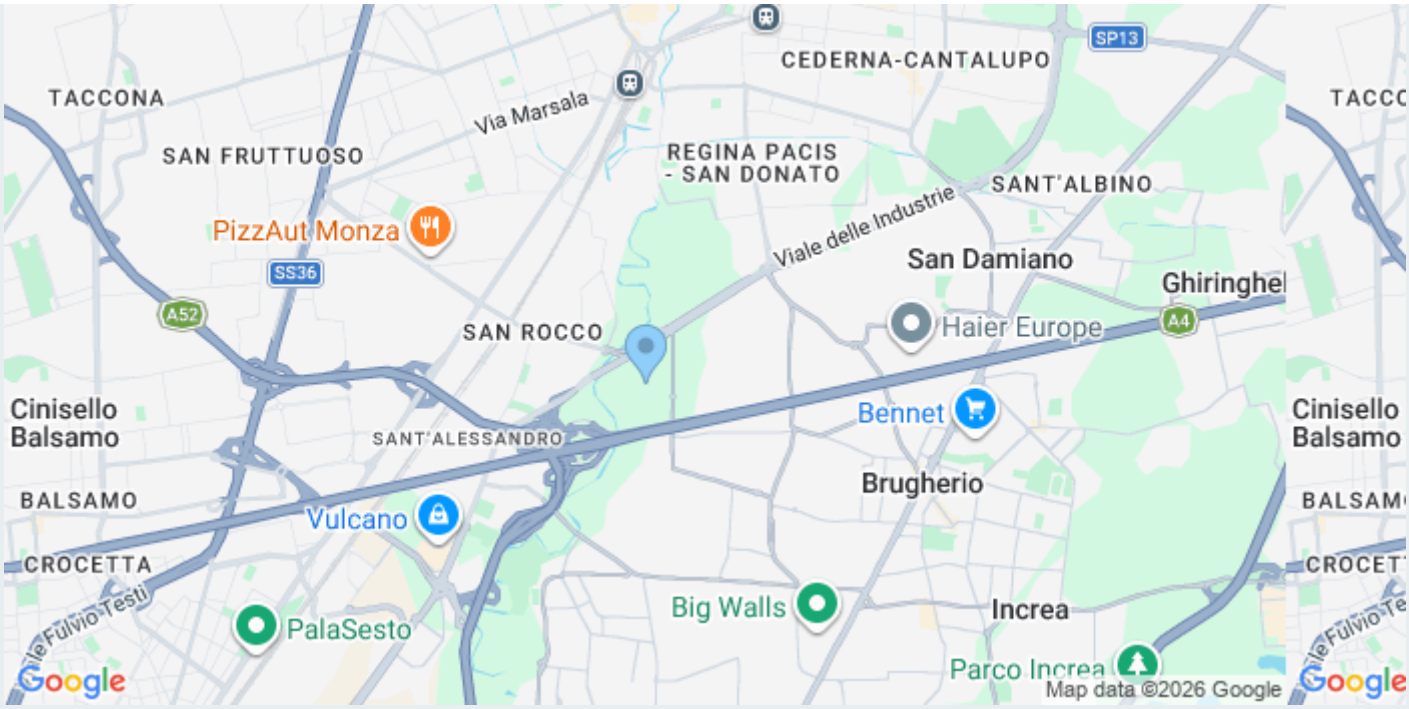
- **Validation of the Lake Habitat Survey (LHS) method in the Italian context, through its application in 11 lakes** (5 natural and 6 artificial)**. Now it can be extended to the whole national territory**. This method was developed to assess and characterize natural and artificial lake habitats, and its application could provide additional useful elements for a better understanding of the ecological status to be considered for drafting management plans.
- **Practical tools developed within the project:** survey mode for river habitats was refined through the **CARAVAGGIO method** (Core Assessment of River hAbitat VAlue and hydromorpholoGIcal cOndition), that produced the application manual "**Guide to the survey and description of river habitats**". Moreover the data archiving and synthetic descriptor calculation software: **CARAVAGGIOsoft** was updated and extended. Thanks to this, procedures are now available to survey, quantify and assess the characteristics of river habitats in a wide range of contexts. These procedures can be used for different purposes, i.e. validation of reference sites, EQB data interpretation, fishery management, biodiversity protection, quantification of pressures, definition of minimum environmental flows and environmental impact/ strategic environmental assessments. Also another software, the **MacrOper.ICM software**, was developed, updated and distributed, allowing to perform – through benthic macroinvertebrates – the ecological quality classification in all Italian rivers. Said classification is in compliance with the requirements of the WFD and the Ministerial Decrees, relating to river monitoring in Italy, n. 260/2010 (Decree on classification), n. 56/2009 (Decree on monitoring), and n. 131/2008 (Decree on typing).

- A general **analysis of the River Management Plans** in relation to habitat and hydromorphological aspects was carried out, to evaluate its approaches, methods and programs of measures. The River Basin Management Plans of the Po river, Sardinia island, Eastern Alps, Southern Apennines and Central Apennines were studied; as well as for the rest of Europe the management plans of some British an Austrian districts. Results of the analysis are described in the document "**River Basin Management Plans under the WFD (2000/60/EC) in some Italian hydrographic districts: approaches, methods, scale factors, measurement programs**".
- The document "**General indications and field protocols for the acquisition of hydromorphological and habitat information**" was drafted, which describes the possible approaches to be used in habitat evaluations and descriptions.
- The natural capacity to remove nutrients in rivers in plain areas and in temporary rivers was assessed, with the identification of habitat characteristics useful for the estimation of the ongoing processes. The approach used can be applied in other areas to estimate the rivers' potential of self-cleaning, in relation also to the achievement of good ecological status.
- It has been confirmed that the lentic-lotic nature of water (relationship between lentic areas and lotic areas) is an important factor in structuring benthic communities.
- Reference river sites were selected and validated, while for lakes methods were refined for evaluating and/ or modeling the reference conditions for chlorophyll concentration and phytoplankton indices.
- It has been verified how the quantity and quality of aquatic habitats and shelters have a direct influence on the capacity of aquatic communities to tolerate pollution, flow reductions and hydromorphological alterations. For example, it was highlighted how the simultaneous presence of optimal conditions for different habitat factors can limit the negative effects of perturbation factors such as water pollution and morphological alteration.
- The study of the Biological Quality Elements and of the chemical-physical and habitat aspects in the basins of Sardinia, carried out for the first time in Italy, allowed to highlight some innovative factors for their management.
- The Technical Report "**Uncertainty of classification and suggestions for the improvement of Management Plans: Rivers**" was elaborated, outlining a conclusive picture of the path followed for the rivers in the Inhabit Project. In particular 7 contributions were selected to represent the path followed in order to arrive at defining the tools and guidelines for a more effective assessment of anthropogenic alterations and consequently a more incisive setting of measures to restore ecological quality.
- **6 workshops (with about 400 participants)** were held: 3 national ones, involving water resource management bodies, local authorities, universities and research institutes, which were focused on the dissemination of the project approaches and consolidated results; and 3 international workshops (in Cyprus, Austria, Spain), with the aim of initiating an exchange of information on approaches related to the assessment of habitat/ biota relationships and disseminating the results and approaches of the INHABIT project. **The international workshops had also the objective to evaluate the comparability of methodologies and results obtained during the project with similar activities in other EU countries and to promote the application of INHABIT approaches in these countries**.

The results of the INHABIT project can be used as a basis and an example to improve the knowledge of the other lacustrine/ fluvial water bodies and the overall quality of the Basin Plans.

The most relevant long-term benefits expected in relation to the results achieved by the project are:

- optimization of monitoring activities for lake and river environments;
- activation and/ or integration of hydromorphological and habitat information collection, together with biological sampling;
- optimization of restoration measures and of the cost-benefit ratio of requalification in relation to the ecological status;
- possibility to quantify ecologically acceptable flows (e-flows) using descriptors of the lentic-lotic character and the relationship observed with aquatic biocenosis.



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Acronym
INHABIT

Number of reference
LIFE08 ENV/IT/000413

Reference Programme
LIFE

Beneficiary Coordinator
Consiglio Nazionale delle Ricerche - Istituto di Ricerca Sulle Acque (CNR-IRSA)

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1.118.493

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2008

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Region
Piemonte

Description

Area di intervento: Sardegna e Piemonte