Cities and Sport. Proximity Planning Among Green Networks and Commons

Giuseppe Borruso[1] and Ginevra Balletto[2(✉)]

[1] DEAMS - Department of Economics, Business, Mathematics and Statistics "Bruno de Finetti", University of Trieste, Via A. Valerio 4/1, 34127 Trieste, Italy
giuseppe.borruso@deams.units.it

[2] DICAAR - Department of Civil, Environmental Engineering and Architecture, University of Cagliari, Via Marengo 2, 09123 Cagliari, Italy
balletto@unica.it

Abstract. This paper discusses the relationship between sport, health and urban form within the perspective of proximity planning, focusing on the role of green networks and urban commons. Starting from the growing relevance of outdoor physical activity after the Covid-19 pandemic and from the effects of climate change on urban environments, the contribution interprets sport as a driver of sustainable urban development and public health. The paper reviews the evolution of the relationship among sport, urban greenery and health, highlights current conditions in Italian cities, and argues for a planning approach that integrates walkability, green infrastructure and informal sports practices. Particular attention is devoted to large mono-functional urban enclaves and disused compounds, which can hinder proximity networks but also become strategic spaces for regeneration. Using previous research on Cagliari and Trieste, the paper recalls the use of GIS tools, community data and the Walkability in Big Buildings Index to support the interpretation of urban space as a network for health-oriented and inclusive sports practices. The contribution concludes that sport should be recognized as an urban common good and as a key component of the resilient city within the ecological transition.

Keywords: Sport City · Health Geography · Urban Greenery · Proximity Planning · Commons · Walkability

1 Introduction: Sport, Health and Urban Form

The interconnection between sport, health, and urban form is increasingly evident as a consequence of urbanization processes, such as the growing prevalence of sedentary lifestyles, air pollution, and climate change, as well as epidemiological aspects related to the spread of viruses and diseases. The Covid-19 pandemic marked a moment in which outdoor activities experienced a significant grassroots-driven upsurge, characterized by both organized and informal practices taking place in spaces not necessarily designated for sporting purposes. This trend led, albeit still timidly, to the development of urban policies aimed at assigning areas to sports practices (gyms, swimming pools, playing

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fields, etc.) and at the reappropriation of urban spaces not originally intended for sporting use.

At the same time, the increasing frequency of perceived extreme climatic events, associated with rising temperatures in urban areas, has highlighted the crucial role of green spaces in mitigating the effects of these phenomena, making them an increasingly essential component of urban regeneration strategies.

The statement that "sport is an important enabler of sustainable development" [1] prompts a rethinking of urban policies from a health geography perspective, linking urban morphology to the spatial distribution of diseases. Within this framework, the arrangement of open spaces, green networks, and sports facilities assumes a structural role in shaping cities oriented toward health, influencing socio-geographical factors of access to well-being and the capacity for prevention with respect to major risk factors by structuring everyday opportunities for active mobility, social interaction, and exposure to restorative environments, these spatial configurations operate as "health-promoting" urban devices that can either reduce or exacerbate inequalities in morbidity and mortality [2, 3]. Recent contributions in urban health and epidemiology have shown how landscape morphology, connectivity, and the distribution of activities condition patterns of exposure to airborne diseases, with more "patchy" and heterogeneous urban fabrics often associated with higher contact rates and vulnerability [4, 5]. In this sense, the design of green and sport infrastructures intersects with debates on the 15-min city and chrono-urbanism, which advocate for proximity-based access to everyday services and physical activity as a way to advance health equity, particularly for socially and spatially disadvantaged groups [6, 7]. Such perspectives reinforce the idea that integrating sport, greenery, and walkable public spaces into ordinary planning is not merely a matter of amenities, but a core public health strategy embedded in the spatial organization of the contemporary city.

2 Sport, Health, City, and Urban Green: Evolution of the Approach

The relationship among city, health, sport, and urban greenery has become a well-established connection, understood as a multidimensional system in which geographic space acts as a multiplier and diffuser of well-being, rather than as a mere container. Sport is viewed as a "total social fact," capable of both reflecting and influencing the structures of contemporary society, engaging aspects of medical and health geography [8, 9], where the quality of urban life is intrinsically linked to the equilibrium between the environment and the human body.

Physical and sporting activities also serve as a driving force for local and territorial development [10, 11], producing new geographies and processes of rewriting the urban space. Urban sporting events have become a consolidated practice [3], materializing the interaction among economic, social, environmental, and territorial marketing benefits [12]. Historically, stadiums, arenas, and large sports facilities have represented emblematic spaces of the "public city"—a space that is identity-building, spectacularized, and often politically symbolic. The current transition toward widespread forms of everyday sporting practice marks a shift from a nodal and centripetal model—based on specific facilities for dedicated sports activities—to a diffuse, networked configuration in which

streets, waterfronts, squares, and parks collectively function as a "distributed stadium" designed from the bottom up [13].

Alternative sporting practices [14] reveal how citizens "rewrite" the urban territory, transforming marginal areas into spaces of well-being and reclaiming a healthier and more inclusive city. This shift moves the focus away from traditional, institutionalized sports (such as football, tennis, and athletics) toward so-called "Lifestyle Sports" or "action sports" [15].

From a geographical perspective, new functional networks emerge, overlapping those of mobility and following temporal and spatial logics often unforeseen by traditional planning tools. Within the planning domain, however, this vision translates into a growing critique of functionalist standards. According to Boeri [16], urban forestry represents vital infrastructure for public health, while Castagnoli [17] argues that urban green areas should not be confined to a purely conservationist dimension. The link between sport and green space [18] becomes a central issue: outdoor recreational activity transforms urban greenery into a "territorial health service." Yet coherence in policy implementation often remains weak. Lindsey and Darby [19] warn of the fragmentation between sustainable development goals (SDGs) and actual practices.

From a social standpoint, the right to health and sport within green spaces acquires a distinct political value. Harvey [20] conceptualizes these spaces as essential *commons* for the "right to the city," while Corburn [21] emphasizes that urban planning must incorporate the claims and experiences of local communities to achieve genuine effectiveness.

3 Sport, Health, City, Urban Green. The State of the Art in Italian Cities

Recent analyses on Italian cities confirm the interdependence among sport, green infrastructure, and public health, outlining a "Sport City" model conceptualized as an integrated ecosystem, generally associated with high levels of urban quality of life [22, 23]. According to the Green White Paper 2025 [24], urban greenery is no longer seen as a mere decorative feature but as a functional "lung" structured around three core pillars: economic and managerial integration, social cohesion, and environmental resilience. This approach directly addresses the climate emergency identified in ISPRA reports [25, 26], complemented by Copernicus data, which indicate a critical temperature increase of + 1.33 °C in Italy in 2024 as a peak year if compared to the trend recorded from 1961. Within this scenario, green spaces act as mitigators of "urban heat islands," providing essential ecosystem services that foster psycho-physical well-being and protect socially vulnerable groups.

The *2025 Sports Index* [23, 27, 28] highlights how sports participation serves as a key determinant in balancing quality of life and economic development, while still reflecting marked geographic disparities. Northern and Central Italy retain their leading positions: Trento confirms its top ranking by combining outstanding sports performance with exceptional environmental indicators (over 100 m^2 of green space per capita). Bolzano follows for its high per capita green endowment, alongside major urban centers such as Milan, Bologna, and Florence—the latter ranking first for women's sports.

Among metropolitan areas, Venice (35.5 m^2/inhabitant) and Turin (22.7 m^2/inhabitant) stand out for green space accessibility. Structural weaknesses persist in Southern Italy, where cities such as Reggio Calabria, Vibo Valentia, and Crotone consistently occupy the lower end of national rankings. In Catania, Messina, and Bari, accessible green space falls below the legal threshold of 9 m^2 per inhabitant, exacerbating urban vulnerability.

Environmental emergencies continue to affect the Po Valley's urban areas, which, despite slight improvements in emission trends, still record harmful concentrations of fine particulate matter (PM2.5) and ozone—making urban afforestation an urgent public health necessity. Data analyses reveal encouraging signs of progress: urban afforestation projects increased by 6.7% over the past year. The regulatory framework, influenced by the *Nature Restoration Law* [29], is steering local administrations toward the "no net loss" goal for natural land, promoting a qualitative and adaptive management of open spaces.

4 The Role of Urban Planning in Sports Practices

The emergence of new urban forms of outdoor physical activity highlights how the city serves as the territorial framework for the daily production of health and well-being. International literature on sport, green spaces, and urban environments underscores that the coexistence of ecological infrastructures and facilities for active mobility can reduce psychosomatic stress, influence metabolic risk factors, and enhance perceived quality of life—thus confirming the interconnection between urban form, social capital, and health. In recent years sport-equipped urban green spaces have become part of urban regeneration projects and initiatives. Green areas are currently integrated and structural parts of redevelopment projects in urban areas, while the inclusion of publicly available sport equipment is integrating urban green particularly along scenic footpaths and strolling streets.

Within this framework, the authors have investigated the concept of the "Sport City" as an integrated planning device capable of guiding community movement practices in a democratic and non-extractive manner, in some cases fostering the urban transition toward "street sport."

Recent reflections inspired by the "15-min city" model, aimed at enhancing proximity-based activities and services, now demand a reconfiguration of ordinary planning processes—placing walkability and other movement practices at the center as indicators of health and as modes of sustainable transport. This often intersects with the presence of "urban voids" and large mono-functional complexes—typically industrial, military, or infrastructural—which generate spatial fragmentation, perceptual discontinuity, and barriers to walkability. These enclaves, characterized by underuse and selective accessibility, can be interpreted as "anti-common goods," subtracting significant portions of land from collective enjoyment and limiting the potential for building proximity networks.

4.1 Materials

Trieste and Cagliari—mid-sized Italian port and regional capitals located respectively on the Northern Adriatic and in Southern Sardinia, respectively hosting 198,388 and 146,692 in 2025—can be framed as comparable Mediterranean "sportscapes" in which sport, walking, and outdoor physical activity have become elements of the urban environment and important key points for interpreting contemporary urban transformations and changes.

Both cities combine their relatively compact historical cores – the two municipalities span from around 80 km^2, with nearly half of such surface hosting citizens and urban activities - with a relevant and dominant maritime interface, where seafront promenades, waterfronts, and linear parks function as everyday "sport corridors" supporting running, walking, and non-motorised mobility. Trieste waterfronts are in the city centre and in the Barcola suburb, this latter a key promenade enabling year-round outdoor practices. Cagliari presents its waterfronts as the city centre and the Poetto urban beach (≈8 km) and its backshore, provide a continuous infrastructure for jogging and cycling. This spatial configuration aligns with recent national rankings, where the PTS/Il Sole 24 Ore Sportiveness Index [23] places Trieste 7th and Cagliari 10th among Italian provinces, and is further reinforced by their designation as European Cities of Sport (Trieste 2011; Cagliari 2017), reflecting a growing emphasis on the accessibility and diffusion of spaces for grassroots and outdoor activities rather than elite performance alone. Such a geographical and morphological configuration offers the roots for analysing how different groups of inhabitants and temporary users appropriate, traverse, and reconfigure these urban spaces through everyday sport practices, thereby informing sport-oriented planning strategies for public space regeneration and the redefinition of the relationship between city, health, and citizenship.

4.2 Methods

In this context, the authors have focused on indicators of regeneration of large urban complexes [13, 30–32], expressed, for instance, through the Walkability in Big Buildings Index (WBBI). This composite index measures the effectiveness of interventions across three pillars: Porosity (PI), understood as the capacity to create spatial relationships; Crossability (CI), referring to the quality of pedestrian and cycling connections; and Attractiveness (AI), linked to the diversity of proximity functions (sports, health, social interaction).

Building on this, the authors define the Walkable Big Buildings Index (WBBI), a composite indicator that integrates three components—PI, CI, and AI—through a weighted sum. Each component is assigned a weight (pk) reflecting both the characteristics of the buildings and the conditions of the surrounding urban context, with all weights summing to 1. The index is normalized on a 0–100 scale using the formula:

$$WBBI = \sum_{i=1}^{n} (I_i \cdot p_k) \cdot 100 \quad (1)$$

The weighting system is informed by the spatial and functional features of historic urban centers, which serve as the primary reference for evaluating context. Overall, the WBBI captures the potential walkability of large abandoned buildings by combining building-specific attributes with broader urban conditions.

The use of GIS technologies and community data enables the mapping of "physical activity landscapes," turning static spatial readings into dynamic analyses of usage flows.

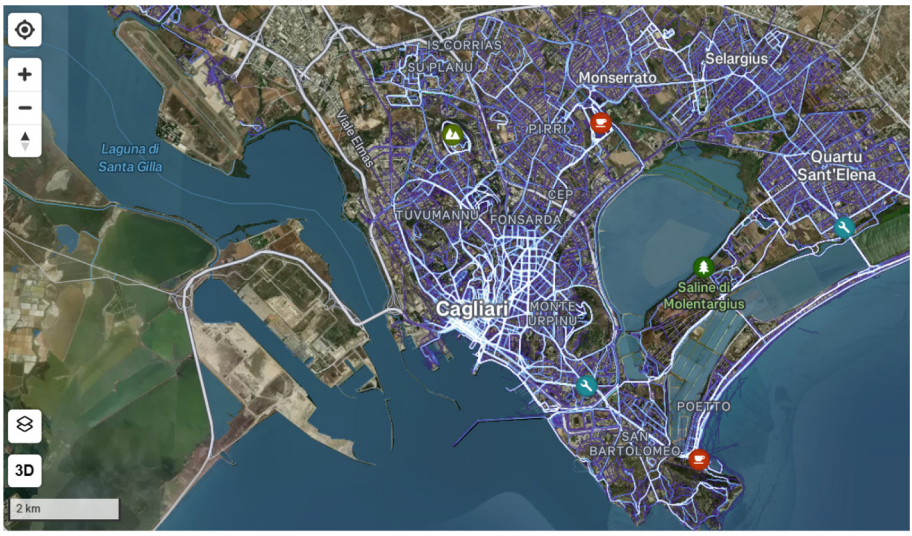
4.3 Results and Discussion

Focusing on the cities examined in the research (Cagliari and Trieste), GPS tracks of "urban athletes" using the walking mode were organized into density maps that highlight the most frequented streets and routes (shades ranging from light to dark blue based on their intensity of use). The resulting representation of the "sportively lived network" traces paths across both traditional and newly created networks - often non-pedestrian or vehicular -, while also revealing urban enclaves—blocks effectively closed to public access (Fig. 1 *a* and *b*; Fig. 2 *a* and *b*).

Reasoning about the patterns drawn by user-generated digital sport tracks leads to identifying most chosen areas for leisure and outdoor activities, as well as highlighting urban enclaves, therefore presenting a map of accessible and non-accessible areas within the different urban environments considered.

The overview of the two cities considered presents some similarity in patterns, where more dense areas, as highlighted in Fig. 1 and Fig. 2, tend to concentrate in central parts of the city. Nonetheless, denser and most frequented areas appear to be located in linear orientation along major walkable pathways, often located in close proximity to urban and peri-urban amenities.

Zooming onto selected parts of the cities examined reveals some interesting and relevant elements related to two aspects of the relationship among active citizens and urban fabrics. The comparative reading of training-app traces across the two cities highlights how digital mobility footprints can function simultaneously as urban portraits and as diagnostic instruments of spatial inequality. In the first case – Fig. 3a and b -, the aggregation of individual workouts produces a legible "drawing effect": repeated trajectories thicken into luminous corridors that effectively map the city's preferred and performative spaces—waterfronts, parks, scenic footpaths and roads, and central districts—where perceived safety, environmental quality, and symbolic attractiveness converge. These patterned concentrations should not be interpreted merely as the sum of personal choices, but as an emergent representation of how the city invites movement through continuity of public realm, aesthetic cues, and accessible infrastructures. In the second case, as it by contrast, the traces are fragmented, abruptly interrupted, and forced into detours, making visible the presence of urban "enclaves": fenced, circumscribed, and functionally exclusionary areas that constrain permeability and reduce route diversity – Fig. 3a and b, bounded polygons.



(a)



(b)

Fig. 1. **a.** Heatmap of pedestrian urban traces in cities. City of Cagliari. 2D view. Source: Authors' elaboration from Strava Heatmap (https://www.strava.com/maps/global-heatmap). **b.** Heatmap of pedestrian urban traces in cities. City of Cagliari. 3D view. Source: Authors' elaboration from Strava Heatmap (https://www.strava.com/maps/global-heatmap).

In the case of Cagliari – Fig. 3a -, the bounded area corresponds to the former Tobacco factory, now a cultural centre, reconverted from industrial to urban uses and purposes, but at the same time representing a non-permeable enclave to pedestrians. On the contrary, even major boulevards and traffic bypass in the central part of the city, as well as the waterfront pedestrian area – now under a relevant process of urban renewal and reconversion, appear densely traced by sport traces.



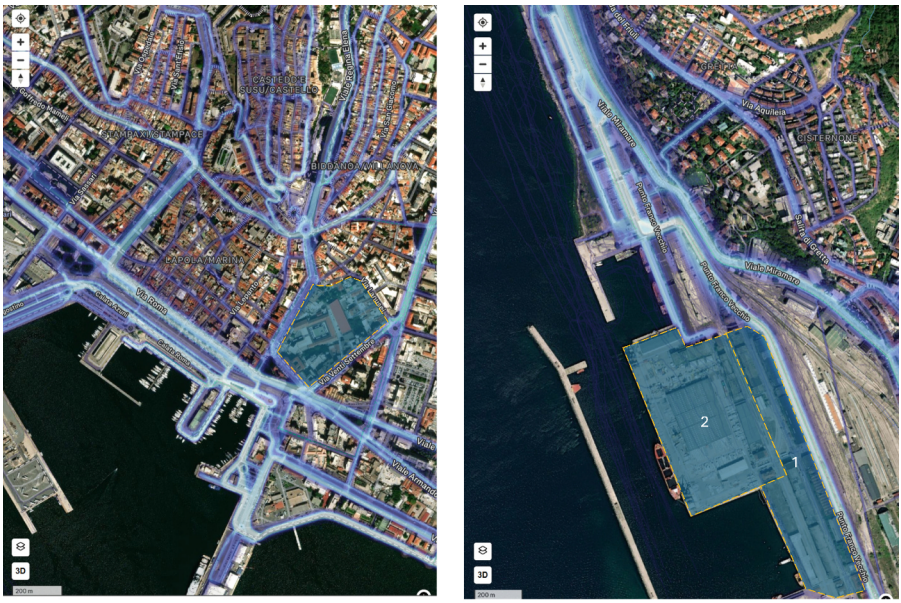
(a)



(b)

Fig. 2. **a.** Heatmap of pedestrian urban traces in cities. City of Trieste 2D view. Source: Authors' elaboration from Strava Heatmap (https://www.strava.com/maps/global-heatmap). **b.** Heatmap of pedestrian urban traces in cities. City of Trieste 3D view. Source: Authors' elaboration from Strava Heatmap (https://www.strava.com/maps/global-heatmap).

In the case of Trieste – Fig. 3b - a focus is on the former Old Port, now at the centre of a major urban regeneration process. The denser traces present part of the area widely and intensively used by active citizens, the two bounded polygons represent two areas earmarked for urban conversion in different times. No 1 is expected to be rapidly assigned to urban functions, while No 2 is still hosting terminal port operations and still separated by the rest of the urban fabric.



(a) (b)

Fig. 3. Zoomed heatmaps of a) Cagliari and b) Trieste (same scale).

5 Conclusions

The analysis of sports mobility trajectories makes it possible to interpret street sport as a practice of re-territorializing public goods, foregrounding the value of collective space over land rent. In this perspective, the city no longer serves as a mere backdrop for athletic performance, but becomes part of the performative dispositive itself, shaping differentiated conditions of accessibility, safety, inclusion, and environmental comfort. This calls for rethinking the "Sport City" as a field of negotiation between institutional uses and spontaneous practices, between event-based economies and rights to bodily citizenship, in line with recent debates on policies for sport, including informal activities and non-conventional practices, in which urban green spaces, urban voids, and enclaves can together give shape to an extensive urban ecological and sports network.

Trieste and Cagliari can act as laboratories in which urban morphology (density, central compactness, coastal location) and the spatial distribution of sport facilities and open spaces co-evolve with emerging patterns of urban health, well-being and social inclusion. The work operationalises geolocated fitness-platform traces (e.g., running and swimming) via GIS processing and heatmaps, revealing marked spatial clustering along seafront linearities and within compact, walkable central fabrics, thereby offering an empirical basis for accessibility- and well-being–oriented planning agendas.

In conclusion, sport must be recognized as a social fact [33] and an urban common good and as a cornerstone of the resilient city. The key challenge for future planning is to ensure that the landscape quality and accessibility of sports networks are genuinely inclusive—with particular attention to vulnerable groups—thereby elevating the right

to health and outdoor physical activity to fully-fledged new rights of urban citizenship within the broader framework of ecological transition.

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