From Spontaneous to Strategic: Integrating Street Experiments into Urban Planning Practices

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Abstract. In the pursuit of urban planning goals aimed at creating more liveable cities with enhanced public spaces, a crucial aspect to consider is the attention to vulnerable road users (pedestrians and cyclists) and their mobility and interaction within street space. This is also aligned with the principles of urban sustainability and inclusivity (Sustainable Development Goal n. 11). Extensive scientific literature supports the multifaceted benefits of this approach, encompassing not only environmental sustainability but also the enhancement of individuals' physical and mental well-being. These principles and models foster a communal approach to public space, thereby enhancing overall societal well-being and promoting sociability. A notable strategy to promote sociability is the adoption of experimental and temporary transformations of public spaces, such as tactical urbanism's street experiments. These initiatives often arise from community input rather than comprehensive urban planning analysis. Nevertheless, the literature illustrates how such interventions significantly contribute to increased social interaction, walkability, and ultimately the enhancement of quality of life within neighbourhoods where they are implemented. While many of these projects are initially temporary in nature, there is a growing interest in their potential integration into local plans and programs. Within this framework, the paper proposes the development of an analysis protocol for identifying optimal locations for street experiments interventions, focusing particularly on parklets, through a comprehensive examination of various components of the urban context. The protocol is then tested in the Oltretorrente neighbourhood in Parma, Italy. The adoption of such a localization protocol holds promise for enhancing the likelihood of successful interventions and advancing the integration of tactical urbanism initiatives into long-term urban planning strategies.

Keywords: GIS · Streets experiments · Parklets · Tactical urbanism · Sustainable mobility

1 Introduction

The issue of vehicular traffic in cities is increasingly apparent in modern urban environments. Not only does it pose significant environmental concerns such as air and noise pollution, but it also profoundly impacts the quality of life for urban dwellers [1–5].

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The dominance of motor vehicles over road space, often at the expense of other road users, notably vulnerable ones, is a striking feature of urban landscapes [6–10]. This dominance is exemplified by the prevalence of parking spaces, which consume a considerable portion of street space [11, 12]. This issue is even more evident within spaces such as historic centres whose morphology and intended use did not foresee the presence of vehicles within them and where the presence of on-street parking is even more impactful [13]. Numerous directives and planning policies advocate for the reduction of car-oriented spaces in favour of allocating more area to pedestrians, sociality, and active mobility, aligning with global agendas like the 2030 Agenda, more specifically Sustainable Development Goal n.11 [i.a., 14–17]. Moreover, several scholars have emphasised the integration of spatial planning and transport planning and explored strategies to assess and transform public space, making it more inclusive and adaptable to the needs of weaker users such as cyclists and pedestrians [i.a., 18–24]. Alongside these formal planning policies, interventions known as Tactical Urbanism (TU) [25–28] have emerged as alternative approaches, characterized by their temporary nature, community initiative, and cost-effectiveness. TU can be considered as an alternative and a challenge to formal spatial planning tools in response to the need for a more responsive planning system [29]. These temporary TU experiments have gained even more prominence following the recent COVID-19 pandemic, owing to their adaptability and rapid implementation capabilities [30].

Among the various TU interventions, Bertolini [31] draws out a specific group of interventions which he defines as "street experiments". In these experiments, the focus is on transforming streets from primarily serving vehicular traffic into spaces that prioritize active movement and socialization for people. Among the diverse array of TU interventions and street experiments, parklets can be deemed as the most suitable for repurposing parking spaces into areas conducive to social interaction and active mobility services. The concept of parklets was first introduced in 2005 in San Francisco by the Rebar Art and Design Studio, which transformed a parking lot into a temporary public space for two hours. This initiative eventually evolved into an annual event called "Park(ing) Day," designed to raise awareness about the shortage of green spaces in urban centres and stimulate discussions on the reclamation of urban space [32]. Since then, parklet installations have been legalized and widely embraced by numerous cities worldwide, with some interventions transitioning from temporary setups to permanent ones. Thus, while many of these projects are initially temporary in nature, there is a growing interest in their potential integration into local plans and programs.

Within this context, the paper aims to investigate parklet implementation by examining relevant criteria for identifying suitable spaces for their allocation. Subsequently, the paper defines a methodology to systematically determine the optimal pedestrian path segments for parklet localization within a neighbourhood. The methodology is then applied to the case study of the Oltretorrente neighbourhood in the city of Parma, Italy.

The innovation of this research lays on the gathering information on existing parklets and literature to create a location protocol applicable at the neighbourhood scale. This will make it easier for associations, citizens or eventually the administration to choose the location of interventions.

The paper is structured as follows: Sect. 2 describes a literature review focusing on the road optimal characteristics for parklets' location, Sect. 3 outlines the proposed methodology for identifying the segments of the pedestrian network most suitable for parklet installation. Section 4 introduces the case study neighbourhood and presents the results of applying the methodology. Finally, Sect. 5 provides conclusions on the application of the methodology to the proposed case study, highlighting its strengths and limitations, and suggesting potential avenues for further research.

2 Literature Review

Several guidelines have been formulated by cities worldwide, particularly those in America, in response to parklets' implementation. America, being the pioneer in parklet implementation, has played a significant role in shaping these guidelines. An essential factor in determining parklet placement is the presence of roadside parking along the street, a criterion supported by various sources, including the 2015 Philadelphia University City District report [33–35]. This criterion holds utmost significance in determining the location of these interventions, as the primary aim of parklets installation is to repurpose areas designated for private vehicles parking into spaces for communal interaction and active mobility related activities.

The table presented below (Table 1) summarizes the main characteristics of the urban context that the literature considers relevant for a more effective intervention, with the overarching goal of maximizing benefits in the surrounding area.

Amongst those, three main factors play a key role. Firstly, pedestrian traffic, which must already be significant, as emphasized in the manuals of Seattle [36], Philadelphia [33], NACTO [34], and UCLA [37]. Indeed, the Philadelphia University City District Report [29] underlines the high social function of parklets. Secondly, the presence of commercial activities along the street, as highlighted by the same manuals, but also by the cities of Watsonville [38], Boston [39], and Littke [40]. This aspect contributes to a livelier atmosphere, fostering increased pedestrian flow and facilitating greater social interactions. Moreover, parklet installations have been correlated with substantial sales boosts [29]. Thirdly, narrow sidewalks present a unique challenge. In such circumstances, where alternative solutions are limited due to various constraints, the installation of a parklet can significantly enhance pedestrian space, as highlighted in manuals such as Wellington city manual [41], Minneapolis city manual [42] and NACTO [30], as well as academic literature by authors like Campisi [32], Caymaz [43], and Peterson [44].

The 2015 Philadelphia University City District Report [33] proposes a categorization of the characteristics influencing the success of parklets in a specific area, offering useful guidance for planning and implementing such projects. It can be noticed, for example, that the aforementioned factors are strongly correlated, while proximity to bike lanes is considered a secondary variable.

Other factors to be considered include surrounding environmental and infrastructural conditions. For example, Watsonville [38] highlights the importance of reducing vehicular traffic speed near parklets to ensure user safety. Guidelines such as those provided by the Boston Tactical Public Realm [39] emphasize the importance of placing parklets in areas not provided with open public spaces (such as parks) or available seating, to maximize their use and attractiveness.

Regarding vehicular traffic flows, there exists a divergence of opinions among authors or manuals depending on the intended function of the parklet. While some advocate for placing parklets along streets with higher vehicular traffic volumes, as evidenced in the case of Divisadero Parklet in San Francisco [44], others suggest the opposite approach [33, 45, 46]. In this analysis, the authors consider streets with lower vehicular traffic flow. Indeed, the streets with high traffic often indicate high vehicle speeds or a lack of roadside parking and these conditions could conflict with other protocol requirements.

Finally, other aspects such as the street slope and proximity to bike lanes can influence the accessibility and use of parklets. The San Francisco Parklet Manual [47] recommends that parklets be built on streets with a slope of less than 5% to maximize accessibility for disabled users and minimize design challenges. Furthermore, although no direct correlation has yet been made between bicycle infrastructure and successful parklets, the Pavements to Parks movement [35] advises for parklets to be installed in areas that fall along bicycle routes to emphasize its goals of encouraging non-motorized transportation and enhancing pedestrian safety [48].

Table 1. Literature review about the best localisation of parklets.

Location	References
High pedestrian traffic	[33, 34, 36, 37, 43, 49]
Commercial activities	[33, 37–40, 43–45, 48, 50]
Narrow pedestrian paths	[32–34, 36, 37, 39, 41–44, 50, 51]
Lack of public spaces	[32, 39, 41, 44, 52, 53]
Slow speed streets (<25mph)	[37–39, 43, 54]
Narrow streets	[33, 45, 55]
Connected to cycle lanes	[33, 40]
Low rate of vehicular traffic	[33, 45, 46]
High rate of vehicular traffic	[44]
Presence of shade	[33, 37]
Areas that can improve pedestrian and bicycle safety	[53]
Presence of street lighting along the path	[37]

3 Materials and Methods

This section of the paper outlines the methodology developed to identify the most appropriate road segments for parklets locations. The methodology is structured into four stages:

- Classification of parklets based on their features;
- Development of a protocol encompassing relevant characteristics of the pedestrian infrastructure and urban context for parklet implementation;

- Evaluation of suitability for each type of parklet;
- Compilation of a comprehensive database detailing the current state of the area under analysis, followed by the application of the protocol to pinpoint potential parklet locations.

Subsequent subsections provide an in-depth explanation of the different stages of the methodology.

3.1 Parklet Typologies

The main feature of parklets implementation is the repurposing of areas originally designated for parking private motor vehicles into spaces intended for social interaction and active mobility. However, through literature analysis and case studies, it becomes apparent that parklets can serve various functions, including providing seating, green spaces, or bicycle parking facilities [31]. To understand this diversity, the research conducted an analysis of different parklet implementations documented in existing literature (including grey literature), categorizing them based on their intended purposes. Subsequently, these categories are used to identify different types of parklets, each associated with specific examples, as presented in the table below (Table 2).

Table 2. Typologies of parklet.

Location	Typologies	References
Public	Bicycle parklets	[56]
	Social parklets	[57]
	Pocket parks	[58]
Private or semi-private	Streateries	[36]

Through the literature analysis, four main types of parklets are identified. These can be grouped into two main categories based on their use. Specifically, there are parklets for public use and those for private or semi-private use. The latter consists of parklets located in close proximity to catering activities, such as restaurants, intended for patron use during their operating hours, and are defined by the Seattle guidelines [59] as Streateries. On the other hand, public parklets serve three primary purposes: bicycle parking and related services, pocket parks characterized by the inclusion of vegetation, and social parklets. The latter feature seating areas intended for passersby and community members. It is important to note, however, that this type often includes additional elements found in the previously mentioned categories, particularly bicycle racks and urban greenery.

3.2 Comprehensive Protocol for All the Typologies

This section aims to identify the relevant characteristics of public space for parklet placement, informed by a review of existing literature. To identify the most suitable

locations for parklet interventions, a protocol is developed to assess open public spaces and ascertain the presence or absence of critical characteristics. Instead of creating separate protocols for each parklet type, a unified protocol for evaluating urban space has been established. Thus, the protocol highlights the prevailing qualities and crucial aspects of urban space, aiding in the selection of the most suitable parklet type for installation in each identified area.

Each pedestrian path is then evaluated based on a set of factors, with values ranging from 1 to 0 assigned for each individual factor. A value of 1 indicates support for parklet installation, while 0 suggests that the characteristic does not favour parklet placement. Moreover, a value of 0 may indicate that existing conditions are sufficient, rendering parklet installation unnecessary.

The protocol considers various characteristics of the pedestrian path and surrounding urban context. Firstly, of primary importance is the presence of roadside parking, which, as previously emphasized, is crucial for determining the suitability of a segment for parklet placement.

Considering street characteristics, the protocol prioritizes streets with low vehicular speed limits, assigning a positive value to streets with a speed limit equal to or less than 30 km/h. Additionally, streets experiencing low traffic flows also receive a positive rating. Specifically, in the context of the paper's case study, located in Italy, suitable streets for parklet installation are those classified as E/F or F according to Article 2 of the Italian Highway Code [60]. Next, while the width of the street itself can be of significant consideration, the width of pedestrian paths becomes even more relevant. In fact, if the dimensions or the presence of obstacles cause the accessible width to be less than 90 cm, the installation of a parklet could address this limitation. Consequently, a value of one is assigned to pedestrian paths exhibiting this criticality, indicating their suitability for parklet installation. Other characteristics collected and assessed by the protocol, related to the pedestrian infrastructure, include the presence of shade provided by tree rows and the availability of street lighting. The presence of catering activities, i.e. bars and restaurants, along the path is also taken into consideration. To ascertain the presence of such activities along the pedestrian path, a 10-m buffer originating from the activity is employed. Additionally, the protocol assesses the proximity to cycle paths and green areas, i.e. parks and green squares. For cycle paths, a 100-m buffer is established, identifying segments within this radius as most suitable for parklet location. This is because parklets can also encourage active mobility and offer a convenient option to cyclists when equipped with services for bikes, such as bike racks or repair stations. For green areas, the protocol considers a 5-min walk time isochrone and segments outside this range are deemed favourable for parklet localization. This approach acknowledges that parklets can function as small pocket parks, providing access to green spaces where other parks may not be readily accessible.

In addition to the elements identified within the literature, the protocol also identifies as optimal characteristics for parklet localisation, including the presence of cultural buildings along the path. These buildings can contribute to creating a more enjoyable environment for walking, thereby promoting social interactions. Furthermore, the presence of urban seating along the path and proximity to bike racks within a 100-m radius, are considered favourable for parklet placement, as parklets can compensate deficiencies in

these amenities. Lastly, the protocol also considers the proximity of bike-sharing stations as a favourable element, following the reasoning applied to cycling lanes (Table 3).

For the protocol application to the selected case study, base maps and data for the analysis are collected from multiple sources. These include the Territorial Information System of the municipality of Parma and the Geoportal of Emilia-Romagna Region, which provide cartographic data on the street network, buildings, existing public services, and mobility services. Open data websites, i.e. Open Street Map, are used instead for the location of commercial facilities, notably bars and restaurants. Lastly, the remaining data, such as pedestrian paths and their characteristics, roadside parking, and urban furniture, are collected in situ by the authors.

Table 3. Values assigned to each characteristic of the paths.

Characteristic	Evaluation	Values
Roadside parking	Present Absent	1 0
Width	"<90" "90 < x < 150" + bottlenecks # null AND "90 < x < 150" + bottlenecks # absent Other	1 1 0
Cultural buildings	Present Absent	1 0
Proximity to cycle lanes	Present Absent	1 0
Proximity to sharing services	Present Absent	1 0
Proximity to urban green areas	Within a 5-min walk Beyond a 5-min walk	0 1
Speed limit	"30 km/h" Other	1 0
Shading	Present Absent	1 0
Lighting	Present Absent	1 0
Presence of catering activities	Present Absent	1 0
Vehicular traffic	"E"or "E/F" or "F" Others	1 0

(*continued*)

Table 3. (*continued*)

Characteristic	Evaluation	Values
Urban seating	Present Absent Present without protection	0 1 1
Bike racks	Present Absent	0 1

3.3 Suitability Evaluation

Once the protocol is defined, data collection for evaluating the pedestrian infrastructure and the immediate urban context is initiated. Values are then assigned to individual segments of the pedestrian network. To identify the most suitable type of parklet to be located along the various segments, specific conditions for each type are then defined as follows:

- **Social parklets**: Roadside parking + Speed limit + Vehicular traffic + Width + Shading + Lighting + Urban seating + Cultural buildings + Proximity to cycle lanes + Proximity to sharing services;
- **Pocket parks**: Roadside parking + Proximity to urban green areas;
- **Bicycle parklet**: Roadside parking + Proximity to urban green areas;
- **Streateries**: Roadside parking + Presence of catering activities.

4 Results and Discussion

4.1 Case Study: Parma's Oltretorrente Neighbourhood

The case study used to test the methodology is the Oltretorrente neighbourhood in the city of Parma. Situated to the west of the Parma River, it constitutes part of the city centre along with its eastern counterpart (Fig. 1). The neighbourhood covers an area of 1.1 km^2 and is home to 8,496 inhabitants (as of 2023 [61]). Bordered by urban boulevards to the north, west, and south, and the Parma River to the east, the district can be divided into two main areas along the east-west axis, represented by via Emilia. The northern area is primarily designated for services and amenities, which includes the Parco Ducale park, while the southern area is predominantly residential. The neighbourhood is equipped with green and blue infrastructures, including small parks in the inner areas, health facilities such as clinics and hospital services, and various commercial activities. Furthermore, a notable presence of secondary schools, constituting most of such institutions in the city of Parma, is observed within the neighbourhood. These schools are primarily situated along the eastern border, facing the Parma River. Additionally, some of the University of Parma premises are also located within the neighbourhood, particularly in close proximity to the Parco Ducale park. In terms of mobility, the district is predominantly accessible to vehicular traffic, apart from Via Emilia and the surrounding area until Ponte di Mezzo, the bridge that crosses the Parma River along Via Emilia. Indeed, this area of the neighbourhood included within the LTZ (Limited Traffic Zone). Active

mobility infrastructure is limited, partly due to the mainly narrow configuration of the neighbourhood streets. However, extensive pedestrian paths are prevalent throughout the area. The local public transport network is extensive and offers convenient access along the main streets of the neighbourhood. Additionally, numerous bike-sharing stations are identified within the Oltretorrente neighbourhood.

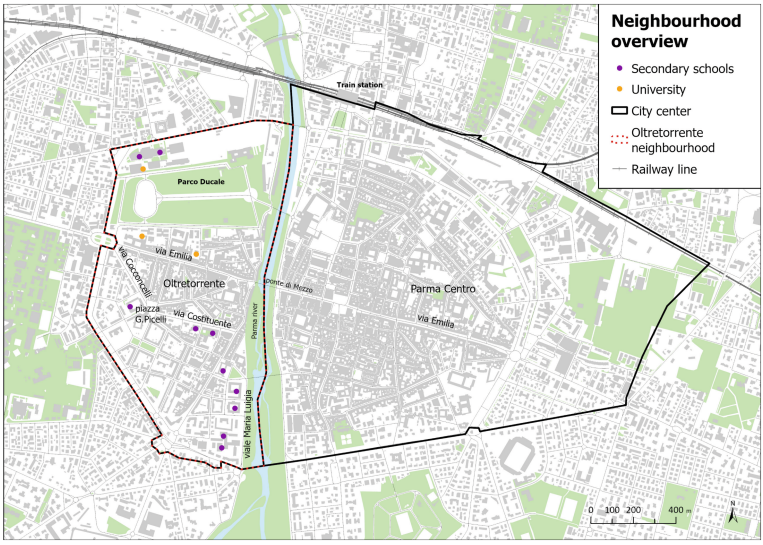

Fig. 1. Framework of the Oltretorrente neighbourhood in relation to the historic city centre. Secondary schools and University poles, as highlighted, characterise this neighbourhood. Source: authors' elaboration.

The neighbourhood was selected as the case study of this paper due to its previous inclusion in studies on sustainable mobility [62], including the recent European project Thriving Streets - URBACT III 2014–2020, where the city of Parma played a central role as lead partner. Furthermore, in 2023, the neighbourhood was chosen for the installation of a parklet along Viale Maria Luigia, the street which accommodates most of the area's high schools. The parklet initiative is temporary and stems from a bottom-up approach initiated by a group of teachers and students from one of the schools situated along the street. Thus, given the complexity and diversity of the neighbourhood, it can be interesting to study where and which typology of parklet could be located.

4.2 Protocol Application Results

The primary criterion established in the methodology chapter for parklet establishment is the availability of roadside parking spaces.

Within the Oltretorrente neighbourhood, the analysis (Fig. 2) indicates the inner residential streets with reduced traffic flows are depicted as the most suitable areas for parklet installation, as they typically offer roadside parking. In contrast, the ring roads, and main thoroughfares, particularly in the southwest portion of the area, characterized

by higher traffic flow and faster speeds present parking spaces of different types that are not aligned along the roadside, thus making them unsuitable with the selected criterion. Consequently, a preliminary selection of suitable streets for parklet localization is conducted based on this criterion.

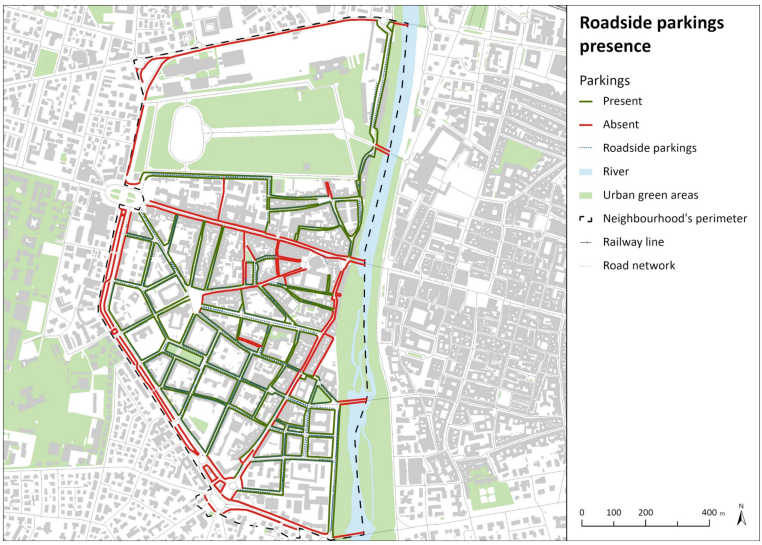

Fig. 2. Streets suitable for parklets due to the presence of roadside parking. Source: authors' elaboration.

The case study assessment, using the protocol, unveiled that the neighbourhood features numerous cultural buildings, shared mobility services, and tree-lined main routes. However, one of the protocol factors considered seems to hold little relevance for this study area. In fact, the vehicular speed limit throughout the neighbourhood remains uniformly limited to 50 km/h, with very few exceptions. As a result, the rating for almost all streets regarding this feature are 0.

The following figures (Figs. 3, 4, 5 and 6) illustrate the identified suitable streets for each parklet typology previously defined: social parklets, bicycle parklets, pocket parks and Streateries.

Those segments are primarily located along the perimeter of the Parco Ducale park and in the southwest area of the neighbourhood. Conversely, the majority of segments achieves a sufficient rating. Those segments are primarily located within the inner streets of the district, concurring with the previous observation made through Fig. 2. Particularly noteworthy are the main streets with high pedestrian traffic, such as Via della Costituente, Via Cocconcelli, Viale Maria Luigia, and their intersecting streets.

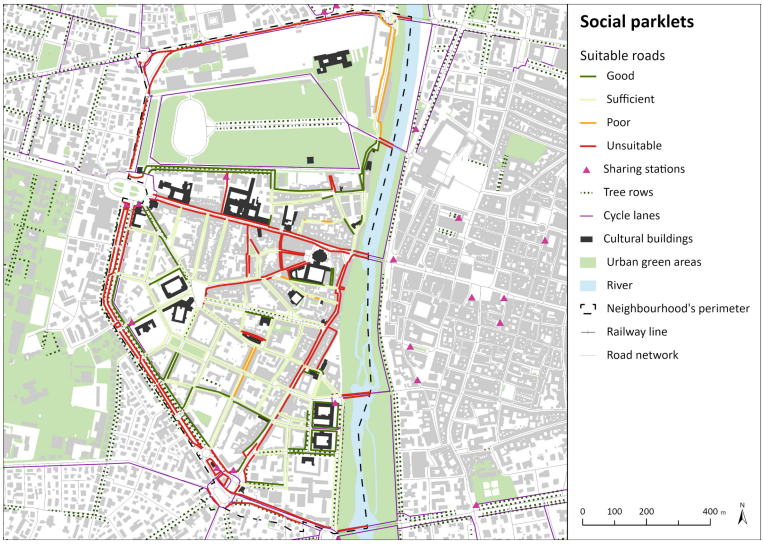

Fig. 3. Streets suitable for parklets as meeting places, i.e. to enhance sociality. Source: authors' elaboration.

In terms of bicycle parklet typology, Fig. 4 highlights the widespread presence of bike racks throughout the neighbourhood, especially near public facilities such as schools. Nevertheless, these amenities frequently appear insufficiently sized in relation to demand, suggesting a potential need for additional bike racks. Suitable locations for

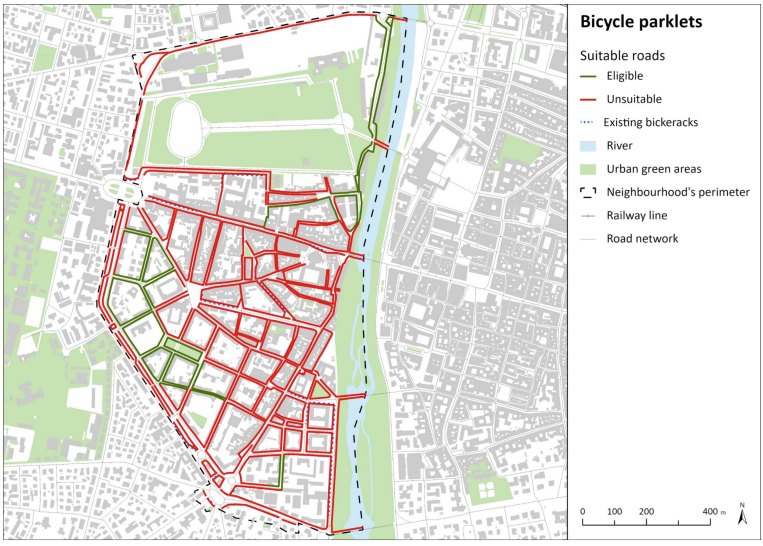

Fig. 4. Streets suitable for parklets as bicycle racks. Source: authors' elaboration.

such installations are observed primarily in the western and northern parts of the district, including areas adjacent to the Parco Ducale park.

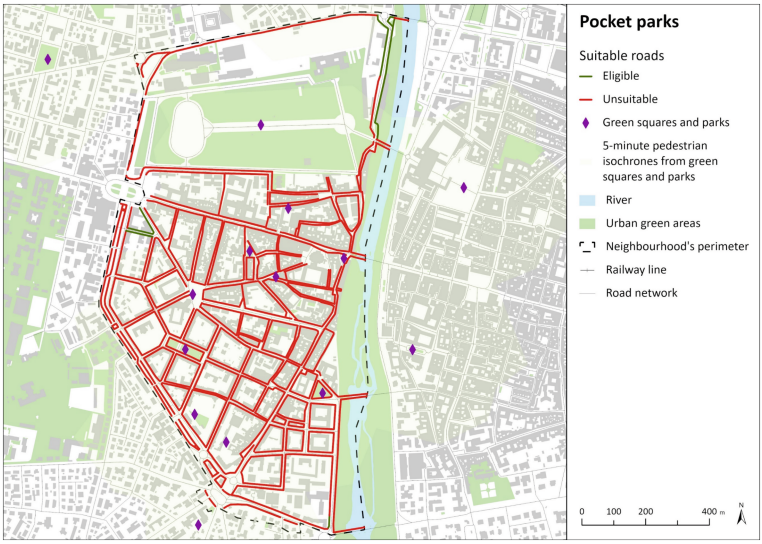

Fig. 5. Streets suitable for parklets as pocket parks. Source: authors' elaboration.

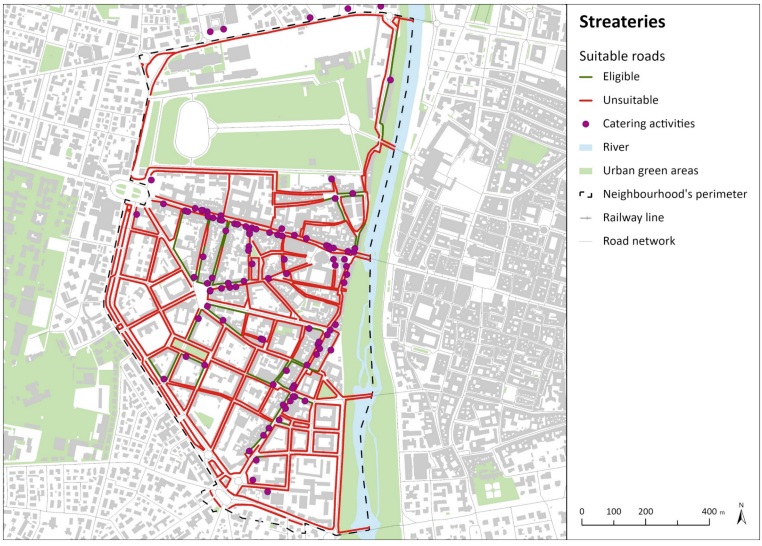

Fig. 6. Streets suitable for parklets as Streateries, for catering activities. Source: authors' elaboration.

Figure 5 depicts the pedestrian path segments deemed suitable for pocket park installations according to the protocol assessment. A closer examination of this figure reveals

the neighbourhood's abundance of public green spaces, both within its boundaries and in the surrounding areas. Consequently, the demand for pocket parks in the case study neighbourhood appears to be minimal. Indeed, nearly the entirety of the area falls within the 5-min walk isochrone generated from the identified green spaces, ensuring convenient access to these areas for the neighbourhood population. Thus, only two streets, located to the west of Piazzale Santa Croce, are identified as potential locations for pocket parks.

On the contrary, identifying suitable segments for Streateries (Fig. 6) interventions poses challenges, primarily due to the concentration of catering activities along the main streets of the neighbourhood. These streets coincide with those identified in the initial analysis to determine the presence of roadside parking. As a result, only specific inner streets are capable of effectively accommodating this parklet typology.

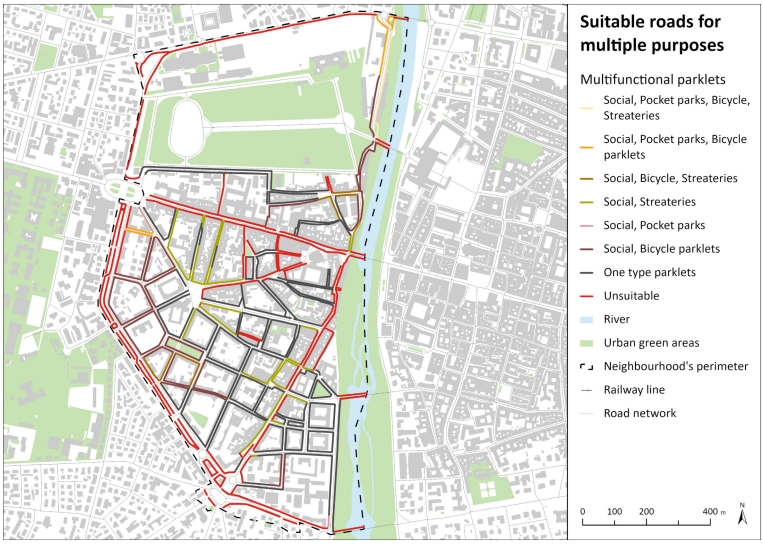

Fig. 7. Streets suitable for parklets with multiple purposes. Source: authors' elaboration.

Lastly, an additional analysis is conducted to evaluate the suitability of pedestrian path segments for various types of parklet installations (Fig. 7). This analysis makes it possible to not only identify the most suitable locations for street experiments but also to determine the most appropriate typology of intervention. The findings indicate that the two most pertinent typologies and thus most suitable for the neighbourhood under study, are social parklets and Streateries. This observation aligns with the neighbourhood's primarily residential character and the abundance of catering activities in the area.

5 Conclusions

Tactical urbanism interventions, as emphasized by the authors, play a crucial role in promoting sociability, enhancing social interaction, improving walkability, and ultimately enhancing quality of life. However, these interventions are typically bottom-up in nature

and are characterized by their temporary implementation. Nevertheless, while many of these projects are initially temporary in nature, there is a growing interest in their connection with local plans and programs.

In this context, the aim of this study is to introduce the initial results of the development of a localization protocol, which seeks to integrate parklet interventions into local urban planning plans and programs. One potential application of this tool could support public administrations, where it could help conduct preliminary assessments to identify suitable locations for parklets interventions. This process could facilitate dialogue with citizens, who are often the advocates for such interventions. In fact, by providing a list of suitable locations based on desired functions, the protocol could promote more interventions and offer alternative options in cases where proposed locations are deemed unsuitable by public administrations, thus becoming a toolkit for community engagement.

Thus, the paper outlines a methodology to identify potential locations for street experiments, specifically parklets, through the development of an assessment protocol based on characteristics of pedestrian paths, streets, and the surrounding urban context, identified in the existing literature. This underscores the importance of focusing attention on the specific needs and vocation of the neighbourhood, which can be partially addressed through these interventions.

The results of the methodology application revealed that not all of the identified typologies of parklets are suitable for the area. Additionally, it is evident that improving walkability cannot solely rely on the installation of parklets. For instance, the presence of adequate public lighting along paths is essential, as parklet installation alone may not compensate for this deficiency. Therefore, to truly enhance walkability and sociability, parklet implementation must be complemented by targeted interventions along pedestrian paths and the surrounding urban context. Conversely, the inverse holds true: the more favourable the conditions of the urban context and the route where the intervention is situated, the greater its likelihood of success of parklet implementation. Consequently, at this stage, the methodology focuses on areas where such specific street experiment interventions can effectively contribute to an overall improvement of people's quality of life and walkability.

While the developed protocol presents certain limitations, it could be refined in future iterations to further enhance its effectiveness and applicability. In particular, the most important limitations can be summarised as follows:

- the protocol focuses on pedestrian and street infrastructure characteristics, neglecting environmental and social aspects of the area, including the need to engage the local population in constructive dialogue;
- the protocol considers cultural buildings, it does not take into account other public buildings that could serve as significant focal points for promoting sociability, such as schools or neighborhood primary services;
- the methodology identifies suitable areas for intervention, but it does not consider the potential challenges of specific streets that may make them less suitable for such interventions. This condition is exemplified by the case of via Kennedy, located south of the Parco Ducale park, which the protocol assesses as suitable for the localization of social parklets. However, both pedestrian paths along the street are bordered by fences:

one belonging to the park itself and the other delimiting the university premises. Thus, even if relevant buildings and services are present along the path, it would be advisable to also investigate their degree of permeability and openness towards the street;

- many of the investigated features require on-site collection, due to their unavailability on institutional portals or in public geodatabases. Therefore, it is essential to collect and constantly update this data to ensure the validity and reliability of the methodology;
- need for additional data reported in the literature, including the identification of the neighborhood's most frequently visited areas and the monitoring of traffic flows. The latter is particularly useful for conducting pre- and post-installation analyses of the parklet to assess its impact on the presence of people in the surrounding area;
- the methodology doesn't take into account the calculation of parking spaces lost due to the installation of parklets. This is relevant in order to possibly determine where parking spaces can be replaced.

Lastly, future developments of the work will consider refining the methodology, specifically the evaluation protocol, to promote the inclusion of parklets in sustainable urban mobility plans, thus making them a structural measure. The refinement of the evaluation methodology and protocol aims to address these limitations.

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References

1. World Health Organization, Motor vehicle air pollution: public health impact and control measures. https://iris.who.int/handle/10665/61927?locale-attribute=en&show=full. Accessed 27 Mar 2024
2. European parliament Topics, CO2 emissions from cars: facts and figures. https://www.europarl.europa.eu/topics/en/article/20190313STO31218/co2-emissions-from-cars-facts-and-figures-infographics. Accessed 27 Mar 2024
3. Stansfeld, S., Haines, M., Berry, B., Burr, M.: Reduction of road traffic noise and mental health: an intervention study. Noise Health **11**(44), 169–175 (2009)

4. De Nazelle, A., et al.: Improving health through policies that promote active travel: a review of evidence to support integrated health impact assessment. Environ. Int. **37**(4), 766–777 (2011)
5. Van Wee, B.: The unsustainability of car use. In: Gärling, T., Ettema, D., Friman, M. (eds.) Handbook of Sustainable Travel. Springer, Dordrecht (2014). https://doi.org/10.1007/978-94-007-7034-8_5
6. Newman, P., Kenworthy, J.: End of Automobile Dependence. Island Press, Washington DC (2015)
7. Reid, C.: Roads Were Not Built for Cars. Island Press, Washington DC (2015)
8. Hartman, L.M., Prytherch, D.: Streets to live in: justice, space, and sharing the road. Environ. Ethics **37**(1), 21–44 (2015)
9. Gössling, S.: Urban transport justice. J. Transp. Geogr. **54**, 1–9 (2016)
10. Attard, M., Guzman, L.A., Oviedo, D.: Urban space distribution: the case for a more equitable mobility system. Case Stud. Transp. Policy **14** (2023)
11. Shoup, D.: Parking and the City. Taylor and Francis, London (2018)
12. Nello-Deakin, S.: Is there such a thing as a 'fair' distribution of road space? J. Urban Des. **24**(5), 698–714 (2019)
13. Morar, T., Bertolini, L.: Planning for pedestrians: a way out of traffic congestion. Procedia – Soc. Behav. Sci. **81**, 600–608 (2013)
14. United Nations: The 2030 Agenda for Sustainable Development, New York (2015)
15. European Commission (EC), White paper 2011: Roadmap to a single European transport area – towards a competitive and resource efficient transport system. https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:en:PDF. Accessed 27 Mar 2024
16. UNHABITAT: Planning and design for sustainable urban mobility: Policy directions. Global report on human settlements 2013. Abridged edition. United Nations Human Settlements Programme, Routledge New York (2013)
17. Nieuwenhuijsen, M.J., Khreis, H.: Car free cities: pathway to healthy urban living. Environ. Int. **94**, 251–262 (2016)
18. Gehl, J.: Cities for People. Island Press (2010)
19. Conticelli, E., Maimaris, A., Papageorgiou, G., Tondelli, S.: Planning and designing walkable cities: a smart approach. In: Papa, R., Fistola, R., Gargiulo, C. (eds.) Smart Planning: Sustainability and Mobility in the Age of Change. GET, pp. 251–269. Springer, Cham (2018). https://doi.org/10.1007/978-3-319-77682-8_15
20. Campisi, T., Basbas, S., Tesoriere, G., Trouva, M., Papas, T., Mrak, I.: How to create walking friendly cities. a multi-criteria analysis of the central open market area of Rijeka. Sustainability **12**(22), 9470 (2020)
21. Ignaccolo, M., Inturri, G., Giuffrida, N., Le Pira, M., Torrisi, V., Calabrò, G.: A step towards walkable environments: spatial analysis of pedestrian compatibility in an urban context. Eur. Transp. **76**(6), 1–12 (2020)
22. Gössling, S.: Why cities need to take road space from cars – and how this could be done. J. Urban Des. **25**(4), 443–448 (2020)
23. Anciaes, P., Jones, P.: Redesign of urban roadspace in Europe considering all road uses. In: ETC Conference Papers 2021. Association for European Transport (2021)
24. Garau, C., Annunziata, A., Coni, M.: A methodological framework for assessing practicability of the urban space: the survey on conditions of practicable environments (SCOPE) procedure applied in the case study of Cagliari (Italy). Sustainability **10**(11), 1–23 (2018)
25. VanHoose, K., de Gante, A.R., Bertolini, L., Kinigadner, J., Buttner, B.: From temporary arrangements to permanent change: assessing the transitional capacity of city street experiments. J. Urban Mobil. **2**, 100015 (2022)
26. Furchtlehner, J., Lička, L.: Back on the street: Vienna, Copenhagen, Munich, and Rotterdam in focus. J. Landsc. Archit. **14**(1), 72–83 (2019)

27. Vasilev, M., Pritchard, R., Jonsson, T., Panek, J.: An exploration of multiuser perceptions of a Norwegian complete streets modification using interim design strategies. Case Stud. Transp. Policy **13**, 101058 (2023)
28. Smeds, E., Papa, E.: The value of street experiments for mobility and public life: citizens' perspectives from three European cities. J. Urban Mob. **4**, 100055 (2023)
29. Silva, P.: Tactical urbanism: towards an evolutionary cities' approach? Environ. Plann. B. Plann. Des. **43**(6), 1040–1051 (2016)
30. Iborra Pallarés, V., Flor García, M., Aragonés Pomares, L., Ortuño Padilla, A.: The healthy city: how sustainable mobility policies gave a resilient response to the COVID-19 crisis through tactical urbanism. In: Cheshmehzangi, A., Sedrez, M., Zhao, H., Li, T., Heath, T., Dawodu, A. (eds.) Resilience vs Pandemics. Urban Sustainability. Springer, Singapore (2023). https://doi.org/10.1007/978-981-99-7996-7_3
31. Bertolini, L.: From "streets for traffic" to "streets for people": can street experiments transform urban mobility? Transp. Rev. **40**(6), 734–753 (2020)
32. Campisi, T., Caselli, B., Rossetti, S., Torrisi, V.: The evolution of sustainable mobility and urban space planning: exploring the factors contributing to the regeneration of car parking in living spaces. Transp. Res. Procedia **60**, 76–83 (2022)
33. Philadelphia University City District Report, The case for Parklets: measuring the impact of sidewalk vitality and neighbourhood businesses. https://issuu.com/universitycity/docs/the_case_for_parklets_2015?e=4547788/11667837. Accessed 27 Mar 2024
34. NACTO, Urban Street Design Guide. https://nacto.org/publication/urban-street-design-guide/interim-design-strategies/parklets/. Accessed 27 Mar 2024
35. Pavement to parks. http://pavementtoparks.org/parklets/. Accessed 27 Mar 2024
36. Seattle right-of-way improvements manual, Parklets. https://streetsillustrated.seattle.gov/urban-design/public-space/parklets/. Accessed 27 Mar 2024
37. UCLA, Reclaiming the right of way – A Toolkit for Creating and Implementing Parklets. https://innovation.luskin.ucla.edu/wp-content/uploads/2019/03/Reclaiming_the_Right_of_Way.pdf. Accessed 27 Mar 2024
38. Watsonville California, Parklet Program. https://www.watsonville.gov/2101/Parklet-Program. Accessed 27 Mar 2024
39. Boston Tactical Public Realm Guidelines, Boston City 2018. https://www.boston.gov/sites/default/files/file/document_files/2018/08/fina_tactical_public_realm-8.18-no-wrap_1.pdf. Accessed 27 Mar 2024
40. Littke, H.: Revisiting the San Francisco parklets problematizing publicness, parks, and transferability. Urban Forestry Urban Green. **15**, 165–173 (2016)
41. Wellington City Council. https://wellington.govt.nz/certificates-and-licences/apply-for-a-parklet. Accessed 27 Mar 2024
42. Minneapolis City. https://www.minneapolismn.gov/government/programs-initiatives/transportation-programs/parklets-street-cafes/. Accessed 27 Mar 2024
43. Caymaz, G.F.Y., Zerriouh, M.A.: A study of parklet planning, design and planting criteria examples. In Izmır And Istanbul. SAUC - Street Art Urban Creat. **8**(1), 98–106 (2022)
44. Peterson, E.F.: Using pilot projects to reclaim public space for pedestrians: lessons from New York City and San Francisco. Thesis, University of British Columbia (2012). https://doi.org/10.14288/1.0073081
45. Stevens, Q., Leorke, D., Hai Thai, H.M., Innocent, T., Tolentino, C.: Playful, portable, pliable interventions into street spaces: deploying a 'playful parklet' across Melbourne's suburbs. J. Urban Des. **29**(2), 231–251 (2023)
46. London Borough of Hounslow, Parklets. https://www.hounslow.gov.uk/info/20053/transport/2400/parklets. Accessed 27 Mar 2024
47. San Francisco Parklet Manual. http://groundplaysf.org/wp-content/uploads/San-Francisco-Parklet-Manual.pdf. Accessed 27 Mar 2024

48. Stroman, G., Opportunity Mapping San Francisco Parklets & Plazas. https://groundplaysf.org/wp-content/uploads/GS_Opportunity-Mapping-Report_Stroman_Report_2014.pdf. Accessed 27 Mar 2024
49. Owens, L.B.: A Tale of Two Cities: The Parklet Implementation Processes in Los Angeles and San Francisco. https://www.oxy.edu/sites/default/files/assets/UEP/Comps/Lena%2520Burton%2520Owens_A%2520Tale%2520of%2520Two%2520Cities%2520Parklet%2520Implementation%2520Processes%2520in%2520LA%2520and%2520SF.pdf. Accessed 27 Mar 2024
50. Seattle Department of Transportation, Parklet handbook. https://www.seattle.gov/documents/Departments/SDOT/PublicSpaceManagement/Parklet_Handbook_DIN_2017.pdf. Accessed 27 Mar 2024
51. Ghandi, M.: Parklet: a new urban platform for emergent forms of communication and social interaction in the cities. In: Proceedings of the 2019 Modular and Offsite Construction (MOC) Summit, 21–24 May 2019, Banff, Alberta, Canada (2019)
52. Grabiec, A.N., Łacka, A., Wiza, W.: Material, functional, and aesthetic solutions for urban furniture in public spaces. Sustainability **14**(23), 16211 (2022)
53. Corey, K.: Making Space: An Exploration of Parklets in North America and Vancouver. Thesis of Master of Landscape Architecture, University of Guelph, Ontario Canada (2014)
54. Birdsall, M.: Parklets providing space for people to park...themselves. ITE J. **83**(5), 36–39 (2013)
55. Koué, C., Evan, B.: Sustainable implementation of emerging infrastructure in cities: a case study of parklets. Master's thesis, Faculty of the Graduate School of Arts and Sciences of Georgetown University in partial fulfilment of the requirements for the degree of Master of Arts in Communication, Culture and Technology, Washington, DC (2013)
56. Cargo Bike Parklet in London – Hackney. Meristem Design (2023). https://www.meristemdesign.co.uk/news/cargo-bike-parklet-london. Accessed 15 Apr 2024
57. Creating Parklets for Community and Business. Your project guide. July 2020. https://crossriverpartnership.org/wp-content/uploads/2020/07/Creating-Parklets-for-Community-and-Business-Resillience.pdf. Accessed 15 Apr 2024
58. ResilienceGreen Cities Europe Parklet. Bord Bia Bloom. https://www.bordbiabloom.com/green-cities-europe-parklet/. Accessed 15 Apr 2024
59. Seattle right-of-way improvements manual, Streateries. https://streetsillustrated.seattle.gov/urban-design/public-space/streateries/. Accessed 27 Mar 2024
60. Italian Road Code, L.D. n. 285 of April 30, 1992
61. Comune di Parma, Quartieri. https://www.comune.parma.it/it/amministrazione/documenti-e-dati/statistica/demografia/quartieri. Accessed 27 Mar 2024
62. Caselli, B., Rossetti, S., Ignaccolo, M., Zazzi, M., Torrisi, V.: Towards the definition of a comprehensive walkability index for historical centres. In: Gervasi, O., et al. (eds.) ICCSA 2021. LNCS, vol. 12958, pp. 493–508. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-87016-4_36