



Pocket parks towards more sustainable cities. Architectural, environmental, managerial and legal considerations towards an integrated framework: A case study in the Mediterranean region

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ABSTRACT

Pocket-sized urban parks may contribute to more widely distributing the advantages created by parks in urban neighborhoods, allowing more citizens to benefit more frequently from park environments. Notwithstanding their several benefits, including citizens' psychological, physiological and physical well-being; possibilities for recreational activities; and improved economic attractiveness of a neighborhood, pocket parks (PPs) are not yet widely diffused worldwide. Considering the state of the art of PPs, we identify four main perspectives that characterize them: architectural, microclimate, managerial and legal. Focusing on a relevant case study, i.e., the Mediterranean context, we analyze the multi-disciplinary challenges – connected to the four identified dimensions – for their diffusion elsewhere. Finally, we provide a general framework for favoring PPs' creation and management, as the original contribution of this work. Besides advancing scientific knowledge about PPs, our results also interest policymakers and public organizations, as the diffusion of PPs can mitigate urban environmental challenges by creating pleasant experiences for citizens and favoring economic activities.

1. Introduction

“For the benefit and enjoyment of the people” (Roosevelt Entrance Arch, Yellowstone, 1903)

This sentence dominates the entrance arch of Yellowstone National Park, declaring the right of all the people to enjoy its natural environment, conserved to guarantee access to nature and its related benefits (Knez and Thorsson, 2008; Schnell et al., 2019). Enjoying this pleasant experience is even more crucial nowadays, as citizens increasingly live in intensively built cities (Moglia et al., 2018). Current United Nations (UN) reports state that by 2050 the world population will rise from 7.2 to 9.5 billion and 66.4% to 85.4% of the world population will reside in cities, while today the percentage is 54% (United Nations, 2018). The creation of a healthier urban environment constitutes a major policy priority (Foray et al., 2012). Parks and greenery in urban areas increase contact with nature, providing crucial relief, considering projections about the increasing stress and number of work hours, and rising pollution in populated areas (Lederbogen et al., 2011). Additionally, urban areas are facing growing pressure due to ur-

ban land consumption and soil sealing, contributing to microclimate alteration phenomena, such as Urban Heat Island (UHI) and exacerbated heat waves (Kafy et al., 2021; Moriarty and Honnery, 2015). Urban parks proved successful in mitigating all these issues (Lin et al., 2017). Previous studies have highlighted the importance of urban parks, demonstrating their role in citizens' psychological well-being (Kim and Jin, 2018), lowering the stress and anxiety of urban life (Schnell et al., 2019); providing restorative experiences, such as recovery from attention fatigue (Kaplan, 1995) as well as acting as recreational destination for nearby residents (Liu and Wang, 2021); and allowing high values of self-reported physical state and life satisfaction (Ayala-Azcárraga et al., 2019). Studies have also evidenced that parks and nature in urban areas favor higher housing and hotel-room prices, thereby raising an area's economic attractiveness (Kim et al., 2019). Hedonic studies highlight that urban parks and meaningful urban open spaces increase home values (Park and Kim, 2019). Residents, especially seniors, are willing to pay more for an increased amount of urban parks (Kim and Jin, 2018). Thus, the diffusion of urban parks can be extremely beneficial.

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As further evidence of the relevance of urban parks, the Intergovernmental Panel on Climate Change and the Sustainable Development Goals (SDG) (United Nations, 2015), adopted by UN Member States towards a more sustainable future, highlight the Grand Challenges, i.e., the pressing environmental and social problems deeply affecting society worldwide. Specifically, Goal 11 of the SDGs states that in cities, each citizen should have convenient access to open public space within 400 m walking distance from their residences (Morakinyo and Lam, 2016). Currently, only 21% of the world's urban population has such proximity to decent open public space (United Nations, 2015). These data motivate the interest of researchers, policymakers and organizations towards the diffusion of parks.

While introducing large urban parks is complex in consolidated urban areas, inserting smaller parks in residual spaces is more easily implemented throughout neighborhoods (Delgado-Capel and Cariñanos, 2020). In dense urban areas, outdoor spaces are usually characterized by paved surfaces, with little space left for nature (Fischer et al., 2018). Small (or pocket) urban parks could effectively contribute to more widely distributing their advantages, allowing more citizens to benefit more frequently from park environments (Zhou et al., 2021). Tailoring solutions to implement “small,” – or “pocket” – parks in big cities may increase citizens' wellbeing, allowing more frequent encounters with nature and possibilities for comfortable, relaxing experiences in daily life. Studies have shown that citizens in residential settings prefer smaller parks over large urban parks (Kim et al., 2019) and small neighborhoods parks have higher visiting intensity than larger parks (Zhang and Zhou, 2018). Having green spaces at a walking distance from home/work positively affects citizens' satisfaction and the frequency of use of outdoor spaces (Hadavi et al., 2018). Hadavi and colleagues (Hadavi et al., 2015) highlight how residents appreciate nearby nature settings and small green spaces. We will hereinafter refer to small urban spaces that are open to public and include greenery as “pocket parks” (PPs).

Given the global call for increasing parks in urban areas, and the benefits brought about by PPs, we seek to address how to favor their diffusion worldwide. Today, PPs are mainly present and widespread in countries characterized by specific climates, a high civic sense of belonging (Albanesi et al., 2007), a developed institutional framework and efficient law enforcement (e.g., the USA). However, it is not clear how they can be effectively applied in different contexts, considering specific architectural, microclimate, managerial and legal dimensions. Therefore, the aim of this study is to address the following research question: How can the diffusion of PPs be successfully and effectively favored?

Starting from the exemplificative and successful PPs in New York City (NYC), USA, as they are the archetypal PPs and among the first to be designed and developed with specific design criteria as “pocket parks.” we analyze the benefits that they provide and their main features. Then, we highlight the challenges in developing PPs in the Mediterranean region, taken as a relevant case study of a different context in which to implement PPs, considering its peculiar architectural, environmental, managerial and legal environments. In greater detail, we have focused on Italy for its barycentric geographical position in the Mediterranean area, noting also that the Italian National Strategy and Plan Towards Adaptation to Climate Change highlights the critical importance of outdoor open space in urban areas. Finally, from the NYC example and the Italian case study, we tailor the general framework for designing and developing PPs in urban areas, as this work's original contribution towards more sustainable and resilient urban areas. Indeed, the effective creation of PPs could aid in mitigating urban challenges and improving urban resilience, for safer, healthier and more pleasant urban open spaces.

The manuscript is organized as follows: Section 2 reports the origins and defines the phenomenon of PPs, considering architectural, microclimate, managerial and legal features; in Section 3 we highlight the challenges for their diffusion in different contexts, focusing on the Mediterranean region; in Section 4; in we discuss a proposed integrated

framework for favoring wider adoption of PPs; and Section 5 reports the conclusions of our study.

2. Pocket park features and benefits

PPs are also known as *vest pocket parks*, referring to the small pockets on vests, indicating their reduced dimensions. Faraci (1967) claims such parks require a “minimum expense, but a great deal of imagination.” He finds the roots of their success in their low cost and greater accessibility, given their widespread presence in many neighborhoods. No standard dimension exists to define “pocket” parks; rather, “the actual size is determined by availability of land rather than pre-established standards” (Faraci, 1967). Paley Park (1967) and Greenacre Park (1971) in NYC are among the most famous and first PPs, exemplifying PP typology. The key elements of PPs are: i) their small/pocket dimension, usually lot-size, built in residual spaces; ii) their visibility and diffusion in each neighborhood; iii) the inclusion of greenery and water elements; iv) accessibility and presence of furniture for pedestrians.

While urban parks have been widely investigated, PPs have not, despite recent research highlighting their importance towards resilience; to date, no overarching framework exists that considers PPs' diffusion. Because resilience fosters adaptive capabilities to maintain complex urban systems, and because resilience is intrinsically multi-disciplinary (Cobbina and Poku-Boansi, 2018), an overall perspective on PPs as open spaces fostering urban resilience requires multi-disciplinary lenses. Moreover, the improvement of the urban environment also plays a role in the development of economic activities and social interactions, as it favors spending more time outside. Therefore, the diffusion of PPs is crucial as they can benefit all three pillars of sustainability, i.e., social, environmental and economic (Cappa et al., 2020b).

Previous publications on PPs are scarce, and have considered one specific aspect of them at a time. For example, Lin and colleagues (Lin et al., 2017), investigated PPs' role in high-density environments for Urban Heat Island (UHI) effect reduction and demonstrated their efficacy. Considering that UHIs and heat waves will exacerbate in the near future (Falasca et al., 2019), PPs could be extremely helpful. Instead, Xue and colleagues (Xue et al., 2017) focused on the effects of different types of small parks in high-density Asian cities on microclimate, and demonstrated the efficacy of PPs embedded in buildings to improve comfort conditions. Amaya-Espinel and colleagues (Amaya-Espinel et al., 2019) and Strohbach et al. (2009) highlighted the importance of small urban parks towards the conservation of bird communities. Their findings have been subsequently confirmed by Delgado-Capel and Cariñanos (2020), whose study highlight the ecosystem services that PPs are able to provide, such as regulating microclimate, allowing for pollination and biodiversity, reducing flooding from rain events and improving air quality. With respect to the latter, Xing and Brimblecombe (Xing and Brimblecombe, 2019) considered small urban parks specifically for pollution reduction, evidencing how their separation from the street could aid in reducing traffic-derived air pollutants and noise. These studies highlight the potential of a broader diffusion of PPs in urban areas, with respect to ecosystems services, which are much needed in urban areas. Mutiara and Isami (Mutiara and Isami, 2012) highlighted that involvement in urban parks help people be “happier and healthier.” Roberts and colleagues (Roberts et al., 2019) found that usability is associated with park satisfaction, and that park satisfaction is negatively related to incivility, the main factor on which to focus to improve parks' use. Delgado-Capel and colleagues traced urban green infrastructures as nature-based solutions to mitigate climate change, and confirm the potential for the development of PPs in compact Mediterranean cities, while observing that as of now they are not diffused in such areas (Delgado-Capel and Cariñanos, 2020). The variety of the above studies evidences the numerous benefits stemming from PPs and the different lenses through which they can be considered.

If replicable, PP's could impart advantages worldwide. Indeed, they are prevalent only in parts of North America and northern Europe

with peculiar climate, social and economic characteristics. These data prompted us to study the potential for adopting PPs in other contexts, such as the Mediterranean region. Towards this aim, a clear identification of PP characteristics is needed. In the following sub-sections, their architectural, microclimate, managerial and legal features are presented. Based on this outline we then highlight the challenges for the diffusion of PPs and thereafter develop a framework to favor their implementation.

2.1. Architectural-dimension features

The small urban spaces identified as PPs call for precise architectural features, which influence pedestrians' comfort, as well as ecosystem services. Such characteristics comprise specific (i) design features (e.g., geometry, furniture, relations with the surroundings); (ii) materials usage, in consideration of these small urban spaces' sustainability and resilience; and (iii) location and position of the small urban space within the urban texture, which is fundamental for PP usage. All of these characteristics, together, are key to PPs definition and success, and are discussed in this section.

PPs are different from the much-used and socially-active squares or urban and neighborhood parks of Mediterranean cities (Martí et al., 2017): one crucial difference is size, as pocket parks are necessarily small. This characteristic allows them to potentially spread in the urban context. Indeed, PPs can be placed in vacant lots or lot portions in the urban texture, even in compact city centers and, given their dimension, they are easier, with respect to time and cost, to be built and maintained (Delgado-Capel and Cariñanos, 2020). Moreover, Ayala-Azcárraga et al. (2019) highlighted that the small size of such parks allows higher values of self-reported mental state and higher trust in neighborhoods as compared to large urban parks. Thus, the most prominent design feature of PPs resides in their size: they are defined as "small" or even "vest-pocket." No "pre-established standard" exists; instead, their dimension is defined by the availability of land (Faraci, 1967). Nonetheless, they usually are "substantially" smaller than one acre, approximately 4000 m² (Faraci, 1967). With respect to other size specifications for pocket parks, the more recent Copenhagen PP program (Peschardt et al., 2012) indicates 5000 m² as the maximum size for PPs, while London recent program for 100 PPs states that most of these PPs are around "the size of a tennis court" (Department for Communities and Local Government, 2015; Mayor of London, 2012). Such a size is also confirmed by the guidelines given in the program report for the NYC Privately Owned Public Space (POPS), which comprises PPs built on privately-owned properties for public use (NYC Planning, 2021) and indicates a minimum surface measurement of 185 m² (2000 square feet) for PPs. Faraci (1967) underlines the importance of such small sizes, which favor wider diffusion of parks in neighborhoods, thus nurturing citizens' affection and identification with the parks by enhancing their potential to be located in their immediate residential areas. The importance and peculiarity of the reduced-size feature for PPs is also evidenced by William H. Whyte's pioneering work (Whyte, 2001): the small dimension allows the space to be diffused and easier to build, maintain and use. An important reference to PP design, Whyte's work analyzes the success of small urban spaces by observing the social life they create, depending on features such as the relation with streets, furniture, greenery and water. The author underlines the importance of PPs' strategic location, providing accessibility and visibility from the street, facilitating usage of the park by passers-by. PPs should be designed as a continuation of the sidewalk, separated from it by low, easy steps, providing a slight elevation. Such elevation should not block visibility or separate the sidewalk from the park (Whyte, 2001). Therefore, parallel to the size feature, PPs' usability and success rely on ease of access, but also clear demarcation from the streets, to act as "rest and restitution" oases (Peschardt et al., 2012). Again, also NYC POPS design guidelines are in agreement with these indications, and state that PPs should be, by design, open and inviting at the sidewalk; accessible;

safe and secure (contain easily accessible paths for ingress and egress, visually connected to the street and well lit); comfortable and engaging. The suggested shape/configuration is rectangular or square, still allowing for a certain amount of façade articulation of surrounding buildings. Alcoves or niches should be avoided, as visibility is fundamental to achieve openness and safety. Because the connection with the sidewalk is crucial towards parks' success, the frontage of the park towards the sidewalk should be at least 50% free from obstructions, to allow for circulation paths. Circulation paths should connect the most important design features of the park (e.g., sitting areas) (NYC Planning, 2021). These precise characteristics regarding shape, geometry, location and accessibility, which we recalled and discussed in this section, should be considered as practical design guidelines for successful PPs. Such parks should also possess specific features, to allow for usability and fruition, as a support for citizens' activities and restoration while inside these spaces.

However, PPs should not be misconstrued as merely pieces of furniture, designed solely for humans' comfort; their benefits go far beyond simply providing rest and restitution for citizens, which are enhanced by the interaction between humans and nature. They also provide ecosystem services, hosting and supporting biodiversity in urban areas (Delgado-Capel and Cariñanos, 2020), important aspects which should not be overlooked. As one example, Strohbach et al. (2009) affirm that PPs slightly increase number of observed bird species. Of course, these spaces do need to attract citizens, thus broadening their impact. Therefore, the following description provides indications on how to make these spaces attractive for socializing, rest or restitution usage by citizens, encouraging them to use PPs and benefit from them.

The most important elements of furnishings are varied sitting spaces, allowing accommodations for individuals and groups alike (Whyte, 2001). Additional amenities such as artworks, water features and food service could further invite restoration sensations in users. Common and crucial features in PPs is the presence of greenery, which allows for shading and contact with nature, as well as ecosystem services, and water elements, which are further discussed in the next sub-sections with respect to their environmental and microclimate benefits. Various approaches to material choices include one that could be applicable to lower-income countries or to citizen-led activities, exemplified by the interim plazas in the NYC regulations. These are small, temporary parks built with low-cost and easy-to-find materials that can later be transformed into permanent parks (New York City Department of Transportation DOT, 2021). Interim plazas generally host greenery in vases and small trees and constitute good practices for low-budget PPs, or those intended as trial locations before becoming permanent. Indeed, PPs are usually composed of more expensive stone or concrete materials and more pervasive green elements. Even if hypothetically less effective with respect to aspects such as ecosystem services, e.g., biodiversity conservation, interim plazas are one solution that can be implemented to gradually achieve PPs when it is not possible to directly build a PP, such as when the budget is low. Interim plazas are thus embryonic PPs, with all the relevant features described in this section, and are still able to provide a place for citizens to stop and rest or socialize, detached from the street and comprising greenery. In NYC, many interim plazas have already been successfully transformed into PPs.

2.2. Microclimate-dimension features

To encourage their use, PPs should provide an overall comfort sensation to users (Chan et al., 2017), while providing improved resilience in the face of increasingly frequent extreme climate events, such as intense rain (Alexander et al., 2019) and heat waves (Lin et al., 2017). Comfort is a multi-sensory, multi-domain sensation (Castaldo et al., 2018), and outdoor comfort is particularly difficult to evaluate, compared to indoor thermal comfort, due to rapidly varying microclimate conditions (e.g., wind, solar radiation). Comfort assessment entails simultaneous consideration of physical, physiological and psychological variables,

thus requiring objective and subjective measures (Nikolopoulou and Steemers, 2003). Thermal, visual, acoustic comfort are the main sub-fields of overall comfort (Frontczak and Wargocki, 2011). However, the sum of individual sensations in these fields does not equal the overall consideration of comfort and a gap exists between objective and subjective comfort assessment, due to the role personal preferences play in shaping sensation (Castaldo et al., 2018). Strategies to improve the “pleasantness” of determined areas can contribute to improving such sensation. The simultaneous consideration of both physical and subjective comfort is of paramount importance for optimizing parks’ efficacy.

Regarding thermal comfort, the main influencing parameters are air temperature [$^{\circ}\text{C}$]; wind speed [m/s]; relative humidity [%]; shortwave and longwave radiation [W/m^2] – respectively, radiation received by pedestrians from the sun or reflected from the built environment and radiation exchanged by pedestrians and the environment; human activity [W/m^2 or met]; and clothing level [clo] (International Society of Biometeorology, 2021). Studies have also demonstrated that local populations, due to physical, physiological and psychological adaptation, have specific thermal sensation (Salata et al., 2016).

Visual comfort is shaped by parks’ light conditions: in daytime, solar radiation is the main variable affecting visual sensation; the main risk for discomfort is glare. At night, visual comfort depends on the adequacy of artificial light illuminating the park. Sudden contrast between glare sources and the surrounding environment should be avoided. Night lighting also strongly influences safety perception, and is a fundamental variable to consider and correctly design (Peña-García et al., 2016). Pleasantness to the eye is one of the main factors influencing visual comfort (Rosso et al., 2016), which is shaped by users’ subjective perception.

Finally, acoustic comfort exemplifies the potential gap between objective and subjective sensation. While strong breaker and background noises deteriorate acoustic comfort (Frontczak and Wargocki, 2011), loud noises can be evaluated positively if they resemble natural sounds (such as that of water). Hong and colleagues (Hong et al., 2020) demonstrated that natural sounds can reduce the perceived loudness of traffic and enhance urban soundscapes. Paley and Greenacre Parks are characterized by strong water noise, which allows isolating users from strong traffic noise on nearby streets, thus producing a positive effect on pedestrians (Whyte, 2001).

The PPs’ geometry and material choice (e.g., greenery, cool materials), considered within the surrounding urban environment, can shape comfort sensation and effectiveness with respect to resilience improvement (Xiao et al., 2018). Indeed, greenery has direct effects on evapotranspiration and shading (Brink et al., 2016; Lobaccaro and Acero, 2015; Shrestha and Shimizu, 2021), in addition to providing crucial ecosystem services (Delgado-Capel and Cariñanos, 2020), and trees can be employed to block traffic noise from streets. Permeable soil and greenery constitute effective nature-based solutions for decreasing the risk of runoff from rain, thus contributing to reducing the impermeousness of urban surfaces (Pappalardo et al., 2017). Materials, with their thermal and optic-characteristics, also contribute in shaping thermal and visual sensation, as well as improving resilience to heat waves and UHI. Cool materials, e.g., maintain lower surface and air temperatures compared to dark materials. Water elements, such as cascades (as in Paley and Greenacre), are effective in influencing thermal sensation and acoustic sensation (Imam Syafii et al., 2017). Additionally, the geometry of the park and surrounding urban environment determine wind velocity and solar access, which is the quantity of solar radiation reaching the PP (Ali-Toudert and Mayer, 2006). PPs’ orientation is crucial to favor plantings and comfort.

Thus, all these design choices are instruments to improve PPs’ microclimate and environmental conditions and, consequently, their occupants’ comfort sensation and safety for both the occupants and the urban area at large, if PPs are implemented throughout the urban territory. Local climate plays a major role in defining which microclimate variables to improve, and in which season. In a cooling-prevalent climate, such as that of the Mediterranean, solar radiation has negative effects on ther-

mal and visual comfort in the hot season, thus trees can be employed to provide shading and cooling, in addition to ecosystem services. Instead, during the cold season, solar radiation is a positive feature, thus, deciduous trees are convenient solutions to improve thermal and visual comfort, since they provide shading in summer and allow sun rays during winter. In fact, studies have confirmed that trees and grassland in urban areas allow shading from solar radiation and decrease mean radiant temperatures (Lee et al., 2016), due to evapotranspiration. Different articles have considered greenery positioning in dense urban areas: large central parks, PPs, and greenery along streets were considered (Duarte et al., 2015), where greenery embedded in more densely built areas was shown to be the most effective solution in providing comfort conditions. The position of small parks in dense urban areas was investigated (Xue et al., 2017), focusing on street-level greenery, sky-rise gardens, or courtyards enclosed by buildings. In this last study, greenery positioning influenced thermal comfort conditions, visiting patterns and healing sensation, and showed citizens preferred street-level parks. Lin and colleagues (Lin et al., 2017) demonstrated that PPs are cooler than their surroundings in Hong Kong and thus help alleviate UHI intensity at the micro-scale.

2.3. Managerial-dimension features

PPs are spaces owned by public and/or private entities that become green, open areas. Besides the availability of an empty lot, PPs require efforts to plan, implement and manage these spaces towards their success and sustainability over time. To mitigate financial and human-resources requirements, careful consideration of greeneries and materials that require both suitable maintenance costs and infrequent interventions is needed (Colding et al., 2013).

Notwithstanding efforts to minimize necessary resources, financial and human efforts are required for PPs’ planning, realization and management. In the current period of scarce available funding, even more exacerbated by COVID19 consequences, several advantages of PPs have been evidenced to motivate private and public financing: environmental benefits, due to positive impact on urban microclimate (as described above); social benefits, in terms of citizens’ wellbeing thanks to increased diffusion of greenery (Knez and Thorsson, 2008); and economic benefits, shown in increased values of nearby assets (Kim et al., 2019). PPs thus represent a valuable resource under the Resource-Based View theory, i.e., something rare and valuable for the interested parties (Barney, 1991). PPs can be seen as valuable resources that can benefit the whole area and all stakeholders, thus motivating efforts towards their establishment and maintenance. Funding to develop PPs may also come from non-profit organizations or alternative crowd-based financing sources.

2.4. Legal-dimension features

The most fundamental legal principle of PPs’ regulatory posture regards the property rights attached to land parcels where such parks are situated when parks are created, and the corresponding property rights and duties once they are established. Ownership of the land parcels targeted for the creation of PPs varies greatly; it can be publicly or privately held. Sometimes, ownership of such land may even be difficult to ascertain, presenting a sort of no-man’s-land situation. Once title to the property is properly identified, the parcel may be transferred to a range of entities, even held jointly by multiple owners that vary across communities, in different cities, states and countries (Kronkosky Charitable Foundation, 2016).

Regardless of the formal ownership status of PPs when first created, once they become established within the city’s community life, they effectively become what are known as “common goods.” Internationally, common goods have been defined as goods “that cannot be enjoyed without [their] communal aspect,” and which “gain their quality as goods

only in connection to a community” and that “typically take a community to create and to sustain.” (Marmor, 2001). As such, common goods require collaboration between cities and citizens, comprising activities that, taken individually, are in most cases of modest importance. However, if the principle of subsidiarity (i.e., autonomous initiatives of citizens towards activities of general interest) is correctly interpreted and widely implemented, small daily activities of a few active citizens appear capable of initiating wider processes of revitalization of democratic, constitutional models aimed to enrich expressions of community engagement and leading to popular sovereignty.

All common goods, including PPs, require regular maintenance, as they are subject to normal wear and tear and vulnerable to acts of vandalism. To maintain parks in good order and combat the effects of vandalism, such spaces largely depend on a well-developed sense of respect for common goods and civic duty among local inhabitants and on efficient law enforcement to prevent malicious or destructive acts. Therefore, both a strong sense of civic responsibility and efficient law enforcement are among the essential elements needed to sustain PPs: where either element is lacking, urban security is not guaranteed, and parks cannot be maintained clean and safe, leading to lesser usage.

In addition to property and ownership rights, local and national regulatory schemes play an important role in the legal landscape characterizing PPs. Zoning and land use laws regulate the way land may be used, and are often employed to encourage, through concessions and other advantages, the creation of green areas or public spaces aimed at collective use (NYC Planning). However, it should be stressed that even detailed provisions in urban planning standards are inadequate to guarantee the effective implementation of sufficient public spaces.

3. Multi-disciplinary challenges for the diffusion of PPs in other contexts: a case study

Today, PPs are mainly diffused in North American and northern European regions, as is shown in the exemplificative features presented in the previous sections. Such contexts bear peculiar microclimate and urban conditions, financial resources, institutional quality and civic sense. While delineating a general approach that could apply to different contexts, we selected a relevant case study for in-depth analysis of possible challenges and solutions towards the development of successful PP models in other areas, specifically, Mediterranean countries. Such countries also have peculiar characteristics that must be considered to reveal the full potential of developing small urban land parcels. Italy represents a relevant case study, for its barycentric geographical position in the Mediterranean basin. Thus, we evidence an integrated, multi-disciplinary methodological approach that could be adopted to implement PPs in Italy. We thoroughly discuss each specific, multi-disciplinary challenge, against the characteristics of the exemplificative case (NYC), previously evidenced as significant for successful PPs. Then, we propose solutions, which are finally considered together in an overall framework, illustrated in section 4.

3.1. Architectural- and microclimate-dimension challenges

Mediterranean urban areas present morphological configurations with lower densities than those of certain North American urban areas (e.g., Manhattan), where most successful and famous PPs are located. Density of construction plays a significant role in PPs’ design, material selection and usage. Indeed, construction density influences PPs’ solar access, and thus their microclimate conditions, while population density affects how many persons they will serve.

One of the most important variables deriving from density is the sky-view factor (SVF), which is calculated as the portion of visible sky from a determined position, considering surrounding buildings. The maximum SVF is 1, while if sky is not visible at all, the SVF is 0: the taller the buildings, the lower the SVF; the denser the area, the lower the SVF (Mirzaee et al., 2018). Lower SVF means lower solar access, which is a

factor that must be considered for parks’ design. Another density indicator is the Floor Space Index (FSI) or Floor Area Ratio (FAR), which defines building intensity. By considering density indicators it is possible to verify a significant difference between the density of Manhattan – taken as the exemplificative case, and by extension that of other large North American cities – and Mediterranean cities’ densities. FSI indicates the ratio between built surface (the sum of the surface of each floor of buildings on a lot) and the lot’s surface area. As exemplificative values, Manhattan has an FSI of 7.8 as a mean value, but up to 12–15 in the high-rise neighborhoods where the famous PPs are (Brueckner and Singh, 2020). In Rome, Italy, instead, only the very core of the city center reaches an FSI up to 5–10; other parts of the city have FSI values between 0.75 and 5 (García Martín, 2013). This implies that PPs in Rome, Italy, would have different SVF and FSI than USA benchmarks, and thus different scales between PPs and their surroundings.

Population density is itself a useful indicator for building density (Salomons and Berghauser, 2012), and for identifying possible challenges for PPs: while Rome’s population density is equal to 2236 persons/km², Manhattan’s population density is a different order of measure, equal to 28,154 persons/km² (Lee and Braham, 2017). While population density gives an immediate idea of different configurations of urban layouts, FSI/FAR is useful in defining the morphology of the urban built environment, which determines the shape, position and solar access of PPs regarding their surroundings (Fig. 2). Previous studies show that Mediterranean cities are mainly defined as open mix-rise; more precise information on this data is available online (Copernicus Land Monitoring Service, 2021) and in other studies (García Martín, 2013). These differences translate into generally higher solar access in Mediterranean urban areas than in Manhattan exemplificative parks, which could be both a positive or negative factor on microclimate, depending on the design of the PP itself; and into lower attendance, which calls for effective strategies to reduce vandalism and provide safe areas.

Another challenge arises from the many historical sites and vast built heritage in Mediterranean regions and in Italy (Mazzarella, 2015). This circumstance calls for careful design, in accordance with cultural heritage protection, but also creates opportunities to incorporate viewpoint-synergies between PPs and such sites. Finally, scarce availability of resources in such regions (Cappa et al., 2020a) highlights the need to use low cost, durable materials and components for PPs’ construction and maintenance.

3.2. Managerial-dimension challenges

3.2.1. Public and private organizations’ involvement

Depending on whether PPs are built on public and/or private space, public and/or private organizations are accountable for their management. Private entities receive the right and duty to manage PPs in exchange for other permits. Enforcement of public and/or private organizations’ duties regarding PP maintenance is not equally strong in all contexts; that of the case study is weaker than that of the exemplificative case in the USA (Ahuja and Yayavaram, 2011).

3.2.2. Citizen participation

Citizens’ proper behavior and involvement in urban spaces are crucial to facilitate PPs’ maintenance and lower costs, especially when parks are not constantly guarded. Outside the USA, greater difficulties arise in maintaining such spaces because of lower control enforcement and different levels of inhabitants’ civic sense and participation (Ahuja and Yayavaram, 2011). Citizens’ involvement in maintaining other types of public goods have been evidenced to be effective (Cappa et al., 2020b). Because PPs are more numerous than larger parks, organizing their maintenance is more complex and should not be left exclusively to governmental funds and agencies; in accordance with the subsidiarity concept, active-citizenship involvement can aid in park maintenance



Fig. 1. Paley Park (left) and Greenacre Park (right).

(Cappa et al., 2021). Moreover, citizens' involvement can also be leveraged to enhance their experiences by directly involving them in data and idea collection through crowd-based phenomena (Franzoni and Sauer-mann, 2014). Strategies to empower citizens across a broad range of the demographic spectrum – even marginalized portions of society – are of paramount importance in pursuing civic engagement and citizens' participation vis-à-vis common goods (Coggan et al., 2021; Elelman and Feldman, 2018). Examples in Italy are citizen-science projects, where citizens contributed data to effectively monitor invasive plant species (Mannino and Balistreri, 2018). The positive cycle of change serves to inspire others with the encouraging results achieved, in accordance with the self-determination theory (Ryan and Deci, 2000): seeing their actions' results makes citizens more willing to devote their efforts to active-citizenship actions because of the intrinsic pleasure of contributing to actions that effectively benefit the public good.

3.2.3. Funding

Financial resources are extremely difficult to obtain especially in countries where private and public funds are lacking. With Tactical Urbanism, actions to improve the urban environment at low costs can be identified (Silva, 2016). This approach comprises short-term, low-cost, and scalable interventions to catalyze long-term change inside cities, and can be led by governments, non-profits, grassroots groups, or residents. Different models, e.g., sponsorship and patronage, can be adopted to collect funds from private organizations. The former allows private organizations to use PPs also for private events, the latter does not. Recent advancements in fund-raising – public-private partnerships and alternative sources of financing – can help satisfy financial requirements. In the first typology, private and public organizations can partner up to finance and manage PP construction and maintenance. The second typology, defined as “crowdfunding,” allows instead exploiting citizens' active involvement for fund-raising by collecting small sums from numerous dispersed individuals through online platforms (Centobelli et al., 2016).

3.3. Legal-dimension challenges

In Italy, the lack of public resources together with new rules on expropriation for public benefit (Repubblica Italiana 2020) have contributed to worsen difficulties municipalities face to create urban spaces for collective use. An attempt has been made to overcome these diffi-

culties by having the public works of urbanization carried out directly by the private sector, but further problems with this approach exist.

Another challenge in Italy is citizens' commonly-held belief that they can simply delegate authority to the public administration to take care of all routine, maintenance and emergency situations requiring action across all sectors of public life. Even with the outbreak of the coronavirus pandemic, which has spurred a surge in civic awareness and community spirit, active citizenship and true participatory democracy are still in their adolescence. Despite increasingly involving citizens in decisions and initiatives, the public administration struggles to handle the vast range of matters requiring regular attention and emergency management in the public domain, including maintenance and care of public spaces such as parks (Spitzmiller, 2019). Many areas suitable for creating PPs have fallen into abandonment, or worse, have become havens for illegal activity. The recent rise in popularity of direct, online participation in public administration actions symbolize the experimental changes that have been occurring in Italy recently and the desire for increased citizen involvement (Florida and Vignati, 2014).

In North American and northern-European contexts (the exemplificative cases), PPs often rely on citizen participation in the management of public goods, especially of urban public goods for collective use – or common goods. This practice is based on the principle of subsidiarity, which is crucial to overcome legal difficulties inherent to diffusing PPs. Subsidiarity was established relatively recently as a legal principle in Italy, demonstrating that the general legal framework could embrace other change as well. The term “subsidiarity” also expresses one of the key principles of European law, as established in the 1992 Treaty of Maastricht and currently formulated under the 2009 Treaty on Lisbon. In both the EU and in Italy, this principle helps distribute and allocate administrative resources and functions throughout governmental frameworks. Through subsidiarity, and together with state and/or local regulations, management of public goods (such as PPs) for collective use are being implemented by directly and actively involving citizens, individuals or associations. Citizens can propose interventions of care or regeneration of public spaces (green areas, squares, streets, sidewalks, etc. and other public spaces, public property or property subject to public use) and municipal buildings in even partial disuse or dilapidation.

Faced with the need to shift societal responsibility and organization, citizens have begun to form groups, such as neighborhood organizations and other active-citizenship associations, which enable them to contribute to caring for common goods. One such group is (Retake Roma, 2021), a volunteer association that empowers citizens

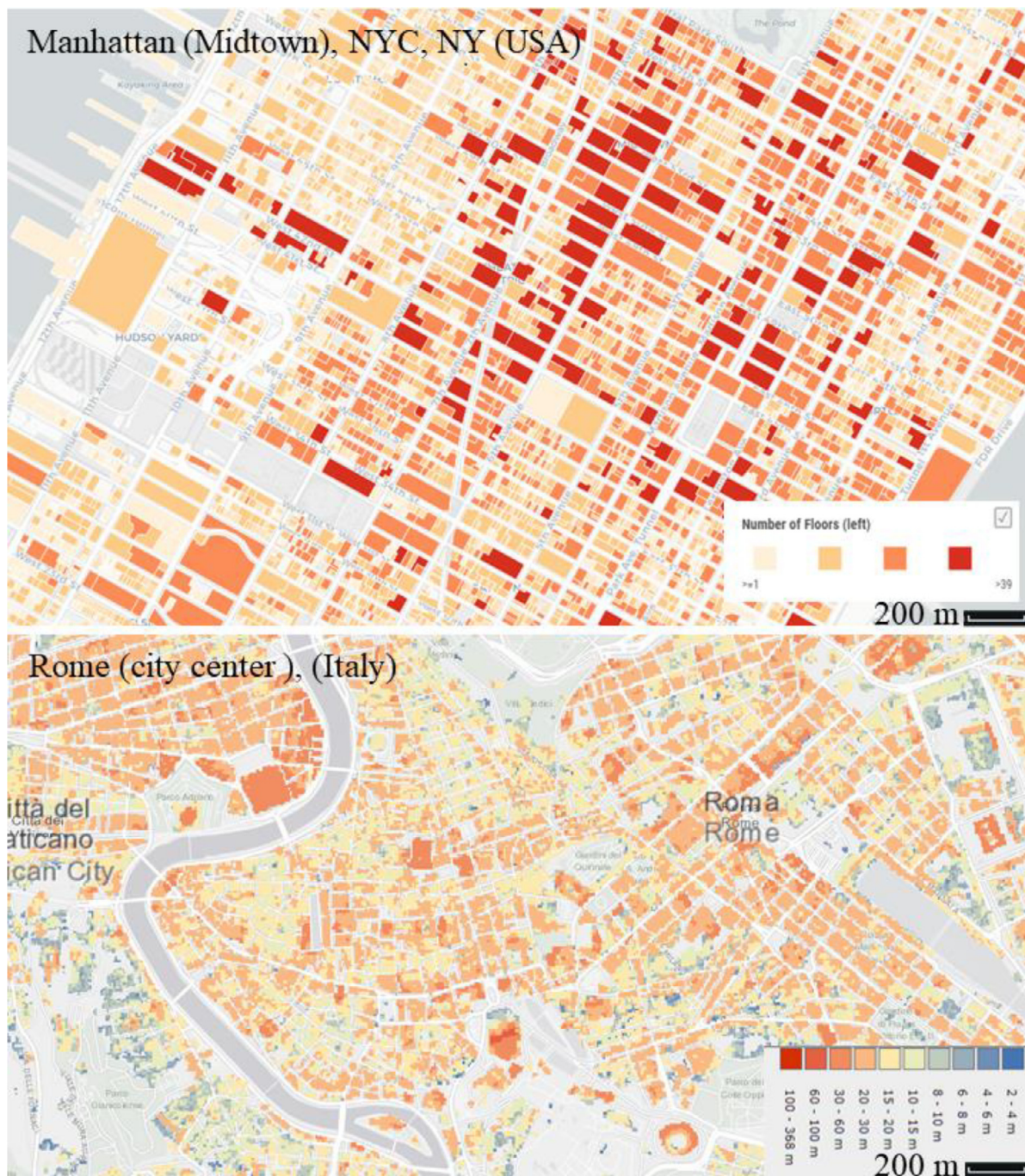


Fig. 2. Manhattan (exemplificative case) and Rome (Italy, case study for application in the Mediterranean Region) building height; Manhattan in # of floors; Rome in meters (Urban Atlas).

to take care of common goods through a grassroots movement spreading across Italy. Retake Roma is a non-profit, non-governmental, non-partisan organization founded in 2010, currently comprised of some 80 self-organizing neighborhood sub-groups in Rome alone. The volunteers aim to bolster civic pride, personal responsibility and empowerment while raising awareness and lobbying city administrators to improve normal and extraordinary maintenance operations. They educate citizens about their duty to respect the public places and influence public opinion through first-hand engagement, social media amplification, endorsements and testimonials from key opinion leaders; they organize clean-up events that engage citizens in the democratic processes of caring for and defending common goods; they gain support and action from public authorities and private sectors. For PPs to catch on and take hold

in Italy, the idea would likely arise through a grassroots demand from citizens, perhaps through a movement such as Retake. Thus, subsidiarity and civic engagement constitute both the challenge and solution to increase PPs in urban areas.

The problems facing all common goods, and therefore also PPs, have been labelled the “Tragedy of the Commons” in Hardin’s seminal work (Hardin, 1968). These difficulties fit within scenarios described in game theories such as “Flood and Drescher’s prisoners’ dilemma” – where cooperation would inevitably lead to the best outcome, but individuals generally end up worse off because they choose options based on self-interest alone. The Retake movement and active-citizenship movements in general reinterpret the role of citizens as passive by-standers, converting them into active protagon-

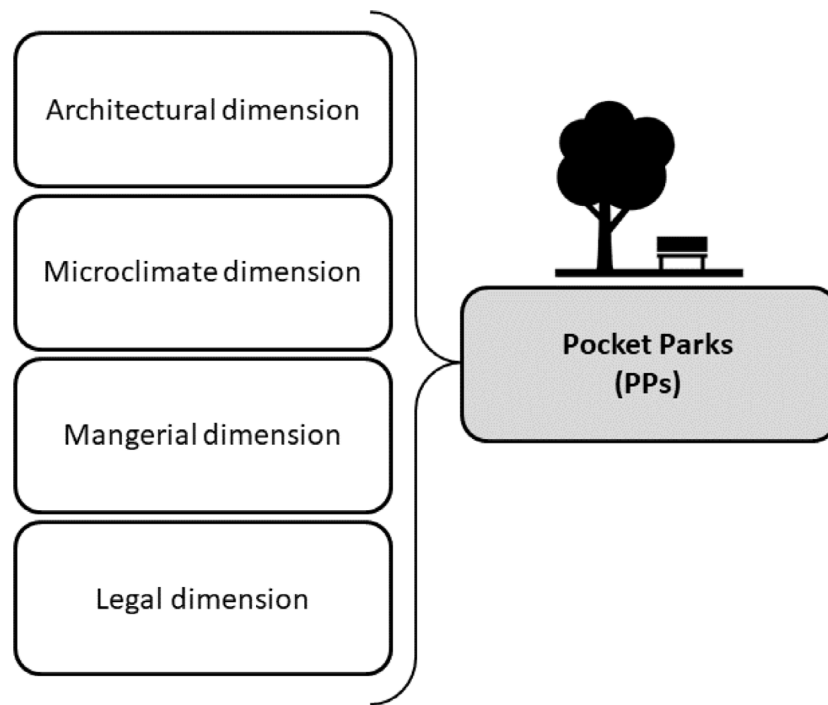


Fig. 3. Dimensions of the PPs.

nists, collaborating with and stimulating institutions to do their work better.

As noted above, PPs have developed mainly in places, such as United States, that possess a robust institutional framework and efficient law enforcement; hence they have strong ratings regarding the rule of law. The World Justice Project Rule of Law Index 2020 (The World Justice Project, 2020) counts qualities such as “institutional framework,” “absence of corruption” and “law enforcement” among the eight main factors contributing to measure and rank countries worldwide regarding the rule of law. Italy stands behind USA and other European countries for the three above-mentioned dimensions.

This overview of Italy’s placement as compared to the countries where PPs are flourishing provides insights as to the areas needing improvement from a legal standpoint. Recent Italian legislation permits pacts between public institutions and private stakeholders to promote urban security, illustrating Italy’s need to strengthen and link civic engagement and law enforcement, and represents a step toward that goal.

4. An integrated framework for diffusing pocket parks

Based on the above discussions of successful PP features and challenges, we propose an overall, comprehensive framework towards PP diffusion in Italy, a relevant case study for the Mediterranean area.

We identified four dimensions crucial to PP design, implementation and sustainability over time - architectural, microclimate, managerial and legal - which must be jointly considered to achieve the diffusion of successful, effective PPs (Fig. 3).

In response to challenges that may arise in each of these dimensions, this research has identified practices that can be implemented to mitigate the highlighted challenges and facilitate enjoyment of PPs’ benefits by citizens, policymakers and organizations, summarized in Fig. 4.

The first two dimensions, architectural and microclimate challenges, can be mitigated through approaches that can be defined as *comfort by design*. A conscious design of architectural features, from geometry to materials, would allow achieving overall, multi-sensory comfortable conditions (Schweiker et al., 2020), suitable for specific contexts. Considering Italy’s climate, greater solar access due to lower density than

in Manhattan (NYC, USA, the exemplificative case study) (*Urban Atlas*) could be exploited to positively contribute to thermal comfort during cold seasons, while shading from deciduous greenery or movable elements can be designed for hot seasons (Lee et al., 2020). Solutions for PPs include *suitable, sturdy, low cost materials*, e.g., high-albedo materials. Such materials would allow maintaining visual comfort (Rosso et al., 2016), which could be further valorized by exploiting viewpoints on historical heritage (Castaldo et al., 2018). Greenery would also allow to insulate and absorb traffic sounds (Azkorra et al., 2015; Salah and Romanova, 2021). Finally, safety, leading to overall comfort, should be provided by allowing park closure at night and by providing suitable lighting at sunset (Nasrollahi and Shokri, 2016). The materials, besides being suitable for achieving comfort and including greenery and possibly water, should be durable and low-cost, in case of scarce resources, but allow for successive interventions (New York City (DOT)).

Different funding sources for construction and maintenance are needed due to scarcity of public resources nowadays. Public–private partnerships or crowd-based initiatives can be helpful. Public-private partnerships allow sharing benefits, resources and risks among partners while leveraging the strengths of all parties involved (Morea and Balzarini, 2019). Public-private partnerships for PPs may mirror the balance of interests between the private and the public benefiting all stakeholders: parks benefit social wellbeing, thus serving public interests, while also benefiting the private sector’s economic-prosperity interests.

Crowd-based initiatives, comprising all those that actively involve citizens in the creation of new knowledge (Cappa et al., 2020a) can also be beneficial. Crowdfunding (Centobelli et al., 2016), e.g., gathering funds for PPs by collecting small sums from dispersed individuals, could be effectively run in PPs by citizens living nearby, who may be willing to donate towards their care.

Other active-citizen initiatives can be leveraged in PPs, including crowd-based initiatives, such as citizen science (Sauermaun et al., 2020) and crowdsourcing (Natalicchio et al., 2017). Through citizen science, citizens without any specific knowledge for collecting data to tackle environmentally-related issues. Once PPs are established, public organizations and research entities can effectively manage citizen-science

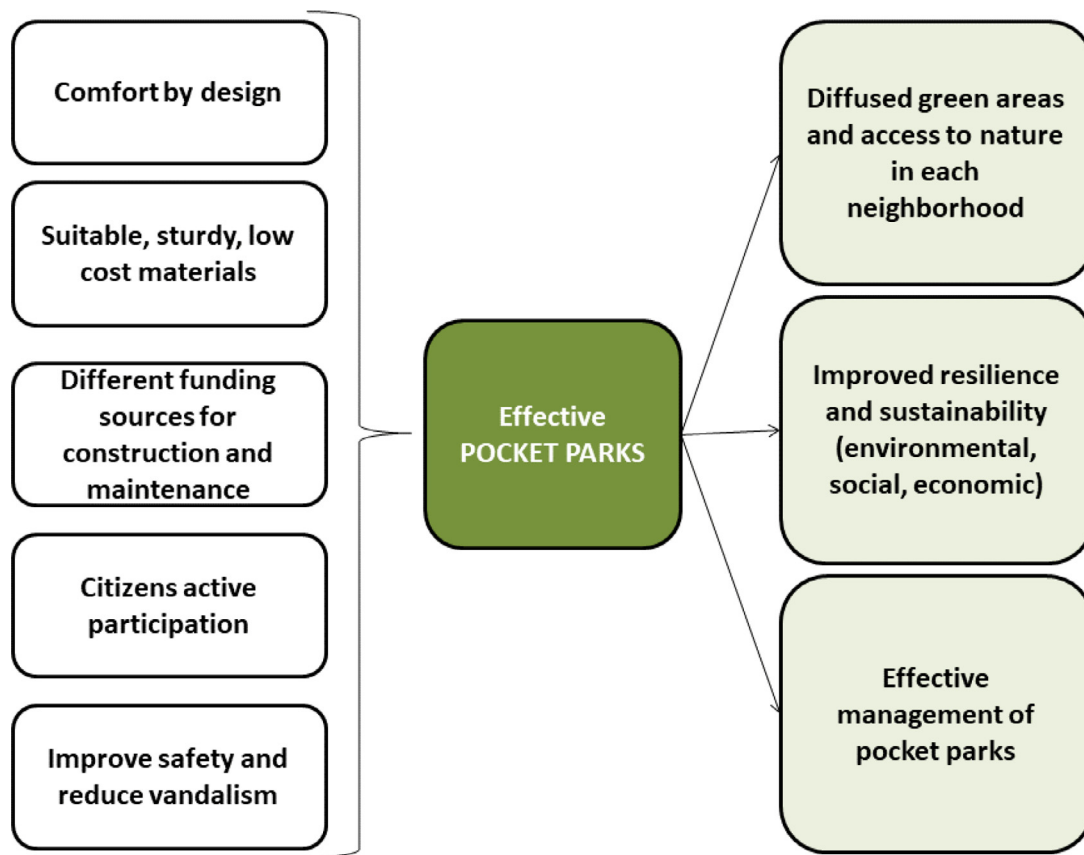


Fig. 4. Practices to mitigate the challenges and facilitate enjoyment of PPs.

projects to collect data to further improve them. Similarly, individuals can be involved in crowdsourcing calls for ideas, providing researchers with ideas regarding PPs. Active-citizenship involvement, based on the legal concept of subsidiarity and exemplified by associations such as Retake Roma, is a crucial factor in PPs' success.

Improving safety and reducing vandalism is the fifth practice we have identified. Respect for the rule of law and awareness of citizens' duty to care for common goods, including PPs, can increase through collaboration between local government and associations, such as Retake, which fosters such goals by educating individuals, public and private sectors and other NGOs through innovative, concrete projects. It presents its philosophy and methodology in schools in its *Retake Schools* program, partnering with other civic and legal organizations, such as "Laboratory for subsidiarity" (Labsus, 2021), a think-tank of legal scholars studying subsidiarity (Zonfrilli, 2013). Education on common goods, subsidiarity and democratic principles can increase safety and reduce vandalism.

By leveraging these practices, it would be possible to favor broader diffusion of PPs, towards allowing access to nature in each neighborhood of urban areas, improving resilience and sustainability thanks to PPs' benefits (discussed in Section 1 and 2) and effectively manage them with increased efficiency and efficacy, in order for PPs to be sustained over time, by involving citizens and finding alternative financing sources.

5. Conclusions

This study provides several contributions. First, we contribute to the identification of PPs' characteristics to clearly determine their boundary conditions, and advance scientific knowledge on this phenomenon, aiming to nurture future studies around this topic. Secondly, we identify the main challenges in establishing successful PPs outside the con-

texts where they are most popular. We focus on the Mediterranean area, which is characterized by peculiar climate and diverse institutional, legal and civic contexts, concentrating on the case of Italy, due to its barycentric position. Finally, the paper's third contribution is evidencing interdisciplinary best-practices that can favor PP's implementation and maintenance, which can represent an effective framework for designers, policymakers, citizens' associations, and researchers. By exploiting strategies relevant to multiple PPs' dimensions, they could be designed to achieve safe, comfortable conditions, while involving citizens in their construction and maintenance to guarantee their sustainability over time.

Besides advancing scientific knowledge on PPs, the framework proposed in this study is also of interest to policymakers, urban planners, designers, governmental and non-governmental organizations and active-citizenship associations.

The study is not exempt from limitations, paving the way for future developments. First, when delineating the state of the art, we have mainly referred to New York, USA. Future research may consider enriching the understanding of PPs by considering other successful implementations. In addition, while Italy represents a relevant case study to identify the challenges and a framework for the diffusion of PPs, future studies should consider other countries to further validate the outcomes of this work and increase the generalizability of its results. Besides considering other case studies for identifying the state of the art as well as the challenges that may prevent the diffusion of PPs, future research direction may consider adopting a multiple case study approach, rather than a single relevant case. Moreover, while we have outlined PPs' main features and proposed a framework to facilitate their diffusion, future studies should empirically test the outcomes of this research, in terms of aiding the implementation of PPs.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

- Ahuja, G., Yayavaram, S., 2011. Explaining Influence Rents: the Case for an Institutions-Based View of Strategy. *Organ. Sci.* 22, 1631–1652. doi:10.1287/orsc.1100.0623.
- Albanesi, C., Elvira, C., Zani, B., 2007. Sense of Community, Civic Engagement and Social Well-being in Italian Adolescents. *J. Commun. Appl. Soc. Psychol.* 17, 387–406. doi:10.1002/casp.903.
- Alexander, K., Hettiarachchi, S., Ou, Y., Sharma, A., 2019. Can integrated green spaces and storage facilities absorb the increased risk of flooding due to climate change in developed urban environments? *J. Hydrol.* 579, 124201. doi:10.1016/j.jhydrol.2019.124201.
- Ali-Toudert, F., Mayer, H., 2006. Numerical study on the effects of aspect ratio and orientation of an urban street canyon on outdoor thermal comfort in hot and dry climate. *Build. Environ.* 41. doi:10.1016/j.buildenv.2005.01.013.
- Amaya-Espinel, J.D., Hostetler, M., Henríquez, C., Bonacic, C., 2019. The influence of building density on Neotropical bird communities found in small urban parks. *Landsc. Urban Plan.* 190, 103578. doi:10.1016/j.landurbplan.2019.05.009.
- Ayala-Azcárraga, C., Diaz, D., Zambrano, L., 2019. Characteristics of urban parks and their relation to user well-being. *Landsc. Urban Plan.* 189, 27–35. doi:10.1016/j.landurbplan.2019.04.005.
- Azkorra, Z., Pérez, G., Coma, J., Cabeza, L.F., Bures, S., Álvaro, J.E., Erkoreka, A., Urrestarazu, M., 2015. Evaluation of green walls as a passive acoustic insulation system for buildings. *Appl. Acoust.* doi:10.1016/j.apacoust.2014.09.010.
- Barney, J., 1991. Firm Resources and Sustained Competitive Advantage. *J. Manage.* 17, 99–120. doi:10.1177/014920639101700108.
- Brink, E., Aalders, T., Ádám, D., Feller, R., Henselek, Y., Hoffmann, A., Ibe, K., Matthey-Doret, A., Meyer, M., Negrut, N.L., Rau, A.L., Riewerts, B., von Schuckmann, L., Törnros, S., von Wehrden, H., Abson, D.J., Wamsler, C., 2016. Cascades of green: a review of ecosystem-based adaptation in urban areas. *Glob. Environ. Chang.* 36, 111–123. doi:10.1016/j.gloenvcha.2015.11.003.
- Brueckner, J.K., Singh, R., 2020. Stringency of land-use regulation: building heights in US cities. *J. Urban Econ.* 116, 103239. doi:10.1016/j.jue.2020.103239.
- Cappa Dr, Francesco, Franco Dr, Stefano, Rosso Dr, Federica, 2021. Citizens and cities: Leveraging citizen science and big data for sustainable urban development. *Business Strategy and The Environment* 1–20. doi:10.1002/bse.2942.
- Cappa, F., Rosso, F., Capaldo, A., 2020a. Visitor-sensing: involving the crowd in cultural heritage organizations. *Sustain* 12, 1–14. doi:10.3390/su12041445.
- Cappa, F., Rosso, F., Giustiniano, L., Porfiri, M., 2020b. Nudging and Citizen Science: the Effectiveness of Feedback in Energy-Demand Management. *J. Environ. Manage.* 269, 110759.
- Castaldo, V.L., Pigliatulle, I., Rosso, F., Cotana, F., Giorgio, F.De, Laura, A., 2018. How subjective and non-physical parameters affect occupants' environmental comfort perception. *Energy Build* 178, 107–129. doi:10.1016/j.enbuild.2018.08.020.
- Centobelli, P., Cerchione, R., Esposito, E., Raffa, M., 2016. The revolution of crowdfunding in social knowledge economy: literature review and identification of business models. *Adv. Sci. Lett.* doi:10.1166/asl.2016.6721.
- Chan, S.Y., Chau, C.K., Leung, T.M., 2017. On the study of thermal comfort and perceptions of environmental features in urban parks: a structural equation modeling approach. *Build. Environ.* 122, 171–183. doi:10.1016/j.buildenv.2017.06.014.
- Cobbinah, P.B., Poku-Boansi, M., 2018. Towards resilient cities in Ghana: insights and strategies. *Futures* 101, 55–66. doi:10.1016/j.futures.2018.06.005.
- Coggan, A., Carwardine, J., Fielke, S., Whitten, S., 2021. Co-creating knowledge in environmental policy development. An analysis of knowledge co-creation in the review of the significant residual impact guidelines for environmental offsets in Queensland. *Australia. Environ. Challenges* 4, 100138. doi:10.1016/j.envc.2021.100138.
- Colding, J., Barthel, S., Bendt, P., Snep, R., van der Knaap, W., Ernstson, H., 2013. Urban green commons: insights on urban common property systems. *Glob. Environ. Chang.* 23, 1039–1051. doi:10.1016/j.gloenvcha.2013.05.006.
- Delgado-Capel, M., Cariñanos, P., 2020. Towards a standard framework to identify green infrastructure key elements in dense mediterranean cities. *Forests* 11, 1–22. doi:10.3390/f11121246.
- Department for Communities and Local Government, 2015. Pocket parks: support for small areas of inviting public space where people can enjoy relief from the hustle and bustle of city streets - Prospectus.
- Duarte, D.H.S., Shinzato, P., Gusson, C.S., Alves, C.A., 2015. The impact of vegetation on urban microclimate to counterbalance built density in a subtropical changing climate. *Urban Clim* 14. doi:10.1016/j.uclim.2015.09.006.
- Elelman, R., Feldman, D.L., 2018. The future of citizen engagement in cities—The council of citizen engagement in sustainable urban strategies (ConCensus). *Futures* 101, 80–91. doi:10.1016/j.futures.2018.06.012.
- Falasca, S., Ciancio, V., Salata, F., Golasi, I., Rosso, F., Curci, G., 2019. High albedo materials to counteract heat waves in cities: an assessment of meteorology, buildings energy needs and pedestrian thermal comfort. *Build. Environ.* 163, 106242. doi:10.1016/j.buildenv.2019.106242.
- Faraci, P., 1967. Vest Pocket Parks.
- Fischer, L.K., Honold, J., Cvejić, R., Delshammar, T., Hilbert, S., Lafortezza, R., Nasran, M., Nielsen, A.B., Pintar, M., van der Jagt, A.P.N., Kowarik, I., 2018. Beyond green: broad support for biodiversity in multicultural European cities. *Glob. Environ. Chang.* 49, 35–45. doi:10.1016/j.gloenvcha.2018.02.001.
- Florida, A., Vignati, R., 2014. Deliberativa, diretta o partecipativa? *Quad. di Sociol.* 65, 51–74.
- Foray, D., Mowery, D., Nelson, R., 2012. Public R&D and social challenges: what lessons from mission R&D programs? *Res. Policy* 41, 1697–1792.
- Franzoni, C., Sauermann, H., 2014. Crowd science: the organization of scientific research in open collaborative projects. *Res. Policy* 43, 1–20. doi:10.1016/j.respol.2013.07.005.
- Frontczak, M., Wargocki, P., 2011. Literature survey on how different factors influence human comfort in indoor environments. *Build. Environ.* 46, 922–937. doi:10.1016/j.buildenv.2010.10.021.
- García Martín, F.M., 2013. Densità e compattezza di Roma. U3 - Urban.
- Hadavi, S., Kaplan, R., Hunter, M.C.R., 2018. How does perception of nearby nature affect multiple aspects of neighbourhood satisfaction and use patterns? *Landsc. Res.* 43, 360–379. doi:10.1080/01426397.2017.1314453.
- Hadavi, S., Kaplan, R., Hunter, M.C.R., 2015. Environmental affordances: a practical approach for design of nearby outdoor settings in urban residential areas. *Landsc. Urban Plan.* 134, 19–32. doi:10.1016/j.landurbplan.2014.10.001.
- Hardin, G., 1968. The tragedy of the commons. *Science* doi:10.1126/science.162.3859.1243, (80-).
- Hong, J.Y., Ong, Z.T., Lam, B., Ooi, K., Gan, W.S., Kang, J., Feng, J., Tan, S.T., 2020. Effects of adding natural sounds to urban noises on the perceived loudness of noise and soundscape quality. *Sci. Total Environ.* doi:10.1016/j.scitotenv.2019.134571.
- Imam Syafii, N., Ichinose, M., Kumakura, E., Jusuf, S.K., Chigusa, K., Wong, N.H., 2017. Thermal environment assessment around bodies of water in urban canyons: a scale model study. *Sustain. Cities Soc.* 34, 79–89. doi:10.1016/j.scs.2017.06.012.
- Kafy, A.-Al, Dey, N.N., Al Rakib, A., Rahaman, Z.A., Nasher, N.M.R., Bhatt, A., 2021. Modeling the relationship between land use/land cover and land surface temperature in Dhaka, Bangladesh using CA-ANN algorithm. *Environ. Challenges* 4, 100190. doi:10.1016/j.envc.2021.100190.
- Kaplan, S., 1995. The restorative benefits of nature: toward an integrative framework. *J. Environ. Psychol.* 15, 169–182. doi:10.1016/0272-4944(95)90001-2.
- Kim, D., Jin, J., 2018. Does happiness data say urban parks are worth it? *Landsc. Urban Plan.* 178, 1–11. doi:10.1016/j.landurbplan.2018.05.010.
- Kim, H.S., Lee, G.E., Lee, J.S., Choi, Y., 2019. Understanding the local impact of urban park plans and park typology on housing price: a case study of the Busan metropolitan region. *Korea. Landsc. Urban Plan.* 184, 1–11. doi:10.1016/j.landurbplan.2018.12.007.
- Knez, I., Thorsson, S., 2008. Thermal, emotional and perceptual evaluations of a park: cross-cultural and environmental attitude comparisons. *Build. Environ.* 43. doi:10.1016/j.buildenv.2007.08.002.
- Kronkosky Charitable Foundation, 2016. Research Brief. Pocket Parks.
- Lederbogen, F., Kirsch, P., Haddad, L., Streit, F., Tost, H., Schuch, P., Wüst, S., Pruessner, J.C., Rietschel, M., Deuschle, M., Meyer-Lindenberg, A., 2011. City living and urban upbringing affect neural social stress processing in humans. *Nature* 474, 498–501. doi:10.1038/nature10190.
- Lee, H., Mayer, H., Chen, L., 2016. Contribution of trees and grasslands to the mitigation of human heat stress in a residential district of Freiburg. Southwest Germany. *Landsc. Urban Plan.* 148, 37–50. doi:10.1016/j.landurbplan.2015.12.004.
- Labsus, 2021. Labsus, Laboratorio per la Sussidiarietà [WWW Document]. URL <https://www.labsus.org/>.
- Lee, H., Mayer, H., Kuttler, W., 2020. Impact of the spacing between tree crowns on the mitigation of daytime heat stress for pedestrians inside E-W urban street canyons under Central European conditions. *Urban For. Urban Green.* 48, 126558. doi:10.1016/j.ufug.2019.126558.
- Lee, J.M., Braham, W.W., 2017. Building energy analysis of Manhattan: density parameters for high-density and high-rise developments. *Ecol. Modell.* 363, 157–171. doi:10.1016/j.ecolmodel.2017.08.014.
- Lin, P., Lau, S.S.Y., Qin, H., Gou, Z., 2017. Effects of urban planning indicators on urban heat island: a case study of pocket parks in high-rise high-density environment. *Landsc. Urban Plan.* 168, 48–60. doi:10.1016/j.landurbplan.2017.09.024.
- Liu, S., Wang, X., 2021. Reexamine the value of urban pocket parks under the impact of the COVID-19. *Urban For. Urban Green.* doi:10.1016/j.ufug.2021.127294.
- Lobaccaro, G., Acero, J.A., 2015. Comparative analysis of green actions to improve outdoor thermal comfort inside typical urban street canyons. *Urban Clim.* 14, 251–267. doi:10.1016/j.uclim.2015.10.002.
- Mannino, A.M., Balistreri, P., 2018. Citizen science: a successful tool for monitoring invasive alien species (IAS) in Marine Protected Areas. The case study of the Egadi Islands MPA (Tyrrhenian Sea, Italy). *Biodiversity* 19, 42–48. doi:10.1080/14888386.2018.1468280.
- Marmor, A., 2001. Do We Have A Right to Common Goods? *Can. J. Law Jurisprud.* 14, 213–225. doi:10.1017/S084182090000485.

- Martí, P., Serrano-Estrada, L., Nolasco-Cirugeda, A., 2017. Using locative social media and urban cartographies to identify and locate successful urban plazas. *Cities* 64, 66–78. doi:10.1016/j.cities.2017.02.007.
- Mayor of London, 2012. Pocket Park Prospectus, Mayor's Foreword.
- Mazzarella, L., 2015. Energy retrofit of historic and existing buildings. the legislative and regulatory point of view. *Energy Build* 95, 23–31. doi:10.1016/j.enbuild.2014.10.073.
- Mirzaee, S., Özgün, O., Ruth, M., Binita, K.C., 2018. Neighborhood-scale sky view factor variations with building density and height: a simulation approach and case study of Boston. *Urban Clim* 26, 95–108. doi:10.1016/j.uclim.2018.08.012.
- Moglia, M., Cork, S.J., Boschetti, F., Cook, S., Bohensky, E., Muster, T., Page, D., 2018. Urban transformation stories for the 21st century: insights from strategic conversations. *Glob. Environ. Chang.* 50, 222–237. doi:10.1016/j.gloenvcha.2018.04.009.
- Morakinyo, T.E., Lam, Y.F., 2016. Simulation study on the impact of tree-configuration, planting pattern and wind condition on street-canyon's micro-climate and thermal comfort. *Build. Environ.* 103, 262–275. doi:10.1016/j.buildenv.2016.04.025.
- Morea, D., Balzarini, M., 2019. Bankability of a public private partnership in agricultural sector: a project in sub Saharan Africa. *Agric. Econ. (Czech Republic)* 65, 212–222. doi:10.17221/258/2018-AGRICECON.
- Moriarty, P., Honnery, D., 2015. Future cities in a warming world. *Futures* 66, 45–53. doi:10.1016/j.futures.2014.12.009.
- Mutiara, S., Isami, K., 2012. Characteristic of Public Small Park Usage in Asia Pacific Countries: case Study in Jakarta and Yokohama City. *Procedia - Soc. Behav. Sci.* 35, 412–419. doi:10.1016/j.sbspro.2012.02.106.
- Nasrollahi, N., Shokri, E., 2016. Daylight illuminance in urban environments for visual comfort and energy performance. *Renew. Sustain. Energy Rev.* 66, 861–874. doi:10.1016/j.rser.2016.08.052.
- Natalicchio, A., Messeni Petruzzelli, A., Garavelli, A.C., 2017. Innovation problems and search for solutions in crowdsourcing platforms – A simulation approach. *Technovation* 64, 28–42. doi:10.1016/j.technovation.2017.05.002.
- Nikolopoulou, M., Steemers, K., 2003. Thermal comfort and psychological adaptation as a guide for designing urban spaces. *Energy Build* 35, 95–101. doi:10.1016/S0378-7788(02)00084-1, Pii:S0378-7788(02)00084-1.
- New York City Department of Transportation (DOT), 2021. NYC Plaza Program [WWW Document]. URL <https://www1.nyc.gov/html/dot/html/pedestrians/nyc-plaza-program.shtml>.
- NYC Planning, 2021. Privately Owned Public Space History [WWW Document]. URL <https://www1.nyc.gov/site/planning/plans/pops/pops.page>.
- Pappalardo, V., La Rosa, D., Campisano, A., La Greca, P., 2017. The potential of green infrastructure application in urban runoff control for land use planning: a preliminary evaluation from a southern Italy case study. *Ecosyst. Serv.* 26, 345–354. doi:10.1016/j.ecoser.2017.04.015.
- Park, J., Kim, J., 2019. Economic impacts of a linear urban park on local businesses: the case of Gyeongui Line Forest Park in Seoul. *Landsc. Urban Plan.* 181, 139–147. doi:10.1016/j.landurbplan.2018.10.001.
- Peña-García, A., Hurtado, A., Aguilar-Luzón, M.C., 2016. Considerations about the impact of public lighting on pedestrians' perception of safety and well-being. *Saf. Sci.* 89, 315–318. doi:10.1016/j.ssci.2016.07.009.
- Peschardt, K.K., Schipperijn, J., Stigsdottir, U.K., 2012. Use of Small Public Urban Green Spaces (SPUGS). *Urban For. Urban Green.* 11, 235–244. doi:10.1016/j.ufug.2012.04.002.
- Repubblica Italiana, 2020. Italian Presidential Decree (D.P.R.) n. 327/2001 and Successive Modifications and Integrations. Unified text on Expropriation for Public Use.
- Roberts, H., Kellar, I., Conner, M., Gidlow, C., Kelly, B., Nieuwenhuijsen, M., McEachan, R., 2019. Associations between park features, park satisfaction and park use in a multi-ethnic deprived urban area. *Urban For. Urban Green* 46, 126485. doi:10.1016/j.ufug.2019.126485.
- Rosso, F., Pisello, A.L., Cotana, F., Ferrero, M., 2016. On the thermal and visual pedestrians' perception about cool natural stones for urban paving: a field survey in summer conditions. *Build. Environ.* 107, 198–214. doi:10.1016/j.buildenv.2016.07.028.
- Ryan, R.M., Deci, E.L., 2000. Self-determination theory and the facilitation of intrinsic motivation, social development and well-being. *Am. Psychol.* 55, 68–78.
- Salah, G.M.J.A., Romanova, A., 2021. Life cycle assessment of felt system living green wall: cradle to grave case study. *Environ. Challenges* 3, 100046. doi:10.1016/j.envc.2021.100046.
- Salata, F., Golasi, I., de Lieto Vollaro, R., de Lieto Vollaro, A., 2016. Outdoor thermal comfort in the Mediterranean area. A transversal study in Rome. *Italy. Build. Environ.* 96, 46–61. doi:10.1016/j.buildenv.2015.11.023.
- Salomons, E.M., Berghauser, M., 2012. Urban traffic noise and the relation to urban density, form, and traffic elasticity. *Landsc. Urban Plan.* 108, 2–16. doi:10.1016/j.landurbplan.2012.06.017.
- Sauermann, H., Vohland, K., Antoniou, V., Balázs, B., Göbel, C., Karatzas, K., Mooney, P., Perelló, J., Ponti, M., Samson, R., Winter, S., 2020. Citizen science and sustainability transitions. *Res. Policy* 49, 103978. doi:10.1016/j.respol.2020.103978.
- Retake Roma, 2021. Retake Roma [WWW Document]. URL <https://www.retakeroma.org>.
- Schnell, I., Harel, N., Mishori, D., 2019. The benefits of discrete visits in urban parks. *Urban For. Urban Green.* 41, 179–184. doi:10.1016/j.ufug.2019.03.019.
- Schweiker, M., Ampatzi, E., Andargie, M.S., Andersen, R.K., Azar, E., Barthelmes, V.M., Berger, C., Bourikas, L., Carlucci, S., Chinazzo, G., Edappilly, L.P., Favero, M., Gauthier, S., Jamrozik, A., Kane, M., Mahdavi, A., Piselli, C., Pisello, A.L., Roetzel, A., Rysanek, A., Sharma, K., Zhang, S., 2020. Review of multi-domain approaches to indoor environmental perception and behaviour. *Build. Environ.* doi:10.1016/j.buildenv.2020.106804.
- Shrestha, A., Shimizu, T., 2021. Evaluation of the suppressive effects on solar radiation for a building façade covered with green layers in the Kathmandu valley. *Environ. Challenges* 100246. doi:10.1016/j.envc.2021.100246.
- Silva, P., 2016. Tactical urbanism: towards an evolutionary cities' approach? *Environ. Plan. B Plan. Des.* 43, 1040–1051. doi:10.1177/0265813516657340.
- Spitzmiller, R., 2019. A Comparative-Law perspective on Street Law in Italy: drawing best practices from Common-Law traditions to boost Civic Engagement in a Civil-Law Context. In: McQuoid-Mason, D. (Ed.), *Street Law and Public Legal Education: A Collection of Best Practices from Around the World in Honour of Ed O'Brien. Juta and Company, Cape Town*, pp. 221–236.
- Strohbach, M.W., Haase, D., Kabisch, N., 2009. Birds and the city: urban biodiversity, land use, and socioeconomic. *Ecol. Soc.* doi:10.5751/ES-03141-140231.
- The World Justice Project, 2020. Rule of Law Index.
- United Nations, 2018. World Urbanization Prospect.
- United Nations, 2015. Transforming our world: the 2030 Agenda for Sustainable Development [WWW Document]. URL <https://sustainabledevelopment.un.org/post2015/transformingourworld> (accessed 5.5.16).
- Copernicus Land Monitoring Service, 2021. Urban Atlas [WWW Document]. URL <https://land.copernicus.eu/local/urban-atlas/urban-atlas-2006?tab=mapview> (accessed 6.8.20).
- Whyte, W.H., 2001. The social life of small urban spaces.
- Xiao, X.D., Dong, L., Yan, H., Yang, N., Xiong, Y., 2018. The influence of the spatial characteristics of urban green space on the urban heat island effect in Suzhou Industrial Park. *Sustain. Cities Soc.* 40, 428–439. doi:10.1016/j.scs.2018.04.002.
- Xing, Y., Brimblecombe, P., 2019. Role of vegetation in deposition and dispersion of air pollution in urban parks. *Atmos. Environ.* 201, 73–83. doi:10.1016/j.atmosenv.2018.12.027.
- Xue, F., Gou, Z., Lau, S.S.Y., 2017. Green open space in high-dense Asian cities: site configurations, microclimates and users' perceptions. *Sustain. Cities Soc.* 34, 114–125. doi:10.1016/j.scs.2017.06.014.
- Zhang, S., Zhou, W., 2018. Recreational visits to urban parks and factors affecting park visits: evidence from geotagged social media data. *Landsc. Urban Plan.* 180, 27–35. doi:10.1016/j.landurbplan.2018.08.004.
- Zhou, C., Zhang, Y., Fu, L., Xue, Y., Wang, Z., 2021. Assessing mini-park installation priority for greening planning in densely populated cities. *Sustain. Cities Soc.* 67, 102716. doi:10.1016/j.scs.2021.102716.
- International Society Of Biometeorology, UTCI - Universal Thermal Climate Index [WWW Document], 2021. URL <http://www.utci.org/> (accessed 2.13.18).
- Zonfrilli, L., 2013. Retake Roma... dal degrado Il movimento è riuscito nell'intento di riqualificare importanti spazi urbani [WWW Document]. URL <https://www.labsus.org/2013/10/retake-roma-dal-degrado/>.