

Designing for Flood Management
in Public Open Spaces

STORMWATER

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Birkhäuser

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Parco Gavoglio

Background

Space and water

Location: Genoa, Italy

Landscape design: LAND Italia Srl

Collaborators: Infrastrutture Recupero Energia Liguria (regional agency for infrastructure development, building and urban renovation – engineering)

Client: Municipality of Genoa, European Commission

Area: 1.5 ha

Design period: 2017–2019

Construction period: 2020–2022

Water management functions: Infiltration, detention, purification, storage, reuse, drainage

Designed by LAND, Parco Gavoglio results from the environmental redevelopment of 1.5 hectares of the 19th-century Gavoglio Barracks, gradually decommissioned from the 1970s and acquired by the municipality in 2015. The project aimed at transforming an extensive gated divide between Genoa's historic center and Parco Urbano delle Mura, a protected natural area including remnants of military fortification, into a connecting element. The designed intervention is part of the wider UNaLab project, funded by the European Horizon 2020 program and aimed at enhancing understanding of the role of Nature-Based Solutions (NBS) in urban renewal through implementation across three pilot cities, Eindhoven, Tampere, and Genoa.

The former Gavoglio Barracks complex extends on a steep terrain in the Lagaccio district, one of the most compact and densely populated neighborhoods of the city. The district takes its name from an artificial lake built in the 16th century to feed the gardens of Prince Doria's palace to the south, collecting runoff water from three torrential streams that traversed the area – Rio Lagaccio and its tributaries, Rio Granarolo and Rio Cinque Santi. To gain building space, the watercourses were buried in the 19th century and connected to the sewage system. The area underwent rapid urbanization following World War II and was largely covered with compact residential blocks with high retaining walls and steep stairways serving as the main pedestrian connections. As in many other areas of Genoa, extensive soil sealing combined with the burying of watercourses caused significant drainage problems, leading to the overflowing of underground streams during extreme weather events. Coupled with these issues are significant social contrasts related to low incomes and migration flows, exacerbated by the lack of public open spaces.

Given the area's complexity, the design of Parco Gavoglio pursued several goals. The park was intended as a reinforcement for the site's ecological system, with the construction of open spaces dedicated to rainwater management, wooded climate shelters, and areas to experience urban nature. Other important macro-objectives of the project were to improve accessibility, with the park becoming the main pedestrian connection system between various portions of the neighborhood located at different heights, and to build a social catalyst to provide recreational and interactive opportunities for a diversified public of different ages. The design stages already emphasized the social dimension through a participatory process involving the local community.

The park's spatial structure and programming follow the articulate topography of the site, which is sculpted into a series of terraces distributed across an elevation difference of over 50 meters. The few flat areas, on the lower sections of the site, are designed to accommodate group activities and active recreation, while a series of smaller, more intimate spaces follow on the steep, narrow part of the site. The original main entrance to the barracks offers primary access to the park, where a former paved courtyard is transformed into a lively square for outdoor performances and events, faced by a stepped terrace that offers space for seating while guiding visitors toward a lawn scattered with trees.

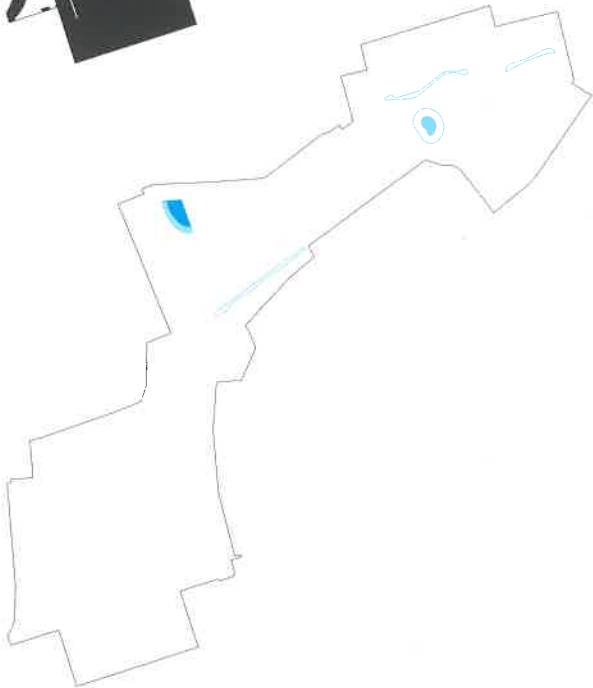
Following this spatial sequence, a playground extends on a slightly elevated terrace, placed against an existing retaining wall and enclosed by metal gabions, while a smaller play area is flanked by a multifunctional sport field sunken into the ground. Two fragments of walls pierced by doors, remnants of the barracks' demolished buildings, mark the passage to the more intimate spatial sequence, enclosed by high retaining walls. Here, a rapid series of small, enclosed, grassy terraces dotted with fruit trees evokes the traditional rural character of the region. To introduce variety to an apparently homogeneous sequence, each terrace is assigned a specific quality: some are planted with fruit trees, others are left free; some terraces accommodate picnic tables, with the largest one designed as a slightly undulating meadow. An urban forest is planted on a steep slope in the site's upper part, hosting rustic tree species with low water requirements. Stairs, linear ramps of stabilized limestone on the more expansive part of the site, and winding ramps of resin-coated gravel around the sequence of small terraces and the urban forests ensure connectivity throughout the park.

The different portions of the project feature scattered NBS aimed at water management, variously interpreting the multiform characters of the site and the terraced sequences. Some solutions also separate different functional areas or constitute spaces themselves. Among these types of NBS is the bioswale developed between the play area and the multifunctional sports field, favoring the collection and management of surface runoff rainwater from an adjacent path and the sports fields. Another, more tranquil space is a slightly lowered rain garden placed at the edge of the sport area, where the occasional presence of a spring also marks the natural confluence point between Rio Lagaccio and Rio Cinque Santi. In the sequence of flat, grassy terraces, the large meadow depression stands out

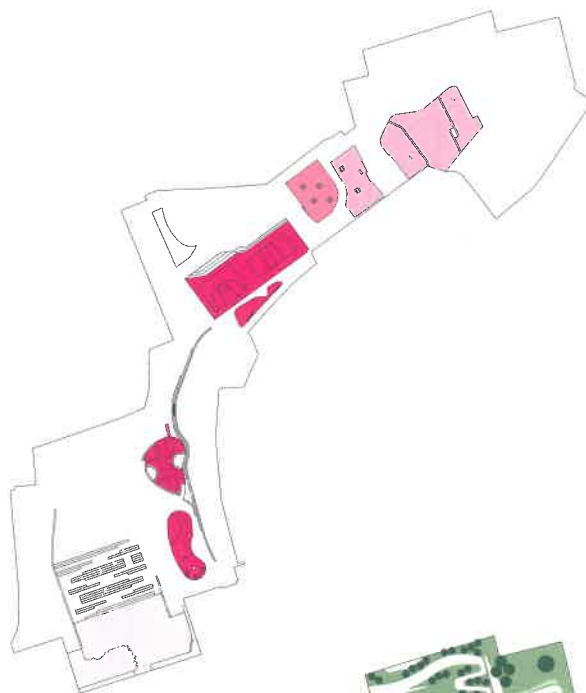
Circulation system
and paved areas



Water distribution



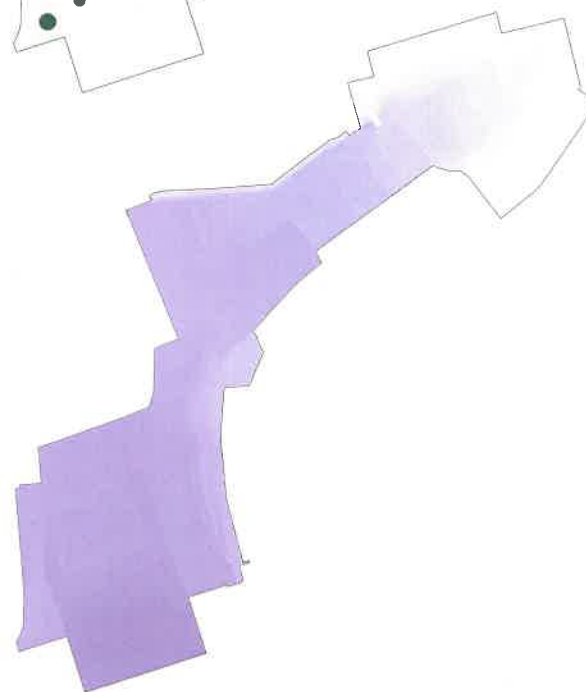
Functional areas

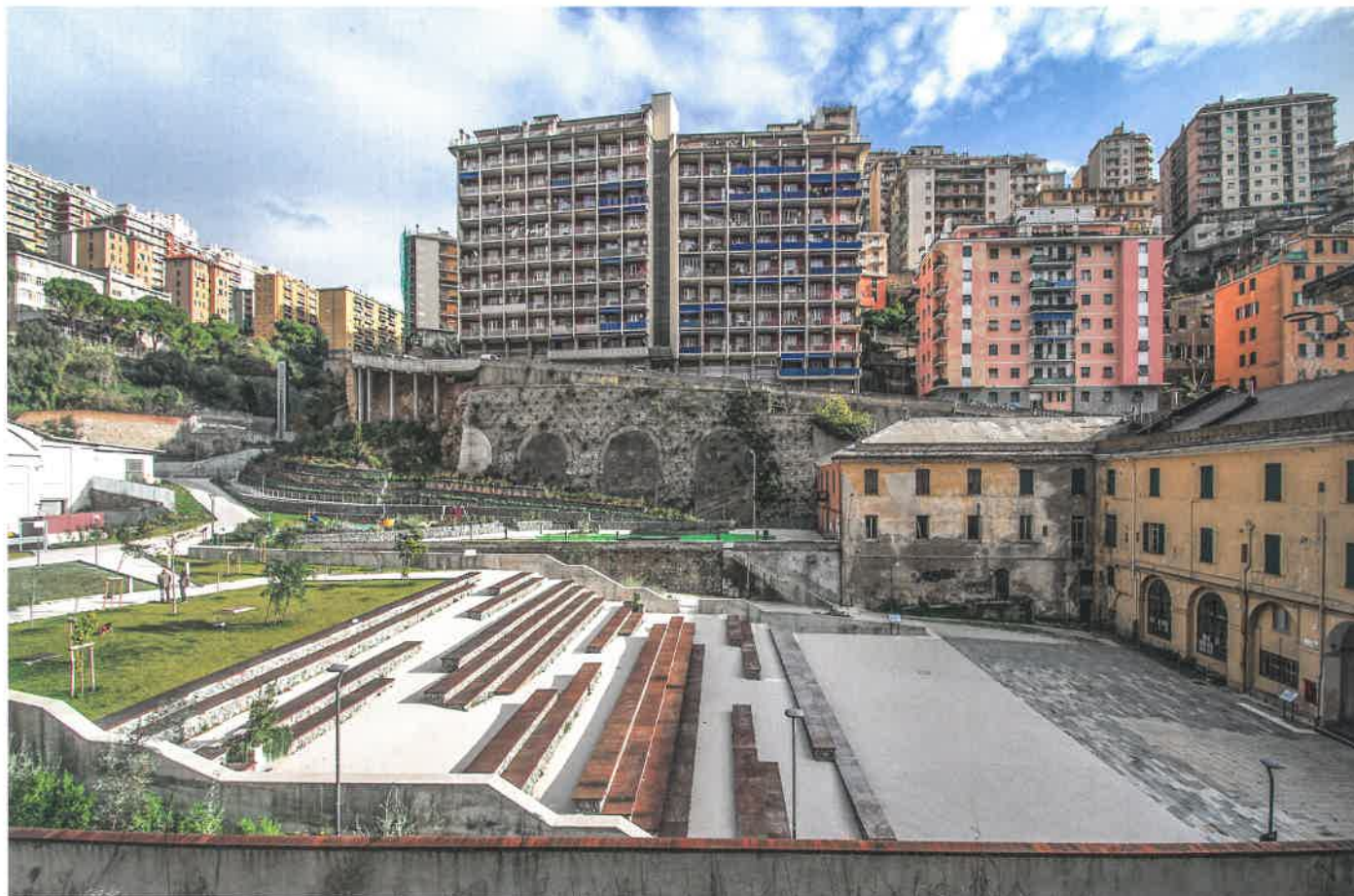


Vegetated areas



Topographical structure





General view of the main access plaza to the park. The square, facing the main barracks building, represents the lowest level of the park. The space integrates the historical pavements and, thanks to the presence of the steps, can occasionally be used as a stage for public events. The steps thus play the dual role of seating and connecting different elevations, allowing access to a sequence of lawns dotted with trees.



The recreational space system includes a second playground and a multifunctional sports field, separated by a detention bioswale. The bioswale manages surface runoff from the sports ground and was meant by the designers as an educational space displaying the water cycle. It is also an element of separation between areas dedicated to different intensities of use and users of various ages.



In an elevated position above the access plaza, the colorful playground for children of different ages extends, the first element of a sequence of recreational spaces. The play area offers a vantage point overlooking the main access plaza. On the other side, it is partially embraced by a metal gabion system that mends the existing unevenness and stabilizes the slope.

Strategies

and occasionally acts as an infiltration basin. Finally, a second bioswale system, alternating with grassy depressions, is located upstream in the urban forest. The system was designed to drain water during intense rain events, acting as a detention and infiltration device, capable of slowing down and reducing the flow downstream.

Other water management solutions, such as collection and sedimentation pits or an underground rainwater harvesting tank positioned below the large access square, are not visible. The tank collects runoff water, which is then reused to irrigate the lower part of the park.

Parco Gavoglio provides an articulate sequence of spaces differing in function and atmosphere. The distribution of NBS within the park interweaves rainwater management strategies with the construction of spatial and ecological quality, going beyond the mere hydraulic function. With such varied elevations, materials, elements, and water management systems, the spatial articulation provides dynamic sequences and varied atmospheres that offer diverse perceptual and social experiences. An example of this approach is the bioswale located between the play area and the

sports area, which, in addition to acting as a technical device for detention and infiltration, takes on further functions. On the one hand, it acts as an element of soft separation between areas dedicated to different uses; on the other hand, it was intended as a demonstrative space inviting visitors to observe the rainwater cycle in an urban context.

The carefully designed heterogeneity of spaces for passive recreation, circulation, play, and sports accommodates users of all ages, emphasizing the inclusive dimension of the project. Inclusivity extends to more-than-humans, supported by the use of bio-engineering techniques, such as live crib walls. In addition to consolidating the soil and helping to overcome topographical unevenness, these techniques increase the structural complexity and ecological richness of the park. Following this attitude, the vegetated gabions, traditionally used as retaining walls, were reinterpreted as multifunctional compositional elements, capable of capturing rainwater and providing microhabitats for fauna while serving as parapets or as informal seating. For example, they are arranged to form a terraced grandstand that partially embraces the rain garden, contributing to the construction of a contemplative space, designed to observe changes linked to the temporary presence of water.



The succession from the orchard to the picnic area and the multifunctional sports field comprises a system of ramps and terraces, also stabilized by gabions, paying homage to the regional tradition of agricultural terracing. This portion of the park was cleared following the demolition of a building in the complex. Only two fragments of arched walls were left, framing the view of the serpentine path and rain garden.

The plant selection also responds to multifunctionality criteria. The choice of species was carefully calibrated to favor biodiversity and increase the park's adaptability to the effects of climate change and extreme weather events. Hygrophilous species in the bioswale and rain garden support the construction of humid microhabitats, which are particularly valuable in urban contexts for insects, amphibians, and other small animals.

The urban, hardy forest and the planting of steep slopes contribute to soil stabilization, drought resistance, and the construction of woodland habitats, strengthening the urban ecological network. Planted groups of trees, shrubs, fruit plants, and xerophilous meadows scattered within the park provide valuable resources for fauna, improve the absorption of rainwater, and help mitigate the urban heat island effect. *MR*

Metal gabions, realized by reusing excavated soil and construction rubble, are widespread in the park and employed as multifunctional elements. In this image, they flank a serpentine ramp that leans against a retaining wall but they also act as space-defining elements. The gabions embrace a rain garden intended to accommodate runoff from upstream. They allow for infiltrating water and provide a microhabitat for wildlife.

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All cities increasingly have to deal with the effects of climate change, and especially with extreme weather events. As the urban grounds' absorptive capacity is limited, stormwater emerges as a challenging agent that reveals the intrinsic fragilities of built fabrics. *Stormwater* offers a systematic presentation of design strategies and a comparative analysis of stormwater-embracing open spaces. Investigating the four categories of urban parks, neighborhood parks, squares, and streets, the authors present 26 European best-practice case studies with photos, project descriptions, and drawings. These sites were conceived as amphibious landscapes that dynamically adjust to both dry and wet conditions. The atlas demonstrates how to effectively respond to stormwater and engage it as a design medium, investigating the varied possibilities it offers in the articulation of adaptive urban landscapes.

ISBN 978-3-0356-2899-9




Birkhäuser