

# NATURE-BASED SOLUTIONS FOR WATER IN THE PERI-URBAN

CASE STUDY BRIEF: SPAIN



2018 JOINT CALL

## ABSTRACT

This NBS implementation is part of a restoration project in the Barcelona metropolitan area that includes the Besòs river park and the Montcada i Reixac constructed wetlands (1996-2006). To address the river alteration, NBS were implemented through the use of overlapping blue and green infrastructure as riverside park and constructed wetlands. Challenges related to water quality as a result of industrial pollution; to water quantity due to flooding risks (torrential storms), water-stressed flows; and hydrology as a natural system. The NBS approach has proven to be beneficial as a long-term intervention for re-integrating water resources in order to close the cycle gap in water management, while providing additional services and benefits. It has improved environmental quality, by reinforcing ecosystem functions and biodiversity.

Through its multifunctional landscape for public use and leisure, it has improved the peri-urban image (perception) of this highly socially vulnerable area. The inhabitants' quality of life has improved as a result of these benefits, and the social added-value of renaturalization appears to maximize the NBS cost-benefit ratio. Finally, the European investment in its development has been an opportunity for capacity building and local collaboration in the form of funding for NBS maintenance, increased participation and involvement of different stakeholders.

## PURPOSE OF THE CASE STUDY

The purpose of this case study is to apply the NATWIP framework to identify the interlinked results of the processes involved (i.e. related to urban planning, governance processes and the integration of ecosystem services provided), by:

- i) Identify the NBS implementation as the ecosystem services provided, focusing on cultural ecosystem services (social aspects of landscape aesthetics and recreation).
- ii) Recognize how previous NBS experiences helped to build capacity for current and future urban green/blue infrastructure implementations.
- iii) Analyse how the NBS improve the environmental quality and drives innovation towards a more sustainable water management (e.g. NBS river and sea connectivity, groundwater use and water quality improvement).

## AREA CHARACTERISATION

Country	Spain
Province	Barcelona (Catalonia)
Municipality	Barcelona Metropolitan Area (BMA) Sant Adrià del Besòs (SAB) Santa Coloma de Gramenet (SCG) Montcada i Reixac (MR)
GPS coordinates	41°25'13.0"N, 2°13'54.8"E



Figure 1. Besòs River re-meandering to boost the diversity of habitats in Montcada i Reixac

## PHYSICAL CONTEXT

Surface (BRP)	115 ha / 9 km Longitude of River banks
Local geography / topography	Narrow river valley limited by the Natural Park of Collserola and the Marina mountain range, finishing in the coastal plain and the Mediterranean Sea, about 160 km south of the Pyrenees mountain range (border with France) Highest elevation: 56m - Lowest elevation: 0m
Main water courses	Main body: Lower Besòs river Starting at the confluence with the Ripoll River to the Mediterranean Sea.
Main soil types	Sant Adrià del Besòs (SAB) Prequaternary substrate: Tertiary Sedimentary Rocks Isobates of the prequaternary substrate: Quota from -60 to -40 m Phreatic Level (1997): From 0 to 2 m Surface geology: Holocene Sand, gravel, clay and slime of the deltaic and coastal plains
Precipitation (monthly averages as well as climate change projections)	Precipitation (mm) 2018 - Year 806,4 JAN - 71,7/ FEB - 82,7/ MAR - 75,8 APR - 34,1/ MAY - 40,8/ JUN - 34,0 JUL - 57,1/ AUG - 30,9/ SEP - 116,2 OCT - 151,2/ NOV - 108,6/ DEC - 3,3 The difference in precipitation between the driest month and the rainiest month is 112,9 mm. (Data from station WU Badalona - Museu)
Critical infrastructure	Motorways: infrastructure for the peripheral vehicular traffic to the city of Barcelona. Regional Railway Urban Tramway Water sewage pipe Wastewater treatment plant (Montcada i Reixac WWTP) Waste to energy plant (Tersa) Energy production plant (Endesa)
Other relevant physical factors	Delta River delta. Pollution effects due to the location of chemical industries in the area.

## SOCIO-ECONOMIC CONTEXT

Population	119081 (3 municipalities)
GPD/capita	€25.600 GDP - Lower income than in Barcelona city (€43.004) and the average of the Province (Catalunya)
Economic status (i.e. low income, high income)	Low Income High social vulnerability

## OBJECTIVE OF THE NBS

Restoration project where the NBS addresses water quality and quantity challenges. To improve the river's water quality, since it was heavily polluted after the location of chemical industries in the area along the XX century. In addition, water quantity issues were related to streamflow stresses, due to scarcity, which is related to Mediterranean dry weather conditions; and in contrast with flooding risks due to torrential rains (e.g. last 500-year flood was in 1962 with a flow of 2345 m<sup>3</sup>/s). The NBS intervention (1996-2006) has considered these challenges as interdependent and dynamic issues, and as such, the development of these NBS (riverpark and constructed wetlands) has taken advantage of the integration of a socio-ecological restoration with the social benefits of an open green space of metropolitan scale in Barcelona metropolitan area.

## POLICY AND GOVERNANCE CONTEXT

### Policy Instruments:

- (EU) European Water Framework Directive (2000) has endorsed the incursion of 25 WWTP in the Besòs basin
- (SPAIN) Water quality related to the Royal Decree 817/2015, by which it is established the criteria for monitoring and evaluating the state of surface water and environmental quality standards. This regulation serves to identify the input vs output in our case study NBS.
- (BMA) In the Metropolitan Urban Master Plan proposal (PDU Metropolità) is been considered as an objective to "Naturalise the territory by fostering the values of the biophysical matrix", to enable and create a global green and blue infrastructure, which reinforces ecosystem functions, and functions for public use and leisure.

- (Besòs area) The Agenda Besòs as a coherent prospective document integrating territorial concerns and the different aspects of the area. Also, currently working on the development of an integrated management plan (2020).

### Actors:

- This project displays a multi-actor governance mediated by the key role played by the Besòs Consortium for the management and development of the lower river area. This Consortium is formed by 5 municipalities to articulate the urban supra-municipal issues, providing technical support for its horizontal and vertical integration.
- Public authorities (GOV): The role of public authorities is related to the overall NBS development. The financial responsibility is shared with funding from Municipalities, Barcelona council, Barcelona Metropolitan Area (AMB).
  - o Regional: Catalan Water Agency (ACA); Barcelona Provincial Council (Diputació de Barcelona - DB); Barcelona Regional. (strategic partner – Think tank)
  - o Metropolitan: Barcelona Metropolitan Area (AMB) Consortium Besòs, Barcelona Water Cycle (BCASA), Barcelona management of the integral water cycle (Agbar);
  - o Local: City halls of Barcelona Metropolitan Area (BMA); Sant Adrià del Besòs (SAB); Santa Coloma de Gramenet (SCG); Montcada i Reixac (MR)
- Water related: The role of water actors is directing the technical management of the water cycle. ACA; AMB; BCASA; Agbar.
- Private (IND): Related to the management of other urban flows, e.g. for waste: TERSA (W2E); energy: ENDESA, and several related to water (ACA; AMB; BCASA; Agbar).

- Academic and research (UNI): Universitat Politècnica de Catalunya (UPC); Universitat de Barcelona (UB).
- Civil society (CIV): Civil society is the direct beneficiary, although they could be potentially involved in the implementation.

## ACTIONS

In the 90's as part of a diagnosis on the main environmental impacts on the Besòs River was indicated the poor water quality because of the industrial activities located in the area. Its purpose as a restoration project was to improve the polluted water of the Besòs River and better manage the flood risks (1996-2006) in this peri-urban area of the Metropolitan Barcelona. The implementation of the Besòs River Park (BRP) has served to

improve the river's hydrology as a natural system, protect the area from flooding risks, and improve underground water recharge (Aquifers). The constructed wetlands have enhanced the overall water quality by complementing the WWTP biological treatments in a resource-efficient manner. As the River Delta is located in an urban area, the NBS implementation has served to promote the need for a natural protected area for biodiversity in its encounter with the Mediterranean Sea, within the inhabitants, who are the direct beneficiaries of the NBS implementation. By addressing the water challenges as a green and blue infrastructure, the NBS approach is acknowledged as a multifunctional landscape and it is nowadays considered as an strategic area to protect the water cycle at the metropolitan level, and as such is considered a metropolitan green infrastructure.



Figure 2. NBS associated to urban infrastructures' improvements for passive recreational uses as the Besòs River Park (Barcelona Metropolitan Area)

## POTENTIAL (OR ACHIEVED) IMPACTS AND BENEFITS

The NBS has served two main functions, to improve water management and promote physical changes in the waterfront as a multifunctional landscape in a metropolitan context. This implementation has promoted innovation for climate resilience and better connectivity among the municipalities. As SOCIAL benefits, NBS provides infrastructure for enhancing the physical and mental health of inhabitants, which is highly relevant as a socially vulnerable area in the Barcelona Metropolitan Area.

## SUSTAINABLE DEVELOPMENT GOALS AND/OR ANY OTHER WATER-RELATED DEVELOPMENT GOALS ADDRESSED

SDG3  
SDG4  
SDG11  
SDG13

## LESSONS LEARNT

**Environment:** The environmental quality of the area has been enhanced by the NBS implementation. This approach has served to re-integrate the water resources for better water management, while delivering additional services and benefits such as improved water quality and biodiversity. It has been recognized how the NBS is regenerating natural capital, keeping resources in use, and marginally avoiding waste externalities.

**Economic:** Economic feasibility for NBS is currently concerned with the management cost-benefits and the way of addressing the shared and fragmented responsibilities in this Metropolitan context. However, it seems to be useful to integrate

the NBS management to the interest for circular urban flows management, which could endorse the accountancy on the added-value of its social and environmental benefits to the maintenance costs.

**Social:** The NBS implementation is actively used by the citizens and is highly appreciated. Nevertheless, it could benefit from higher participation and involvement of citizens, who may be willing to engage in more direct collaborative management. For instance, the integration of its perception, practices, behaviours and attitudes towards the NBS could enhance its implementation and informed decision-making.

In terms of governance, the pathway toward integrating the natural and technical cycles for a more sustainable (peri) urban water management is facilitated by the coordinated actions, role and agenda, as the one played by the Consortium Besòs. The NBS approach could be regarded as a process for water management innovation as an alternative practice and urban experimentation in which other actors may be involved (i.e. private - IND, Civil society CIV), to mobilize actions such as enhanced decision-making, funding, awareness, etc. to improve the water cycle and urban sustainability.

Although the Besòs River Park and wetlands are a successful intervention, it seems that a direct endorsement as an NBS approach could be useful for further promotion of a comprehensive performance assessment. This endorsement can help in NBS management as a place-based and capacity-building process in which flexibility and cross-sector collaboration are critical processes. The NBS assessment could be supported by monitoring, communication, and accounting on established and innovative or experimental aspects such as multi-functionality and delivered benefits, cross-disciplinary approaches, the evaluation of market and non-market values, and social perception.



Figure 3. Besòs River and its encounter with the Mediterranean Sea as an urban space for biodiversity.

## TRANSFERABILITY OF RESULTS

The NBS implementation in the Besòs area have resulted in different benefits and services, which have been contributing to better water management and a more cohesive peri-urban landscape. Specifically, the results of this project expose how NBS could increase the potential of a peri-urban area to support innovation in water management and human well-being. Although NBS implementation calls for contextualization and adaptation, this project was conceptualized in the 90's to address environmen-

tal concerns and high social vulnerability. Along this process, it is worth noting how the Besòs Agenda has aided in the implementation of NBS at the local level, which involves different municipalities in the Barcelona metropolitan area. The Consortium Besòs has been key as a cross-boundary organization as a result of the coordinated action of this instrument, as well as its interest of working with the different stakeholders. This Consortium plays a key technical role, to coordinate, and integrate the other actors for the active implementation of the Agenda at the Metropolitan level.

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## WHAT IS NATWiP?

NATWiP is an acronym for a project entitled: Nature-Based Solutions for Water Management in the Peri-Urban: Linking Ecological, Social and Economic Dimensions.

This is an EU-Cooperation project funded under the Water Joint Programming Initiative (JPI) Call 2018 and is led by an international consortium of scientists. The NATWiP team works towards promoting sustainable implementation of nature-based solutions to address water challenges in peri-urban areas.

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