

GORLA MAGGIORE WATER PARK



REGREEN
NATURE-BASED SOLUTIONS

Addressed SDGs:



> OBJECTIVES

The Gorla Maggiore water park serves as an excellent demonstration case for the effectiveness of nature-based solutions in providing a broad range of ecosystem services, such as water quality improvement, flood mitigation, biodiversity protection and increase, as well as societal co-benefits related to new recreation opportunities and enhancement of human health and well-being. Serving as a trial to test the feasibility of Constructed Wetlands (CWs) to treat Combined Sewer Overflows (CSOs), the Gorla Maggiore water park has demonstrated the high effectivity of nature-based solutions. Apart from treating sewage overflows, the setting also reduces flood risk and provides spaces for recreation, whilst protecting and increasing wildlife and providing health benefits for residents.

> DESCRIPTION

The region of Lombardy is one of the most populated and industrialised regions in Italy, but also in Europe. During heavy rainfall the problem of CSOs arises, as significant amounts of pollution get discharged into surface water bodies. In more detail, the textile and coal industries are sources of surfactants, which can foam and reduce the re-oxygenation rate and oxygen levels of water, harming aquatic life. This mixture of domestic wastewater mixed with rainwater is usually not conveyed towards conventional wastewater treatment plants during rain events because the capacity of the sewer is exceeded. Therefore, the combined flow gets discharged directly into rivers and lakes, subsequently polluting them. As a result, the poor ecological status of water bodies does not satisfy the EU Water Framework Directive.

To reduce pollution from CSOs, it is necessary to manage the settings either upstream or downstream. Upstream controls can minimise the rainwater flowing into the sewer system, whereas the control downstream occurs by directly targeting the CSOs. To enable this, underground storage tanks accumulate the most polluted water and pump it back to the wastewater treatment plant after the rain events.

Gorla Maggiore, a municipality of ca. 5000 inhabitants in the Lombardy Region, showcases a set of constructed wetlands (CWs) surrounded by a park on the shore of the Olona River. Prior to the installation of the park with CWs, the CSO was discharged directly, without any treatment, into the Olona river. Inaugurated in 2013, the Gorla Maggiore water park offers a solution to treat the first flush of CSO (domestic wastewater mixed with rainwater) and can be considered one of the first examples of applied nature-based solutions for CSO treatment in Italy. The area was previously used for poplar plantations. While grey infrastructure formed by underground first-flush tanks and open-air dry retention ponds could contribute to both managing flood

risk and improving water quality, it could not provide relevant changes in terms of biodiversity net-gain and provision of recreation facilities. And that is exactly what the Gorla Maggiore water park offers. The park's CW vegetated set includes a pollutant removal area with a grid, a sedimentation tank and four vertical subsurface flow basins for pollution retention and flood buffering. With an extended retention basin that works as a tertiary treatment for the CW effluents, the park stores and treats second flush, while slowing down the discharge in the river and therefore contributing to flood risk control. The setting not only allows for polluted water to be treated on-site by natural physical, physiological, and biological purification processes, but also provides the community with attractive recreational areas. The CWs are surrounded by information panels, cycling and walking paths, public green spaces and restored riparian trees. Throughout an area of 6.5 ha, multiple services for nature and society are performed within the park: water quality improvement, fostering flood management, biodiversity conservation and provision of an area for city residents to get in contact with nature and improve their physical health and well-being.

> CHALLENGES

Usually decision-makers from municipalities and subnational governments are inclined to opt for conventional grey infrastructure solutions to solve problems related to the discharge of polluted outflows into water bodies. There is an overall lack of awareness towards the numerous positive effects of nature-based solutions for water quality enhancement, as well as a lack of technical implementation expertise and therefore, political decisions tend to avoid greener solutions that would require new protocols, standards or frameworks. The region of Lombardy has a regulation in place that requires that municipalities treat combined sewer overflows. However, a common limiting factor for the application of nature-based solutions is that the usual practice remains in installing grey solutions: the water gets stored in a concrete tank, often positioned underground, and later gets pumped, which is not very sustainable due to energy demand.

> OPPORTUNITIES

One major enabling factor for the implementation of the Gorla Maggiore water park was the publication of a scientific publication at the time pointing out CSO as one of the three main reasons for the goals of the Water Framework Directive not to be achieved. Good design definitely also played a role, as the maintenance demands of the system used within the water park are quite low. Another supporting factor was the site's topography, which made it possible for the system to work mainly by gravity, as the water naturally flows from upper basins to lower basins.

A further supporting factor relating to the region's regulatory framework is that recently Lombardia has approved a regulation demanding that water utilities perform the treatment of combined sewer overflows. Finally, in terms of governance, the close collaboration between technical staff from the municipality, designers and water engineers during the planning and delivery phase of the water park was an enabler, as well as the full support of politicians, who helped with the authorization procedure and allowed for communication processes to raise citizens' awareness on the benefits of green infrastructure.

In terms of funding, the CARIPLO foundation has enabled the installation of numerous CWs in the Region of Lombardy within the last decade. The foundation has been supporting experimental initiatives to promote environmentally friendly solutions and by co-financing European projects that improve the environmental conditions of the region, enhancing the biodiversity network and promoting the resilience of the territories. Also from a financing perspective, it was quite relevant that part of Lombardia's subnational funds were directed at the planning and implementation of the Gorla Maggiore water park. In fact, the construction of the Gorla Maggiore water park has been funded by the regional government and this private foundation (Regione Lombardia and Fondazione Cariplo).

> LESSONS LEARNED

The major lesson learned is that it has succeeded in demonstrating that the green infrastructure in Gorla Maggiore has an equally efficient or even better technical performance than the alternative grey infrastructure to address the area's water purification and flood protection needs. In terms of costs, the green infrastructure of Gorla Maggiore had the same investment cost of the grey infrastructure alternative (see [Liquete et al., 2016](#)). A technical study using multi-criteria analysis was carried out to assess the multiple benefits - environmental, social and economic - provided by the peri-urban water park within the framework of the OpenNESS project (FP7). From the obtained results, a further lesson learned was that for similar costs, the use of green infrastructure ensured not only a good performance in terms of water purification and flood protection, but clearly provided additional benefits such as wildlife support and new recreational opportunities. This points out the advantages of adopting an integrated valuation approach prior to decision making processes. Therefore, a clear recommendation that came out of the Gorla Maggiore experience is that it is relevant to consider the manifold ecosystem services provided by nature-based design from the early stages of decision making.

In terms of water policy, according to the European Commission's recent publication "[Blueprint to safeguard Europe's water resources](#)", nature-based solutions and green infrastructure are highlighted as a valuable alternative to classical grey infrastructure (e.g. embankments, dykes and dams) for the restoration of riparian areas, wetlands and floodplains to retain water, because they can also support biodiversity and soil fertility whilst preventing floods and droughts. The document also identified nature-based solutions as highly effective in the implementation of the Water Framework Directive and the Flood Directive.

> INSPIRATION FOR OTHERS

The Gorla Maggiore water park and the many ecosystem services delivered by the applied nature-based solutions serve as inspiration

to any municipality interested in treating CSO before it gets diverted to water bodies. The case of the Gorla Maggiore water park is representative and inspirational for other municipalities. Since its construction in 2013, the Region of Lombardia has been installing many such nature-based solutions for CSO treatment and water quality improvement in the region. The case was successful at highlighting the manifold benefits of integrated regional water management, also considering support of wildlife and biodiversity-netgain, as well as the improvement of recreation offers for people and related enhancement of well-being and human health.

As water-related projects comprise a high degree of complexity, a series of unforeseen co-benefits might be achieved. Therefore, when considering replication or similar implementation of nature-based water treatment schemes, it is recommended to run multi-criteria analysis studies to assess potential co-benefits from an ecosystem service perspective, also considering qualitative achievements without a monetary value. This project is an inspiration not only due to the implementation process itself, but also due to the study that was realised during its implementation, which helped in the communication with stakeholders and the local community, increasing the awareness of the benefits provided by nature-based solutions and laying the ground for the promotion of integrative practices that protect freshwater ecosystems whilst also enhance people's wellbeing.

FURTHER INFORMATION

All fact sheets were produced from questionnaires and interviews conducted by the ICLEI team. Contact ICLEI Europe for more information or access Oppla: <https://oppla.eu/casestudy/17252>

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