Chapter 59
Resilient Design for Outdoor Sports Infrastructure

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Abstract Cities, and with them the criticalities and opportunities that characterize urban contexts, are one of the main challenges in the transition toward environmental and social sustainability today. Within the contemporary debate dominated by reflections on the effects of climate change, the culture of design is increasingly oriented to measure itself against the concept of resilience: the limitation of land consumption, together with the technological, functional and energetic reorganization of areas and buildings, is the path taken by design to make the built environment adaptable to the changes taking place, so as to promote development, equity and social inclusion. Public space, defined as a system of open urban spaces, is assuming an increasingly important role in urban and environmental regeneration processes. At the same time, the topic of sport and the public infrastructure of cities for practicing physical activity is an increasingly important factor for urban and social quality, requiring strategies capable of redefining places and the way they are used in line with objectives of environmental quality and collective well-being. The picture that emerges from studies and research on the European and Italian panorama of sport infrastructures highlights interesting and innovative trends that show, also in this sector, an increasing focus on the themes of urban, architectural and social resilience. On the basis of this premise, the contribution aims to analyze the recent evolution of the design of public space in relation to sports practices as an area where resilience policies are applied.

Keywords Sports infrastructure · Urban regeneration · Resilient design · Public space · Ecological footprint

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59.1 Introduction

In the era of environmental and economic crisis, characterized by climate change as a constant issue of planetary scope, and energy emergencies linked to resource scarcity, the capacity of societies to implement solutions to mitigate the causes of the primary problems and adapt to their main effects is assuming a central role (Martinelli and Mininni 2021).

Research and experimentation place at the center of the debate the need to address at different scales and in different contexts the issue of resilient design focused on the ability to give answers in terms of adaptability and flexibility framed in a vision geared toward sustainable development (Leone and Tersigni 2020).

Climate change, aggravated by the high rate of urban growth in the last century and the consequent increase in the production of greenhouse gases, requires capacities for "resilient development" (Adams and Watson 2010), i.e., development based, in addition to mitigation actions, on adaptation strategies capable of responding quickly and flexibly to actions arising from the changing environmental, social and economic needs (Ahern 2011; Ferrari 2021).

Transforming cities into resilient organisms, able to adapt to natural and anthropogenic pressures is a priority nowadays recognized by International Bodies, Public Administrations, Research Institutions (Rockfeller Foundation and Arup 2015) and the stakeholders involved in the project process. Adapting urban settlements and public space into resilient systems is a priority and transversal objective where design and innovation must be combined with reference to the conservative, adaptive and regenerative needs to minimize the impacts and vulnerabilities resulting from extreme climate events (Fabbricatti 2013; Newman et al. 2005)

Although the concept of resilience, which originated in the natural sciences in the 1970s, has been an integral part of the vocabulary of urban planning and regeneration for some years now (Landi 2012; Roberts 2000), understood as "the ability of the individuals, communities, institutions and economic systems that make up a city to survive, adapt and grow independently from any kind of shock or stress they may have had to suffer" (Arup 2015), in its widely accepted meaning, the concept of resilience, especially when applied to the public and collective spaces of the city, represents the capacity of a system to regenerate and reorganize itself following an adverse event or change (Fig. 59.1).

59.2 Sport, Space and Society: Resilient Design

In the context of a scientific debate on the concept of resilience that is involving different fields of knowledge, the development of a "resilience thinking" on the built environment can find innovative ideas in the design of public space, a privileged field of experimentation for projects that place social and environmental wellbeing at the center of their work.

Fig. 59.1 Sport, space, society, Portovenere, 2021, Ph. Maria Pilar Vettori

Many studies and research projects are focusing on defining new intervention strategies (Jha et al. 2013; Leone and Tersigni 2020; Losasso 2015), not only for the built system, but also for the unbuilt system, i.e., that open connective tissue that structures the city and constitutes its public spaces (Gehl 1971). Numerous programs, such as the Climate Change Adaptation Plan, envisaged by some cities (Barcelona, Copenhagen, Zurich, Paris) have precisely elected the public space as a privileged sphere of intervention for the adoption of specific resilient actions and strategies.

In this logic, the design of public space can be an important element for contrasting the negative impacts of climate change—such as the management of meteoric water, flood prevention, containment of temperatures, the reduction of urban heat islands—but above all it can promote interventions designed to improve urban health and foster a resilient habitat. These integrations are an exceptional way of doing and conceiving interventions for the defense of territories, as they can be interpreted as a possible way of enriching the articulation of the "Project of the Soil" (Secchi 1986) by developing new materials and new urban functions.

Within the dynamics of public space transformation, sport is an important tool for fostering resilience and regeneration, which can activate new uses and meanings of the places in which it is practiced.

Talking about public spaces broadens the view to include a series of aspects that are usually marginal in the design and planning processes. In this sense, the main

themes that emerge as characterizing factors of a resilient project or initiative can be identified in the concepts of *flexibility*, *community* and resource *management*.

The definition of factors is primarily concerned with *flexibility*, understood as the ability to provide adaptable responses to constantly evolving needs.

This theme has a threefold significance: flexibility of the objectives in terms of vision and project drivers; long-term flexibility through an ability of the design process to work in steps; flexibility of the solutions in terms of multifunctionality and adaptability of the space in its life cycle.

Crisis factors of European cities have generated a large quantity of unused urban voids: awareness of their potential has led to the performance of various experiments on their use in economically sustainable, socially useful, and environmentally aware ways, which find an important opportunity in the combination of urban sports and public space (Castelli 2020; Cognigni and Vettori 2020).

Several programs implemented in Spanish cities are significant in this sense, such as "Esto no es un solar" in Zaragoza or the "Dispositivo de la Cebada", created in Madrid in 2011 on the initiative of the Todo Por La Praxis association. These place the synergy between different sporting activities and temporary cultural and social events at the center of a principle of physical and social urban resilience.

If placed at the center of projects, the *community*, understood both as a common identity and a sense of belonging to a group, and as a set of relationships, can strengthen existing links and spark new ones. One of the possible keys to the success of such an intervention is the active involvement of the residents in the initiative, with a view to stimulating a sense of belonging to the place where they live and a desire to take care of their neighborhood.

Finally, placing the emphasis on *resource management* involves stimulating the development of good practices. Resource management is seen as sensitivity toward the importance of recycling and reducing waste. In this sense, the resilience strategies of public space design, can represent a global reference landscape in terms of tools for achieving high standards of quality of life and environmental protection.

Within this scenario, the immaterial dimension linked to Information Technologies (IT) and Information and Communication Technologies (ICT) supports the management and decision-making processes in the various phases of the design process but also of the activities of users, redesigning decision-making and behavioral methods.

The dimension of computer technologies aimed at simulation and modeling actions allows to verify the contribution of the open space system to the increase of resilience through the ability to correlate data, scenarios, criticalities, opportunities, strategies and projects that reduce climate vulnerabilities through adaptation processes within urban districts most exposed to impacts. For example, the computational design offers useful features to incorporate relevant sets of information in open spaces, allowing them to be modelled and parameterized to evaluate, through simulations, the performance response of technical and design alternatives, also in the involvement with stakeholders and according to participation processes, as happened for Todo Por La Praxis.

59.3 Resilience and Outdoor Sports Infrastructure

Is sport an opportunity for urban resilience? The answer to this question is to be found in the characteristics that infrastructures dedicated to sport are assuming in relation to the contexts that host them, and to the increasingly evident need for communities to have healthy lifestyles.

As reported in the CONI 2016 sustainability report, it is important to consider how "Sport is a vehicle for inclusion, participation and social aggregation as well as a tool for psychophysical well-being and prevention. Moreover, it plays a fundamental social role as a tool of education and training that allows the development of skills and abilities essential for the balanced growth of everyone". Sport teaches resilience, and resilience mobilizes the resources identified to find positive and flexible responses to adaptation.

Public space, today an open and flexible place, together with a culture of leisure time, is based on a concept of the city in which all its constituent elements are geared toward the development of integrated programs and planning strategies that promote the idea of a healthy city.

Sport is an important tool for regeneration, whose integrative value can activate new uses, meanings and changes to the livability of the city (Faroldi 2019).

The themes characterizing the current role of sports infrastructures in the "promotion" and "production" of urban resilience of anthropized contexts, aimed at guaranteeing an ever-greater adaptive capacity of these elements of the urban system, lead to a forward-thinking reflection on the acquisition of adequate skills with which to tackle and manage the processes of planning, design, construction and management of the places and artefacts to be used for practicing sporting activities (Allegri and Vettori 2018).

In recent years, sport and the places connected to it have witnessed a profound transformation, which has produced food for thought on the concept and value of resilience. The uses, design and purpose of sports facilities have changed. The trend is to create places that can accommodate not only athletes but the whole community, with services defined by the needs and demands of society.

There are more and more examples of public spaces conceived to host informal sports practices, in synergy with other functions, taking inspiration, also from a morphological point of view, from the spatiality necessary for sport: the movement of the ground and the spaces, the alternation of permeable and impermeable materials, the coexistence of different categories of users, lead to a stratified use of the spaces (sporting activities, playgrounds, relaxation areas).

Now, physical activity is seen by more and more people as a means to achieving physical and psychological wellness: these changes are also reflected in the physical configuration of the spaces dedicated to sport in terms of type, characteristics and functionality. Alongside sports facilities designed to host competitive or structured sporting activities, new configurations are emerging, in which sport is practiced more informally and with greater flexibility. This trend leads to the creation of systems that integrate with the context, capable of redeveloping degraded areas, rethinking

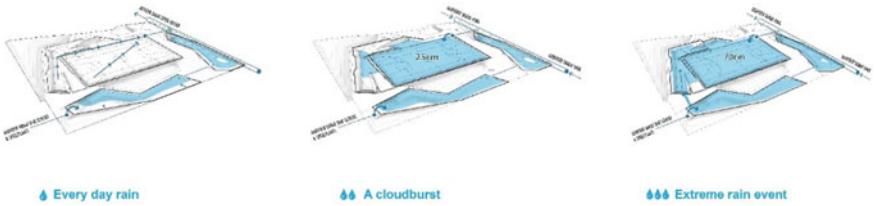

Fig. 59.2 Watersquare Benthemplein, Water system's concepts, Rotterdam, 2013, De Urbanisten, grafics by: De Urbanisten

existing spaces, and implementing and promoting a concept of *resilience* that is both the premise and the objective.

Squares, boulevards, urban parks, but also small residual spaces, roofs and wastelands take on physical configurations that can not only respond to a renewed concept of public space for sports but also configure possible solutions to combat the consequences of climate change (Santamouris 2013; White 2010).

One of the most investigated themes is the opportunity offered by these spaces, thanks to their large surface areas and high ceilings, to control the impact of rainwater in urban areas at risk of flooding, such as some of the projects carried out in Rotterdam as part of the *Stadvisie Rotterdam 2030* program: squares designed for games and recreational activities featuring a layout that can be changed depending on the climatic conditions. Equipped with volleyball, basketball and football pitches and terraces, the so-called "water squares" (*Bellamyplein* in Spangen, *Benthemplein* in Agniesebuurt, Tiel) are designed to "collect" rainwater in a disciplined way and to decant it to prevent flooding, thanks to the use of construction systems and appropriate materials (Figs. 59.2, 59.3 and 59.4).

With the same objective (water management), some interventions take advantage of the opportunities offered by the physical characteristics of different surfaces for sports spaces, the presence of green surfaces, or the necessary altimetric articulation of the spaces. They tend to work on the surface, the porosity of the materials, and the topography to allow their use even during extreme events. See, for example, the *Rabalder Parken* in Roskilde, Denmark, a system of open spaces for skateboarding, skating and BMX, sports which exploit the slopes of the land to create real basins in which to collect water.

59.4 Conclusions

In a perspective of uncertainty and unpredictability due to the qualification and quantification of the consequences of climate change on urban systems and the increase of the world population in cities, the difficulty of finding references for the direction of urban design is emerging.

Fig. 59.3 Benthemplein, Rotterdam, 2013, De Urbanisten, Ph. Ossip van Duivenbode

Multiple studies have been conducted to define new indicators of urban resilience (Carpenter et al. 2001; Normandin et al. 2009), investigate the role of materials and technologies in mitigation and adaptation strategies (Doulos et al. 2004), and to evaluate the effects of resilient strategies with models and instrumental analysis (D'Ambrosio and Leone 2015).

Understanding how to increase resilience, simulate its setbacks and measure its expected effects is a task that cannot be delegated to territorial governance. It requires reflection on the scale of the technological design, its methods and its tools to build a resilient city as a place that does not simply implement extemporaneous remedies to climate change but adapts to them by building new social, economic and environmental opportunities.

The relationship between resilient approach and the use of intangible technologies becomes ever closer, in the control and monitoring of interventions, in the need to simulate and model as well as to use data within the analytical and forecasting processes.

In this logic, the urban spaces of the community become places of change and not simply adaptation, with physical and social characteristics able to respond to the transformations. The community is the central element in the activation of the

Fig. 59.4 Watersquare, Tiel, 2014–2016, De Urbanisten, Ph. De Urbanisten

projects, promoting awareness of the need to address the social, urban and climate changes underway. This would be done through an approach that is inclusive but at the same time conscious of the need for a systemic and scientific vision, able to translate social innovations into behavioral innovations by redesigning public space to reflect the community and its aspirations.

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