Project RII

Hydrological and environmental integrated restoration of brooks in the piedmont area of Emilia Romagna

surface waters

PROJECT DESCRIPTION

In recent decades, increasing **urbanization and intensive agricultural activities** have led to a progressive **artificial transformation of watercourses**, creating over time serious problems of hydraulic safety and poor ecological quality. In this context the RII project had the general aim of demonstrating that the key concepts of the **Floods Directive 2007/60/EC** and of the **Water Framework Directive 2000/60/EC**, in terms of decreasing the risk of flooding and improving the ecological status of water bodies, can be applied with the appropriate adaptations also to **minor drainage networks**, not subject to the two Directives' disposals and located in strongly urbanized areas on the border between mountain-hill slopes and the plain, seriously exposed to pollution from nitrates, in which the minor network acts also as a receptor for discharges and drains. The minor network that collects water in the mountain, often made up of small, 1-2 meter-wide brooks of torrential character, is characterized by steep slopes and the almost total lack of areas for the expansion of floods. The presence of large stretches of urbanized territory, which cut the creeks, strongly limits the availability of flat areas upstream of urban contexts where to recreate or reconnect floodplains. The passage of brooks in inhabited centers, which in most cases occurs in channel pipes with manhole covers, further limits the space for operations.

The project area included the municipalities of Albinea, Bibbiano, Quattro Castella and San Polo d'Enza, in the province of Reggio Emilia, in a strip of land straddling the hilly slopes of the Apennines and the adjoining Po plain. The brooks selected for the pilot actions were: **Rio Arianna, Rio Lavezza, Rio Bianello, Rio Enzola, Rio Bertolini, Rio Bottazzo and Rio Montefalcone.** This choice was made by assessing the problems and specific characteristics of these creeks, so as to be able to face and solve a wider range of hydraulic and environmental problems.

OBJECTIVES

Based on these considerations, the project had the following specific objectives:

- **to introduce, test and demonstrate** the usefulness of innovative land management strategies and intervention techniques on watercourses based on the key concepts of the aforementioned European Directives, to address the hydraulic and ecological problems of the minor drainage networks not concerned by the provisions of said Directives and of other innovative legal-administrative tools to support flood risk management and environmental restoration of the territory;
- **to contribute to improving the naturalistic value of the minor drainage network** in a heavily urbanized area close to hill-slopes, reducing at the same time the problem of flooding and contributing to tackling the problem of surface and groundwater quality in an area which is vulnerable due to nitrates of agricultural origin;
- **to raise awareness** among (Italian and European) institutions responsible for water courses management as well as municipalities and citizens, that the strategies, techniques and tools adopted in the project can contribute to the protection

and ecological regeneration of minor drainage networks as well as to flood management.

The innovative nature of the project is shown not only by the interventions made to solve the drainage and environmental problems but by the entire design process, which saw the involvement of local actors through a structured participatory process, one of the first in Emilia-Romagna on the themes of environmental requalification. Furthermore, the project, conceived in 2011, results already in line with the objectives of the 7° General Union Environment Action Programme (2013).

PROJECT PHASES

The main project phases were:

- **Preparation**: **deepening the knowledge** of the environmental, hydraulic and geomorphological characteristics and problems of the study area, which allowed to build an overview of the peculiarities and the critical aspects of the area of the four Municipalities involved in the project; activities included **executive planning of the restoration interventions along the creeks**.
- **Implementation**: three main groups of activities aimed at the definition of a strategy for managing the selected creeks, providing also indications for the enhancement of the historical-cultural, landscape and recreational elements:
  - realization of a **participatory process** to support the project, **definition of the Brooks Pact and elaboration of the integrated program** of large-scale hydraulic-environmental requalification of the study area;
  - **implementation of demonstration interventions** for the restoration of creeks;
  - **identification of economic-legal-administrative instruments of compensation** for the hydro-environmental use of agricultural lands.
- **Monitoring**: **environmental and hydraulic monitoring** to evaluate the effects of the restoration interventions through the study of chemical - physical, geomorphological, hydraulic as well as flora and fauna elements, measured before and after the interventions; **monitoring of the dissemination's results** in order to evaluate, through specific parameters, the effects in terms of awareness-raising by stakeholders and socio-economic consequences.
- **Communication and dissemination,** at local, national and European levels, of the activities carried out and the results achieved, with contemporary enhancement of the sensibility and attention of the various stakeholders on the issues addressed by the project. It was done through events, workshops, information points, environmental education activities, production of information materials, etc..

PROJECT RESULTS

The RII project has designed and tested a new project approach to make minor hydrographic networks hydraulically more secure. The techniques used proved to be particularly effective for intervening in urbanized contexts and/ or characterized by unstable slopes, in which the construction of holding ponds is rather problematic. Different hydraulic facilities have been created on the watercourses, as, for example, **narrowed stretches with greened stones** to slow down the floods; **selective weirs** to retain branches and plant materials, thus avoiding downstream accumulation and blockage of water flow; **new floodplain areas** to stop the water upstream of inhabited centers. Said interventions were done by **reshaping the banks and doing the maintenance of the embankments**. These interventions were of low environmental impact as they were realized using **natural materials** (wood, stones, vegetation). The solutions adopted under the integrated approach of the project, allowed to deal with the flood danger and, at the same time, **to improve the ecological status of watercourses**. Moreover, wetlands for amphibians have been created, and ramps on existing weirs to allow fishes' journey upstream, as well as **semi-natural riverbeds** (for example through the construction of hydraulic jumps with trunks), where water accumulates and creates the optimal conditions for the development of local flora.

At the end of the project, the Region of Emilia-Romagna was promoting the application of the RII project approach in two other provinces for the environmental-hydraulic requalification of minor networks.

In summary, the main results of the project and works done were:

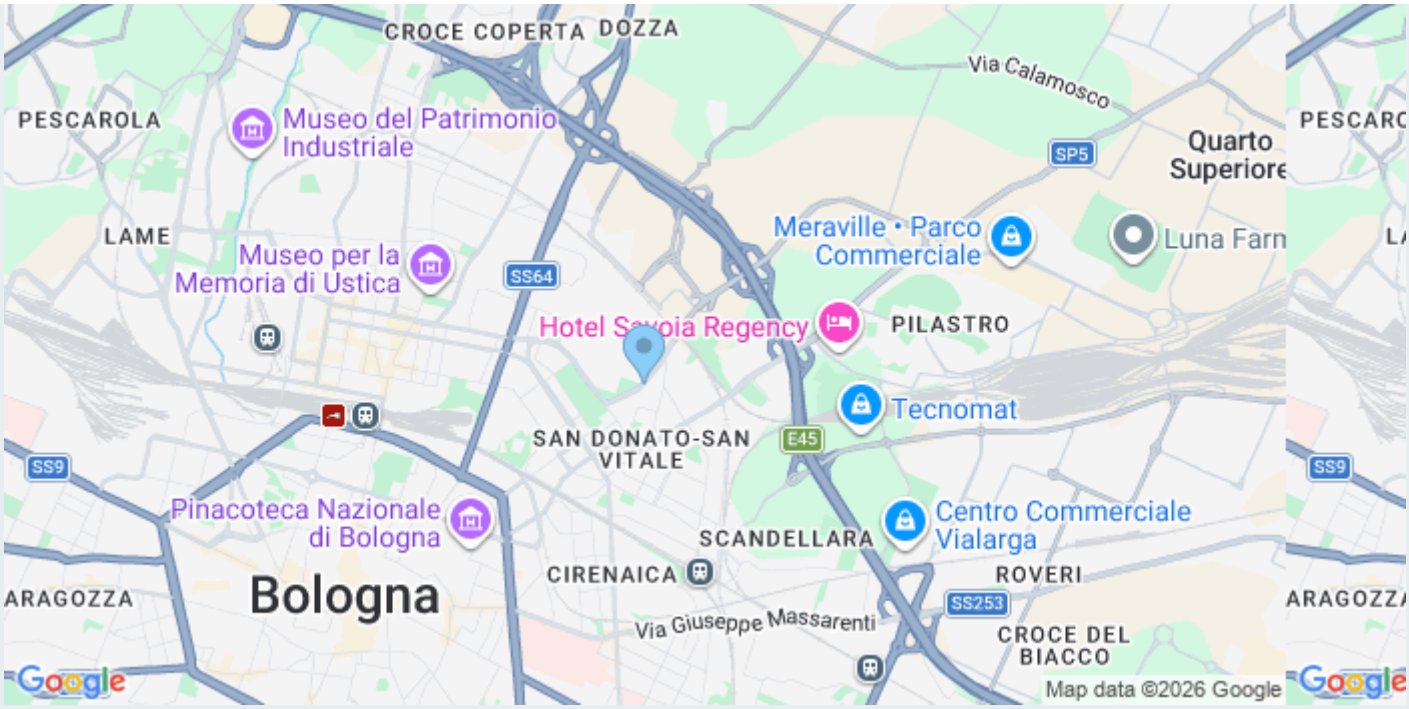
- acquisition of **in-depth knowledge about the natural, environmental and hydraulic character of creeks.** Data are accessible on the **web GIS Moka flex platform**, which allows *online* consultation of the maps developed for the planning of environmental and hydraulic restoration of creeks – selected for the case studies – overlaying on the standard regional and orthophotographic maps;
- **implementation of experimental restoration interventions along the creeks to bring watercourses back to a safer and more natural setting.** The techniques put in place were:
  - excavation and enlargement of sections for the creation of new floodplains;
  - narrowing, by stones, of cross-sections in correspondence of wide stretches of creeks;

- natural-like intervention works in wood for increasing flooding frequency of floodplain areas and diversifying their habitats;
- construction of selective weirs;
- interventions for the increase and diversification of habitats in the riverbed;
- construction of flow deflectors for the increase of lateral dynamics and of the "erodibility" of the opposite bank as well as the formation of habitats in the riverbed.

Details of each intervention are reported in the single **case studies: Rio Arianna; Rio Bertolini; Rio Bianello; Rio Bottazzo; Rio Enzola; Rio Lavezza; Rio Montefalcone**;

- **realization of about 10.000 sqm of section enlargements** excavating approx. 15 km of stretches of the creeks subject of restoration, so as to recover the width of the river lost over the years due to human interventions;
- **wide involvement of stakeholders through the implementation of a participatory process** (**the first in the field of regional soil defense**) which involved the use of *offline* (workshops, laboratories, visits to the territory) and *online* tools. Prior to the participatory process that affected both the operational and strategic choices, a **Participation Booklet** was prepared;
- favorable assessment, through the qualitative monitoring of the effectiveness of the participation and dissemination actions, of the participatory process that involved over 600 people in the 21 meetings held over the four years of work and registered over 30 thousand accesses to the website;
- **definition of the Integrated Hydrological and Environmental Programme of the four involved municipalities**, with whom a redevelopment and creeks management strategy was developed, combining aspects of hydraulic safety, water-, environment-, and landscape protection, as well as enhancement of the recreational fruition of the watercourses;
- **drafting of the agreement called the Brooks Pact** developed on the example of the River Contracts. It is a **voluntary act of shared commitments between different subjects (public and private)** who are interested, for various purposes, by watercourses management. The Pact identifies shared methods to pursue the objectives of environmental, landscape and socio-economic enhancement of the small creeks' network in the four involved municipalities. Participation is regulated by a **specific methodology** (inspired by the principles of the European "EASW®" method), which envisages public meetings on the territory composed of discussion sessions and group work; and in parallel an *on-line* debate in the new virtual space IOpartecipo+. With the conclusion of the approval process, the Brooks Pact entered its operational space. The integrated restoration works will progressively involve the numerous water courses included in the provisions of the experimental Agreement signed between the Region and the Reclamation Consortium, and will be financed with resources made available by the involved bodies;
- **introduction, by the regional administration, of the experience gained within the RII project into the "Guidelines for the integrated restoration of natural watercourses in the Emilia-Romagna Region"** (approved in 2015). The aforementioned guidelines represented also the starting point for the Technical Table of the Ministry of Environment in the elaboration of the evaluation criteria and a standard form for the eligibility for financing of the so-called *win win* integrated interventions (Ref. Law no. 164/2014);
- elaboration of the **feasibility study on the establishment of "flood easement"** which analyzed the legal and administrative instruments to support the implementation of this approach which foresees, instead of the acquisition of the areas through expropriation, the compensation of farmers for the controlled flooding of their lands in case of (natural) flood. The most suitable areas were identified and a **model for calculating compensation fees** was developed taking into account the flooding frequency and the actual crops;
- **drafting of the Monitoring report on morphological variations and development patterns of the brooks** Enzola, Arianna, Quaresimo, Montefalcone, Bertolini, Lavezza and Bottazzo in the post-intervention phase;
- drafting of the **new Technical Manual** "**Design of integrated hydraulic and environmental restoration of the minor drainage networks**", addressed to designers, professionals and experts who are responsible for the territory's security. It collects the tools necessary for the design, implementation and monitoring of the various innovative types of interventions developed within the activities performed along the brooks. Further details are dedicated to the management of vegetation along watercourses and estimation of experimental compensation models for the farmland uses for hydraulic safety purposes.

The Report on the results' transferability indicates all the elements useful for the replication of the RII Project's experience in similar territorial contexts, both in Italy and elsewhere in Europe.



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Acronym
RII

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LIFE

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599.250

Call Year
2011

Start Year
2012

End Year
2016

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Region
Emilia-Romagna

Description

Emilia Romagna