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Questioning Proximity—Opportunities and Challenges for Urban Planning and Mobility Policies

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Questioning Proximity—Opportunities and Challenges for Urban Planning and Mobility Policies

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Editors
Paola Pucci
Dipartimento di Architettura e Studi Urbani (DASTU)
Politecnico di Milano
Milan, Italy

Giovanni Vecchio
Instituto de Estudios Urbanos y Territoriales
Pontificia Universidad Católica de Chile
Santiago, Chile

Centro de Desarrollo Urbano Sustentable (CEDEUS)
Pontificia Universidad Católica de Chile
Santiago, Chile

ISSN 2191-530X ISSN 2191-5318 (electronic)
SpringerBriefs in Applied Sciences and Technology
ISSN 2282-2577 ISSN 2282-2585 (electronic)
PoliMI SpringerBriefs
ISBN 978-3-031-66070-2 ISBN 978-3-031-66071-9 (eBook)
https://doi.org/10.1007/978-3-031-66071-9

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Introduction

Abstract Proximity is an apparently undiscussable guiding concept for urban and mobility planning, addressing several urban planning experiences in the past. A new reformulation of the model—under the concept of a 15-minute city—is a popular reference for cities worldwide, thanks to the need for proximity, experienced during the pandemic and the related restrictive measures for individual mobility. Widely praised such a model, as a reference to adapt cities and metropolitan areas, mitigate their environmental impact, reduce existing inequalities, and promote local economic development, it raises some issues when considering proximity in different socio-spatial settings. The book intends to highlight several dimensions of the concept that may better frame the actual contribution of proximity in different places, challenging an acritical use of the proximity concept. The contributions in the book deal with the conditions required for ensuring accessibility by proximity, comparing a supply-based and functional approach that focuses on the selections of the daily services and amenities within defined travel time thresholds with a more place-based approach, and considers the different planning dimensions that may contribute to the promotion of accessibility by proximity.

Keywords Proximity · Accessibility by proximity · Mobilities · X min city

Proximity as a Keyword

Several cities around the world are adopting planning and policy strategies to promote accessibility by proximity, aiming at the reduction of the spatial and temporal intensities and environmental impact of daily travel by providing accessible services and opportunities in physical proximity to the citizens (Gower & Grodach, 2022). Scholars, practitioners, and decision-makers have widely praised such a model, as a reference to adapt cities and metropolitan areas, mitigate their environmental impact, reduce existing inequalities, and promote local economic development (Moreno et al. 2021). In these experiences, proximity is generally defined in "functional" terms, thus

conceived as the physical spatiotemporal distance to essential daily services and opportunities. The value of proximity-based urban narratives lies in the possibility of aligning different actors by providing them with a common time-based vision for the city. At the same time, these strategies involve different scales of the city and can activate a wide set of policies, from the hyper-local street scale (i.e., convivial public spaces) to the metropolitan region (i.e., Sydney metropolitan region 2020, and the strategical plans of Melbourne, 2017 or Portland, 2012). Despite the worldwide praise for the concept of proximity, as reflected by the hype around the idea of an "x-minute city", several issues emerge when considering proximity in different socio-spatial settings.

The book intends to discuss some of the issues related to proximity, challenge an acritical use of the proximity concept, and highlight several dimensions of the concept that may better frame the actual contribution of proximity in different places. The contributions in the book deal with the conditions required for ensuring accessibility by proximity, comparing a supply-based and functional approach that focuses on the selections of the daily services and amenities within defined travel time thresholds with a more place-based approach, and considers the different planning dimensions that may contribute to the promotion of accessibility by proximity.

Five questions guide the discussion across the book:

1. Is proximity for all? Is it an inclusive concept, or instead it generates new forms of exclusion for specific population groups (based on gender, age, socioeconomic status, and ethnicity…)?
2. Is proximity valid for every setting and at each territorial scale? Is it a universal idea or is it rather based on an isotropic idea of space? How can it be applied in periurban and rural areas, residential and non-residential areas, or even Global South metropolises?
3. What are the dimensions and the metrics of proximity? Are these only spatiotemporal metrics? Should we consider not only functional proximity but also relational proximity?
4. Is proximity always desirable? How does it relate to broader social and environmental challenges? Does the climate crisis question proximity? Is it fair to grant access mainly to local opportunities?
5. While proximity is often related to conditions related to housing, how does it relate to the needs related to jobs and productive activities?

Structure and Contents of the Book

The book is organized in two parts: the first part introduces some experimental approaches aimed at operationalizing accessibility by proximity, while the second part discusses several planning issues related to the implementation of proximity at different scales.

The first part—*Operationalising Accessibility by Proximity: Empirical Approaches*, offers an overview of the multiple meanings and dimensions associated with the proximity concept starting by examining mobility and accessibility issues of the ageing population of Santiago de Chile. In *Proximity for whom? Accessibility in an unequal, ageing city*, Giovanni Vecchio addresses accessibility by proximity focusing on a specific population group, older people, examining the different potential that neighbourhoods have for promoting proximity at a local scale and assessing the quality of the public space through which urban inhabitants have to move to access close opportunities. While the concept of proximity can reorient urban and transport planning towards more environmentally sustainable outcomes, the issues discussed in the chapter intend to highlight the importance of granting that these transformations are also socially just and available to different groups of a population.

With the same focus on the *Quality of the walkability for measuring accessibility*, Matteo Colleoni, Simone Caiello, and Luca Daconto analyse the walking conditions of the elderly people in Milan Metropolitan City focusing on the spatial features of the environment and the perceptions about the environment's pedestrian friendliness of old residents. The results show a general assonance between the objective and subjective evaluation and a dissonance, namely in the case of women and oldest-old respondents, arguing the need to focus more on the quality of walkability to contribute to an age-friendly city for all.

In *Critical issues in operationalizing the x-minute city*, Luca Staricco applies the x-minute city model in Turin highlighting that at least in dense cities such as the case study, the 15-minute threshold is not necessarily the most appropriate target, as it is already attained for many services by the majority of the population.

Dealing with the need of a sensitive place-based measure of accessibility by proximity in *Measuring accessibility by proximity: the Inclusive Accessibility by Proximity Index* Giovanni Lanza and Paola Pucci, introduce IAPI as a tool for assessing accessibility levels to daily services and activities deemed essential for local inhabitants, by considering the impact that the physical and perceptual characteristics of urban spaces and paths can have on active mobility. By using open data—mainly from OSM—integrated with crowdsourced information collected via citizen direct involvement, the IAPI is designed to maximize scalability, transferability, and the level of customization for context-sensitive applications.

Antonella Bruzzese and Alessandro Coppola in *Questioning proximity in a fragmented, disorderly, and complex urban region*, by discussing a variety of concrete urban conditions in the Milan urban region, propose a taxonomy of situations, potentially guiding public policy and spatial planning aimed at increasing proximity. The heterogeneity of urban conditions allows to show how the terms for achieving a 15-minute city condition change profoundly in terms of meaning, contents, processes, and goals, compared to more central and denser urban areas.

The second part—*Planning for Accessibility by Proximity* discusses emerging challenges in the implementation of this model, starting by investigating the metrics of accessibility by proximity in the chapter by Federica Bianchi, Rossella Moscarelli, Paolo Pileri. Proposing the concept of slowness as a practice to experience urban spaces of proximity, the chapter introduces a method to evaluate the quality and the

usability of pedestrian paths in urban areas, highlighting the need to rethink slow mobility first of all as an opportunity for city and neighbourhood design.

Starting with schools: proximity as a space of governance in both urban planning and educational policies by Paola Savoldi proposes to rethink the proximity metrics by observing educational institutions and their spaces and discussing inclusiveness and spatial justice. From this perspective, planning has to face complex challenges such as how to reorganize public services at the neighbourhood scale to activate unused spaces and provide more inclusive services starting from the schools.

About the distribution of daily services and commercial opportunities by Luca Tamini offers a reflection on the strategies of enhancement of proximity services that, from a gravitational viewpoint, are capable of attenuating the extended outflows of expenses towards the extra-urban territory by projects aiming at the revival and competitive repositioning of historical centres, at the creation of local services districts, channeled by the activation of public/private structures of coordinated management of large, medium and small-size retail vacancies.

Ilaria Mariotti and Chiara Tagliaro in *Flexible Working Arrangements and New Proximity Dynamics* focus on job-related needs and productive activities as the place from where mobility originates by challenging an acritical adoption of the proximity concept based on the prevalence of the 'first place' (residences) and bringing the 'second place', and the 'third place' at the centre of the debate. The chapter problematizes potential new forms of exclusion for specific population groups generated by flexible work arrangements, and questions some of the traditional metrics for measuring proximity by reflecting on the concept of hybridity.

About the scale of proximity, Luca Velo reflects on *how can proximity be applied in periurban and rural areas* featuring low population density, characterized by mixed uses and often located in not fully flat territories. Moving to the perspective of ecological transition, the contribution discusses a more articulated design challenge than readily defining the specialized space for the pedestrian, cyclist, or those who practice forms of micro-mobility, needed in contexts where active mobility can be a field of technological and social innovation for reaching the EU carbon neutrality goals.

Finally, in the conclusions Paola Pucci and Giovanni Vecchio reflect on the features that strategies for the promotion of proximity should take into account, discussing issues that both the current academic debate and the chapters in this book discuss. These elements, referring to the *what, who, where, when, why and how of proximity*, consider the power of this concept but also the importance of knowing to what extent it can transform existing urban settings at different scales. The chapter—and the

book as a whole—do not discard the importance of proximity, but intend to critically address it taking into account the several dimensions that compose it, and to explore the several dimensions required to put it into practice.

Paola Pucci
paola.pucci@polimi.it

Giovanni Vecchio
giovanni.vecchio@uc.cl

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Contents

Operationalising Accessibility by Proximity: Empirical Approaches

Proximity for Whom? Accessibility in an Unequal, Ageing City

Giovanni Vecchio

Abstract Proximity is a central concept in the contemporary urban planning debate on making cities more sustainable, but it often overlooks the diversity of the cities and their inhabitants. In different urban settings, the meaning of proximity and the possibility of implementing it may widely change. Moreover, different individuals have different accessibility needs and possibilities depending on manifold demographic, socio-economic and health features. The chapter discusses the multiple meanings and dimensions associated with the proximity concept by examining accessibility-by-proximity and demographic ageing in Santiago de Chile, an unequal Latin American metropolis. The chapter examines the potential that Santiago's ageing neighbourhoods have for promoting proximity locally, also considering the quality of the public space through which urban inhabitants move to access close opportunities. While the concept of proximity can reorient urban and transport planning towards more environmentally sustainable outcomes, the elements discussed in the chapter highlight the social justice issues that may limit the positive impact of proximity for different population groups.

Keywords Proximity · Accessibility · Neighbourhoods · Older people · Sufficiency

1 Introduction

Demographic ageing is a global phenomenon that poses significant challenges for cities and their mobility. Older people, who currently represent 13.5% of the world's population, will rise to 21.4% as early as 2050, with a demographic trend that already

G. Vecchio (✉)
Instituto de Estudios Urbanos y Territoriales, Pontificia Universidad Católica de Chile, Santiago, Chile
e-mail: giovanni.vecchio@uc.cl

Centro de Desarrollo Urbano Sustentable (CEDEUS), Pontificia Universidad Católica de Chile, Santiago, Chile

P. Pucci and G. Vecchio (eds.), *Questioning Proximity—Opportunities and Challenges for Urban Planning and Mobility Policies*, PoliMI SpringerBriefs,
https://doi.org/10.1007/978-3-031-66071-9_1

particularly (but not exclusively) affects countries in the Global North [29]. Ageing raises the need to adapt existing urban environments to the needs of an increasingly ageing population [4, 7, 8]. Ageing in place, defined as "remaining living in the community, with some level of independence, rather than in a nursing home" (Davey et al. 2004, p. 133, in [36]), is one of the most relevant policy strategies to adapt existing urban environments and ensure quality of life for older people [19, 37]. Older people prefer to age in "their" place: this possibility facilitates maintaining an independent life and preserving one's support networks [5].

From an urban mobility perspective, proximity can be crucial for ageing in place. Staying in one's own community facilitates older people's access to infrastructure, facilities and services [10] and participation in personal social networks and community activities [4]. The ability to move around and access services, participate in social activities and remain autonomous thus becomes central to older people's quality of life, but is subject to increasing age-related limitations and is affected differently by gender and individual socio-economic conditions [3, 12, 20, 21]. Older people have a specific experience of urban spaces [22] since physical and cognitive capacities for movement change throughout life and decrease in ageing populations [27]. Therefore, being mobile and accessing proximity services are crucial to ageing well in place. However, not all places have the same potential to promote ageing in place through accessibility-by-proximity.

The chapter examines accessibility-by-proximity and demographic ageing, discussing the multiple meanings and dimensions associated with the proximity concept. The analysis focuses on the ageing neighbourhoods of Santiago de Chile: the city is a representative case of other unequal metropolises in Latin America, where the population is ageing rapidly [30] and a market logic dominates urban development patterns [9]. After presenting the methodology of the study, the chapter examines the potential that neighbourhoods have for promoting accessibility-by-proximity (Sect. 3) and assessing the quality of the public space through which urban inhabitants have to move in order to access close opportunities (Sect. 4), concluding with a discussion of the challenges for the promotion of accessibility-by-proximity in ageing urban settings (Sect. 5).

2 Methodology

The analysis of the relationship between accessibility-by-proximity and demographic ageing starts by identifying the neighbourhoods with the highest concentration of older people in Santiago de Chile. A hierarchical analysis is performed on data from the latest Chilean census (2017) available at the block and census tract level (being this the closest unit to the neighbourhood scale), considering demographic (percentage of older people), socio-economic (percentage of people who completed secondary education, considered as a proxy of their socio-economic level) and spatial (distance to the city centre, where most economic activities and services used to be concentrated) variables. The analysis allows to define clusters of areas with similar

population characteristics. In general, the results show the existence of a pericentral ring in which high percentages of the older population are concentrated, with a pattern that differs from the distribution of the socio-economic groups of the population. Within this area, the first quartile of blocks with the highest presence of people aged 65 and over are chosen. Thus, out of the 1649 census tracts in Santiago, 395 are selected.

Then, the analysis assesses the accessibility-by-proximity levels of ageing neighbourhoods in the city. For this purpose, for each neighbourhood, the Walskcore score is estimated, which takes into account the level of walkability of a neighbourhood by attributing a score from 0 to 100 [26]. The score considers how many services and facilities are available to people within a certain radius (defined considering travel time and mode of transport used). Then, it weighs the available opportunities according to their importance (as defined in a preference survey involving local inhabitants), the number of opportunities available and the distance needed to access them. Nine services and facilities are considered, including commercial activities, parks, and educational establishments. In the case of the analysis proposed here, a service or facility is accessible if an older person can reach it by walking for 10 min at a speed of 2.5 km/h (based on [34]). The scores thus obtained are evaluated by taking into account the possibility of accessing a sufficient number of basic opportunities, adopting the sufficiency view that has been consolidating in the debate on transport, accessibility and equity [17, 18, 31]. In this case, a score of 80 is the sufficiency threshold, below which a person does not have adequate access to proximity opportunities. Although the original Walkscore definition defines *walkers' paradise* as those areas with a score greater than or equal to 90, in this case, considering the profound inequalities of Santiago and the differences with contexts with higher levels of urban density, a neighbourhood is considered to have sufficient level of access if its Walkscore is greater than or equal to 80. In each of the examined neighbourhoods, the housing typologies and the age of the neighbourhood contributed to the identification of recurring features and issues of the public spaces through which older people are expected to move.

3 Accessibility-By-Proximity in Ageing Neighbourhoods

Accessibility-by-proximity highlights significant differences among ageing neighbourhoods in Santiago de Chile, which do not seem to fully respond to the city's traditional segregation patterns. According to the Walkscore results, only one-third of the analysed areas have good walking access to local opportunities. Out of 10,465 blocks that are part of the neighbourhoods with the most elderly inhabitants, 33.2% have a score of 80 or more. In contrast, the remaining 66.8% have insufficient levels of accessibility-by-proximity. The distribution of areas with good levels of accessibility-by-proximity shows a clear concentration in the city's eastern sector, the high-income cone of Santiago (Fig. 1). Neighbourhoods with a high presence of older people in the eastern municipalities of Providencia, Las Condes, Vitacura and Ñuñoa tend to

show positive scores; to these are added the historical nuclei of former rural villages that ended up being included in Greater Santiago (such as Maipú and San Bernardo) and some more recently formed centralities. In addition to these areas, there are other zones with positive scores distributed in a more fragmented manner throughout the city. On the other hand, areas with insufficient levels of accessibility-by-proximity are found throughout the peri-central area of Santiago and mainly within the Américo Vespucio ring road. In addition to these areas, there are affluent peripheral areas, such as in the eastern municipalities of La Reina, Las Condes and Lo Barnechea. The differences between neighbourhoods in relation to access to basic opportunities show that not only affluent areas, but also historical settlements and other scattered areas provide to older people the possibility to access basic opportunities, without depending on other areas of the city [1].

The levels of accessibility-by-proximity are not related to the built environment features of the examined neighbourhoods (see Vecchio and Cantallopts [33]). In Santiago, most ageing neighbourhoods are residential areas with a high presence of single family homes, most of which were built between the 1960s and 1980s (Fig. 2). The housing typologies and their age, here shown according to periods of the Chilean history (before, during and after the dictatorship), greatly affect the density of the neighbourhoods and the emphasis on public or private spaces. Considering the

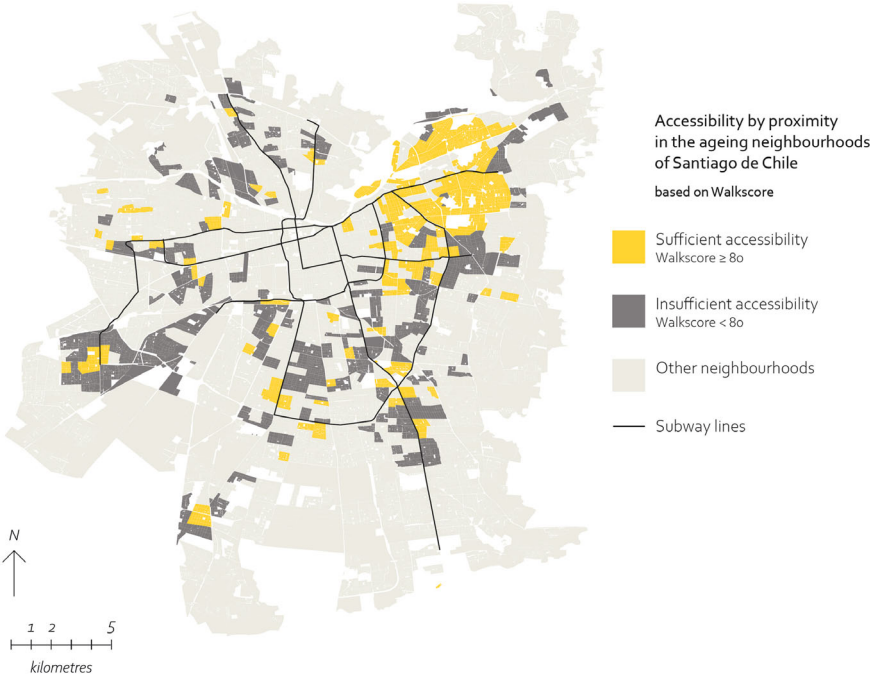

Fig. 1 Accessibility-by-proximity in the ageing neighbourhoods of Santiago de Chile. *Source* own elaboration

prevalent housing typology and the age of the neighbourhood, there is a balanced presence of neighbourhoods that meet or fall below the sufficiency thresholds associated with accessibility-by-proximity. Although higher densities are associated with a greater mix of land uses and, potentially, a greater availability of opportunities at the local level, no significant differences exist between the typologies identified. Neighbourhoods that share similar percentages of single-family dwellings may have different levels of accessibility-by-proximity. Similar dynamics are observed taking into account the age of the neighbourhoods, as more consolidated areas do not present significant differences compared to more recent areas. The absence of differences somehow confirms the reading of other studies that, based on different concepts and indicators, have assessed the levels of accessibility-by-proximity in Santiago, focusing on the older population [28]. Although there is no clear relationship between urban form and accessibility-by-proximity, differences in the opportunities available at the neighbourhood level are evident, showing that older people may be forced to leave their home neighbourhood to access basic services and facilities.

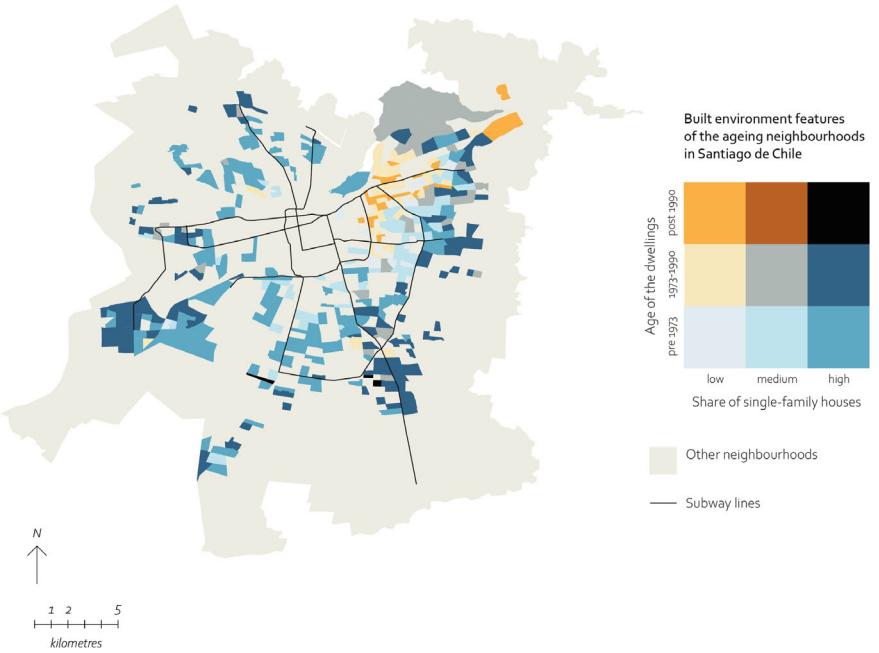

Fig. 2 Built environment features of ageing neighbourhoods in Santiago de Chile. *Source* own elaboration based on Vecchio and Cantallopts [33]

4 The Spaces of Proximity

The built environment of the examined neighbourhoods also influences the characteristics of mobility spaces and, therefore, the experience of movement. The possibility to access local opportunities depends not only on the availability of services and facilities within a distance that can be covered in a short time but also on the quality of the spaces through which one has to move, especially for those who move on foot. These elements are even more relevant in the case of older people, considering that their health conditions often reduce their ability to walk, and the poor quality of public spaces is a potential barrier to their mobility.

The morphological characteristics prevalent in ageing neighbourhoods in Santiago may positively condition older people's walking trips. Considering the results of other studies in Santiago de Chile that have investigated the elements that encourage older people to walk [14, 13], neighbourhoods with low densities and a high presence of single-family houses could motivate older people to walk. These are quiet neighbourhoods with limited flow of people on the streets, reducing potential conflicts of older people with other street users. In addition, the presence of low-rise buildings, with single-family houses that often have their own garden, is associated with feelings of well-being in those who walk, making for a pleasant walking experience. At the same time, the prevalence of low-density locations with a significant presence of single-family dwellings can also have negative consequences. In contrast to areas where residential densification processes have also allowed for the renewal of sidewalks [14], street space—and mainly pavements—may not be well maintained. The low building height and the different presence of vegetation can lead to a lack of shade—especially in comparison to places with higher buildings. In the case of high temperatures, the shade shortage can considerably affect pedestrians' thermal comfort, especially older people. In addition, low densities can shape neighbourhoods with a higher presence of older people as almost exclusively residential areas, where the lack of other activities reduces accessibility-by-proximity and increases the feeling of monotony when moving around in very homogeneous places.

Considering mobility spaces in ageing neighbourhoods, at least two critical issues emerge. The first has to do with the maintenance of existing spaces. The quality of public space is one of the elements recurrently mentioned by older people when describing their walking experiences. It is also one of the most challenging elements for municipal institutions to address. A clear example is the indicator that the Chilean System of Urban Development Indicators and Standards dedicates to the percentage of blocks with pavements of good pavement quality [16]. No municipality in Santiago meets the ambitious standard of 100% of pavements in good condition. The municipality that comes closest to this value is Las Condes (77.15%), while the furthest away is Pedro Aguirre Cerda (7.37%). This cross-cutting problem does not necessarily depend on the resources available to each municipality. In Vitacura, the municipality with the highest municipal budget per inhabitant, only 35.18% of the pavements are in good condition. In contrast, in Cerro Navia, the municipality with the lowest budget, the percentage is 28.76%. Faced with an ageing population and increasing mobility

barriers, the maintenance of public space is a priority that municipal institutions cannot always deal with.

The second issue is the adaptation of mobility spaces to climate change. In central Chile, temperatures are expected to rise between 0.5 and 1.5 °C by 2040 and between 3.5 and 5 °C by 2100 [24]. Santiago must face the significant presence of heat islands, mainly affecting middle and low-income inhabitants [25]. Faced with rising temperatures, most of the analysed neighbourhoods potentially need to ensure shade and lower temperatures for walkers, considering the absence of high-rise buildings to provide shade and the uneven presence of street trees. In addition, rising temperatures would not affect the different neighbourhoods with more older people in the same way. In Santiago, the neighbourhoods with the highest maximum temperatures are in the western part of the city, and often, these are also the neighbourhoods with the greatest thermal amplitude. The expected rise in temperatures will affect the neighbourhoods with the most older people in Santiago differently and significantly impact poorer areas. The importance of the effects of climate change and the greater impact on the most disadvantaged older people raise the need to define strategies that privilege the most disadvantaged groups when thinking about the adaptation of the city and its mobility spaces.

5 Conclusions

Accessibility-by-proximity is a critical factor in ensuring the autonomy of older people and, in rapidly ageing contexts, can guide the adaptation of cities and their mobility spaces. In Santiago de Chile, ageing neighbourhoods show different characteristics: on the one hand, only part of them guarantee sufficient levels of pedestrian access to local opportunities; on the other hand, their built environment determines the existence of different mobility spaces, shaping differently the experience of older people moving through different neighbourhoods of the city. Although the analysis focuses on Santiago de Chile and its ageing neighbourhoods, the work may also be relevant to other contexts where the presence of older people is increasing. Both accessibility-by-proximity and built environment features can be examined in other settings and translated into planning and public policy guidelines. It is possible to identify not only places that require an improvement in the levels of accessibility available to their inhabitants but also areas that need interventions in public space to improve the mobility experience of older people and facilitate adaptation to new climatic conditions. In addition, the analysis reveals at least three major challenges for adapting mobility spaces in the face of a rapidly ageing population.

The first challenge concerns the unequal distribution of opportunities at the local level. Inequality is a problem common to most Latin American cities, where urban growth trends have generated unequal mobility and accessibility patterns for their inhabitants [6, 32]. Although a person's ageing is not necessarily associated with a reduction in their activity space, in the case of individuals who move less or over shorter distances, different levels of accessibility-by-proximity may more strongly

affect their ability to access services and facilities autonomously. Two antithetical but equally problematic strategies can guarantee access to relevant opportunities. On the one hand, one could promote introducing services at the local level to increase levels of accessibility-by-proximity. To do so would require more planning by public institutions and adequate incentives for the market. However, in the Chilean context—where planning has traditionally been weak and effective mechanisms to promote balanced growth in metropolitan contexts have been lacking [35]—the risk is that this is a voluntarist strategy difficult to implement. It can be argued that the Chilean state has followed this strategy, increasing the coverage of public transport infrastructure and introducing fare reductions for older people. While these measures potentially benefit a good part of the older population [34], they do not address the city's structural inequalities and do not promote accessibility at the local scale. The existence of disparities between areas and inhabitants of the same city is not a new problem, especially in Latin America. However, it requires urban planning to adopt effective tools and coordinate the actions of different urban actors in a multi-scale manner.

The second challenge relates to the characteristics of the city's public spaces. As mentioned, accessibility-by-proximity depends on the availability of sufficient opportunities within limited distances and the mobility experience needed to reach different places. Analysing urban morphology is the first step to considering the different mobility experiences generated in different neighbourhoods, as evidenced by the extensive literature on walkability. These characteristics become even more relevant for older people, considering the accessibility barriers they face and the need for safe spaces that avoid the risk of accidents and allow them to move at reduced speeds. In addition, it is necessary to consider the subjective dimensions associated with the experience of moving in neighbourhoods with different mobility spaces. On the one hand, climate change and, in particular, rising temperatures can impact neighbourhoods differently. Shade cast by trees or high-rise buildings alone can generate different mobility experiences when moving around in high temperatures. On the other hand, the perceived safety in the neighbourhoods can affect not only the experience of mobility but can even condition the decision to leave the house to go somewhere else [2, 11, 23]. The possibility of remaining autonomous depends not only on easily accessible opportunities but also on the absence of elements that discourage movement, whether due to fear of criminality or the risks associated with high temperatures.

The third challenge is the double ageing of cities, where the obsolescence of public spaces and buildings compounds demographic ageing. Double ageing is a phenomenon observed in countries with a high presence of older people, such as Japan [15]. The ageing of buildings is compounded by the need to adapt their spaces to guarantee universal accessibility, increasing the interventions required in these spaces. At the same time, the reduced economic resources of the people who should be financing the renovation of these spaces is yet another aspect of the residential risk faced by the older population (Lebrusán 2022). In addition, the reduced autonomy of older people means that contexts with higher density—and greater proximity to other people—guarantee the support networks that are not available in neighbourhoods with single-family dwellings. These challenges appear particularly relevant

in the case of Santiago de Chile, considering the age of ageing neighbourhoods and the prevalence of older people living in single-family houses (although other family members may be living under the same roof, as shown by the phenomenon of *allegamiento*—doubled-up housing). The double ageing of the city's spaces and its inhabitants shows the need for non-incremental interventions that, by renewing the city's spaces, also contribute to strengthening its community.

In conclusion, demographic ageing poses substantial challenges for cities and their mobility spaces, showing that accessibility-by-proximity is a potentially relevant criterion for analysing the functioning of these contexts and guiding their adaptation to a changing socio-environmental context. The proposed analysis is a first approach to the implications that ageing may have for mobility spaces; the inclusion of other city neighbourhoods, the application of the same criteria to other cities and the analysis of mobility practices carried out by older people are all necessary elements to better understand the relationship between accessibility-by-proximity and demographic ageing. The analytical criteria allow us to identify typologies of neighbourhoods and spaces in which different urban planning and public space design tools can propose differentiated strategies for their adaptation. Cities are facing a demographic ageing population in a climate crisis, so it is essential to understand how the spaces we inhabit and in which we move could and should change, to adapt them in the face of profound socio-environmental transformations without leaving anyone behind.

Acknowledgements The author acknowledges the support of ANID (Fondecyt/11220220) and Cedeus—Centro de Desarrollo Urbano Sustentable (ANID/Fondap/1523A0004).

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Critical Issues in Operationalizing the x-minute City

Luca Staricco

Abstract The COVID-19 pandemic made evident the need for a minimum set of proximity-based services accessible by active travel. Since then, the concept of the x-minute city has received increasing attention in planning practices and academic literature. In many respects, the x-minute city can be traced back to previous planning concepts such as the neighbourhood unit, the pedestrian pocket, the superblock etc. However, many theoretical and methodological questions for its implementation are still to be solved. The chapter presents a methodology to operationalize the x-minute city concept, intending to show which parts of the city and what percentage of its population can walk to a location of a given service within three-time thresholds (5, 10 and 15 min). The Italian city of Turin is used as a case study to test this methodology. The results show that at least in dense cities such as the case study, the "classic" 15-min threshold is not necessarily the most appropriate target, as it is already attained for many services by the majority of the population. Moreover, the accessibility levels to services are significantly determined by the number and spatial distribution of the locations of these services. Finally, operational research on accessibility measures and indicators developed in the field of regional sciences from the second half of the last century can help to complexify the operationalization of the x-minute city concept.

Keywords x-minute city · Accessibility · Proximity · Neighbourhood services · Isochrones · Indicators

L. Staricco (✉)
Interuniversity Department of Regional and Urban Studies and Planning, Politecnico di Torino, Turin, Italy
e-mail: luca.staricco@polito.it

P. Pucci and G. Vecchio (eds.), *Questioning Proximity—Opportunities and Challenges for Urban Planning and Mobility Policies*, PoliMI SpringerBriefs,
https://doi.org/10.1007/978-3-031-66071-9_2

1 Operationalizing the x-minute City Concept

The *x-minute city* can be considered a general concept, which refers to a *city* (or a part of it) whose residents can access the most essential activities within a certain travel time (*x minutes*). It couples the spatial and temporal dimensions according to the philosophy of "chrono-urbanism", which assumes the quality of urban life as inversely proportional to the amount of time used for moving [22]. Many specifications of this general concept have been elaborated, the most famous one is the *15-min city* proposed by Carlos Moreno, which is centred on accessibility *by proximity*, i.e. the possibility of reaching the main local services within 15 min by walking or cycling [2].

Many authors have put in evidence how the x-minute city concept based on active mobility is mainly a re-interpretation of earlier planning ideas and models: Howard's Garden City [15], the neighbourhood unit by Clarence Perry [3, 19], the Central place theory by Walter Christaller [23], the urban vitality approaches by Jane Jacobs [12], the geography of time by Torsten Hägerstrand [12], the human-scale urban design by Christopher Alexander and Jan Gehl [22], the pedestrian pocket proposed by Peter Calthorpe in the Transit-oriented development approach [1], the principles of New Urbanism and Smart Growth [8].

Despite being so rooted in history, when used in practice the x-minute city concept is often reduced to mere political slogans, city branding devices or general advocations for planning principles such as walkability, density, mixed uses etc., with little measurability or benchmarks [11, 15]. Even in the academic literature, some theoretical and methodological questions remain to be fully discussed [12], concerning dimensions of the concept such as spatial scales (neighbourhood/city), travel means (walking, cycling, public transport, car), time thresholds and activities to be accessed.

As for the spatial scales, the most used are the neighbourhood and the city, associated with the chosen time threshold: e.g., 20-min neighbourhood or 20-min city. In the case of the neighbourhood, the focus is on the proximity to local functions within each neighbourhood. When the city is directly referred to, the emphasis is on the proximity to local functions throughout the whole city [23].

As regards transport modes used for accessing the services, walking is regularly examined, as it is at the core of the x-minute city concept. A lot of articles propose indicators and indexes of walkability [10, 14, 17] or bike-ability [21] to assess accessibility to neighbourhood facilities by active mobility. Some authors [24, 25] suggest considering also public transport if accessibility to job opportunities is pursued. A comparison between 20-min accessibility levels by different transport means was developed in the case of Tempe, Arizona [9]: walking, cycling and transit.

The time thresholds range generally from 5 min (proposed by New Urbanism for the neighbourhood) to 30 min (for metropolitan-level accessibility to strategic job and service centres in Sidney) [11]. However, the thresholds most commonly used are 15 (preferred by denser European and Asian cities) and 20 min (generally assumed by low-density suburban areas of American and Australian cities). In most cases, the chosen time threshold is neither theoretically nor empirically justified and

is often the same for different mobility modes (walking, cycling, public transport etc., notwithstanding their very different speed).

Finally, the urban social functions to be accessed within the set time threshold vary greatly depending on the case, even if certain wide categories of services (education, healthcare, commerce and entertainment) are dominant [8]. Some authors recommend to include also job opportunities among the destinations that have to be reachable in 15 min, directly [22] or through accessibility to public transport stops, since buses, trains etc. are essential to reach job and education opportunities [18, 30]. However, poor attention is devoted to the number and spatial distribution of the locations of services [27].

All these issues question the concept of proximity. Can proximity be conceived as accessibility by active mobility? In which cases is a local service considered "accessible by proximity"? What is the time threshold beyond which proximity becomes ineffective compared to accessibility by motorized transport means? Which (walking or cycling) speed correlates with the temporal and spatial dimensions of proximity for different actors? Is proximity a neighbourhood or an urban feature?

That said, this chapter aims to present a methodology to operationalise the concept of the x-minute city, showing which parts of the city and which percentage of its population can access by walking to a location of a certain service within given time thresholds. The application of this methodology to the case study of the Italian city of Turin is used as an opportunity to examine in more depth some of the above-mentioned critical issues, such as the time thresholds and the kind, number and spatial distribution of services.

2 Case Study and Methodology

2.1 Case Study

Turin, the fourth most populated Italian city (about 864,000 residents on 130 km^2), located in the north-western part of the country, was chosen as an appropriate case study for a couple of reasons.

First, Turin has accommodated the headquarters and the main manufacturing plants of the FIAT car company (which merged with Chrysler into FCA in 2014 and recently with PSA into Stellantis) since its foundation in 1899. The dominant role of this automotive company has left a legacy of heavy car dependence. Turin has one of the highest rates of car ownership in Europe (over 650 cars for every 1,000 inhabitants). Private motorized mobility has a modal share of 39% at the city level and 62% at the metropolitan level (only 4 out of the 29 cities monitored by the European Metropolitan Transport Authorities have a higher rate); the shares of public transport and cycling are just 24.3% and 3%.

Second, nearly 90% of the city's residential buildings were built before 1971, so their development was poorly coordinated with the spatial distribution of local

services; as a matter of fact, only in 1968 a national law (n. 1444) set for the first time in Italy a minimum amount of local public services to be provided in newly built urban areas.

For these reasons—the dominant role that automobility keeps playing in the daily lives of the city's residents compared to active mobility, and the historical growth of most of the urban fabric without coordination with local services – Turin can be an interesting opportunity to "stress test" the x-minute city strategy.

2.2 Methodology

The proposed methodology is articulated in 4 steps.

First of all, the city is partitioned into zones, which are the origins of the trips made by residents from their homes to access the services. The more appropriate partition was identified in the 3,851 census tracts of Turin (Fig. 1), which generally correspond to the blocks of the city. These tracts have an average area of 33,766 m^2 and an average number of residents of 253.

Second, the services for which accessibility was to be calculated were selected, based on an analysis of the literature about the x-minute city (in particular, [3, 15, 22, 23]), their availability at the neighbourhood scale and the possibility to georeference their spatial locations. Twenty types of services ended up being taken into account, belonging to three main categories (education, health and social services, and entertainment; Table 1). They have very different numbers of locations ranging from 12 for neighbourhood health centres to 451 for sports facilities. These locations were georeferenced as points at the address of the service entrance; open-air markets[1] and green areas were georeferenced as polygons, since in Turin they are not fenced and do not have limited entry points.

Third, for each census tract it was identified the part of the city that the residents of the tract could reach through a 5, 10 and 15 min' walk from the barycentre of the tract (Fig. 2). No surveys were available about the current (or desired) average travel times to access the twenty kinds of services in the case of Turin; therefore, the three adopted time thresholds were chosen based on the high density and walkability levels in Turin, which let us suppose that most services were accessible by foot in less than 15 min. The free HQgis Python plugin for QGis by the HERE Routing API was used to draw the isochrones, setting an average walking speed of 4,8 km/h (consistent with the one used in walkability studies which equates a 5-min walk to 400 m; [4, 28]). The 5-, 10- and 15-min isochrones calculated along the street network were found to have an average area of 0.24, 0.95 and 2.15 km^2 respectively; they cover 47–48% of perfectly isotropic circles having the same radius of 5, 10 and 15 min (i.e., 400 m, 800 m and 1,200 m).

[1] Among commercial services, only open-air markets have been taken into account, since food shops, restaurants and cafés are so widespread that 95% of Turin's inhabitants can already access them by a 5 minutes' walk.

Fig. 1 The city of Turin partitioned in census tracts

Table 1 Number of the locations of the twenty services

	Locations		Locations		Locations
Education		*Health and social services*		*Entertainment*	
Nurseries	120	Neighbourh. health centres	12	Green areas	234
Kindergartens	218	Counselling centres	37	Playgrounds	285
Elementary schools	144	Social care services	151	Playrooms	30
Middle schools	87	Registry offices	15	Sports facilities	451
Secondary schools	162	Post offices	78	Libraries	20
		Police stations	25	Theatres	28
		Churches	174	Cinemas	26
		Open-air markets	42		

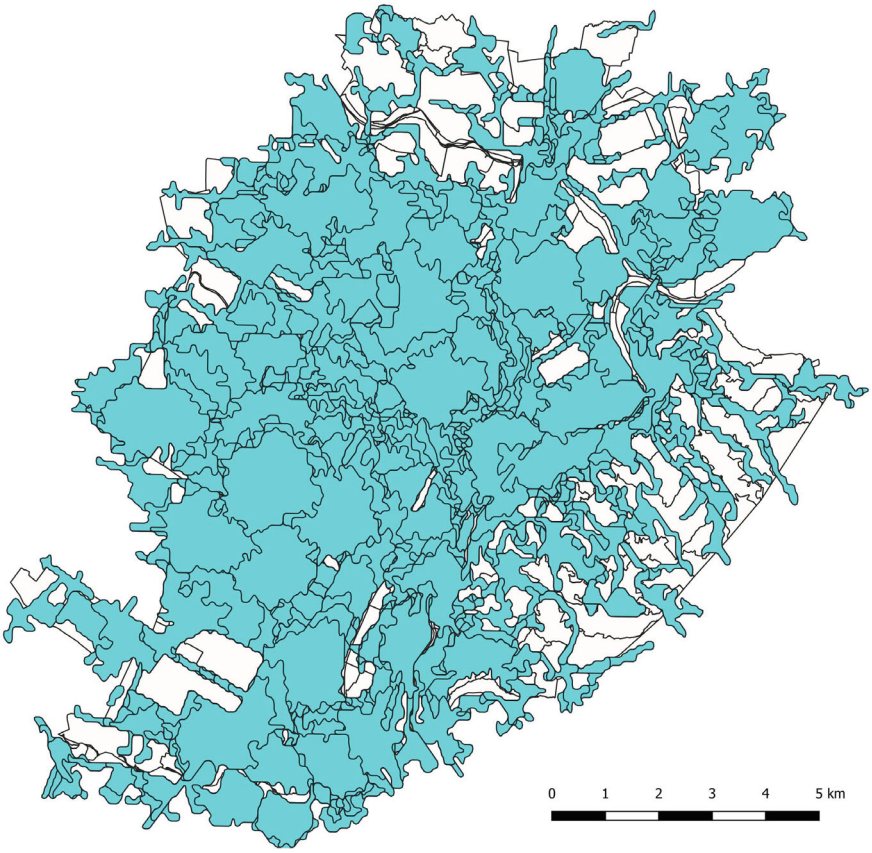

Fig. 2 The 15-min isochrones

Finally, for each census tract and each of the twenty services, the number of locations of that service included in the isochrone from that census tract was calculated for the three walking thresholds (5, 10 and 15 min). In this way, it was verified if the residents in each census tract had access to at least one location of a specific service (being it inside the census tract where they live or inside another one) within the three-time thresholds. The number of the residents of all the tracts having access to at least one location of the service was summed up; so, it was calculated the percentage of Turin's population that had access to that service within a certain time.

3 Results and Discussion

3.1 How Many Residents Can Access One or More Locations of Each Service?

As shown in Table 2, the percentage of Turin's residents that can access one or more locations of each service varies greatly not only depending on the time threshold considered but also from service to service. For example, 66.4% of the residents can walk to a green area in 5 min, but only 2.8% can reach a neighbourhood health centre at the same time.

On the whole, 29.2% of the inhabitants can averagely walk to services in 5 min; 61.8% in 10 min and 77.7% in 15 min. Among the three categories of services, education is the most accessible: at least 25.5% of the population can access one location for each of the five school degrees in 5 min, 65.4% in 10 min and nearly

Table 2 Percentages of residents who can access one or more locations of a service through a 5, 10 or 15 min' walk

	5 m			10 m			15 m		
Accessible locations	1	>1	≥1	1	>1	≥1	1	>1	1
Nurseries	25.5	9.5	35.0	29.8	48.8	78.6	11.2	81.4	92.6
Kindergartens	35.6	22.0	57.6	12.5	81.3	93.8	2.2	96.7	98.9
Elementary schools	39.6	8.8	48.4	25.2	66.5	91.8	6.6	91.8	98.4
Middle schools	30.8	3.0	33.9	38.0	43.6	81.6	14.8	81.1	95.8
Secondary schools	10.0	15.4	25.5	14.4	51.1	65.4	8.9	79.8	88.8
Neighbourhood health centres	2.8	0.5	3.3	15.8	1.4	17.1	34.1	3.9	38.0
Counselling centres	4.2	4.5	8.7	14.6	20.3	34.9	17.8	44.8	62.7
Social care services	14.2	13.1	27.4	23.4	47.3	70.7	8.6	79.8	88.4
Registry offices	5.8	0.0	5.8	22.4	1.1	23.5	39.9	5.7	45.6
Post offices	29.9	2.2	32.1	47.5	33.3	80.8	19.8	75.2	95.1
Police stations	5.2	5.1	10.3	14.9	20.5	35.4	19.9	42.9	62.9
Churches	37.2	9.4	46.6	32.0	60.8	92.8	7.8	91.0	98.8
Open-air markets			33.2			73.7			90.7
Green areas			66.4			95.8			99.1
Playgrounds	37.5	24.9	62.5	11.9	83.4	95.2	3.2	95.9	99.1
Playrooms	6.7	2.2	8.8	16.3	11.1	27.5	21.8	26.2	48.0
Sports facilities	23.5	28.6	52.1	10.9	80.8	91.7	2.1	96.1	98.3
Libraries	6.4	0.1	6.4	26.3	1.1	27.4	41.9	8.9	50.8
Theatres	9.7	0.6	10.3	22.8	6.7	29.5	35.0	19.9	54.8
Cinemas	7.9	1.6	9.5	22.5	5.2	27.7	33.9	14.0	47.8
Mean value	21.6	8.4	29.2	28.5	36.9	61.8	26.0	57.5	77.7

90% in 15 min. As regards health and social services, only 38% of the inhabitants can walk to a neighbourhood health centre in 15 min; post offices and churches can generally be reached in 10 min; social care services and open-air markets are available to about 90% of the residents through a 15 min' walk. Focusing on entertainment, over 50% of the residents can walk in 5 min to green areas, playgrounds and sports facilities, and nearly 100% in 15 min; on the contrary, cultural services such as libraries, theatres and cinemas are poorly accessible, as they can be reached by about 50% of the residents even in 15 min.

In Fig. 3 the cumulative percentage of Turin's residents that can access at least a certain number of different services within the three time threshold is represented. Overall, a maximum of fourteen types of services can be reached through a 5 min' walk, and only by 0.1% of the residents. Within this time, 9.5% of the population can access at least ten different services, 63.9% five services, and 97% at least one service; this means that 3% of the inhabitants cannot access any service at all. Shifting to the 10-min threshold, 84.6% of the inhabitants can reach ten services (95.9% in 15 min), 25.5% fifteen services (71.4% in 15 min); 0.3% of the residents can access a maximum of nineteen services, while in 15 min 0.4% of the inhabitants has access to all twenty services.

According to these results, can the city of Turin be said to conform to the model of the 15-min city? On the one side, it could be said it mostly does, since over 70% of Turin's residents can walk to at least one location for 15 out of the 20 considered kinds of services in 15 min. On the other hand, the answer has probably to be more complex, since—as it was just illustrated—the population that can access at least one location of a given service varies greatly from service to service. Currently, about 90% of Turin's inhabitants can reach schools of all levels, green areas, churches, playgrounds, post offices and sports facilities by walking for 15 min; some of these services can already be accessed by over 90% of residents in just 10 min. Therefore, it is possible

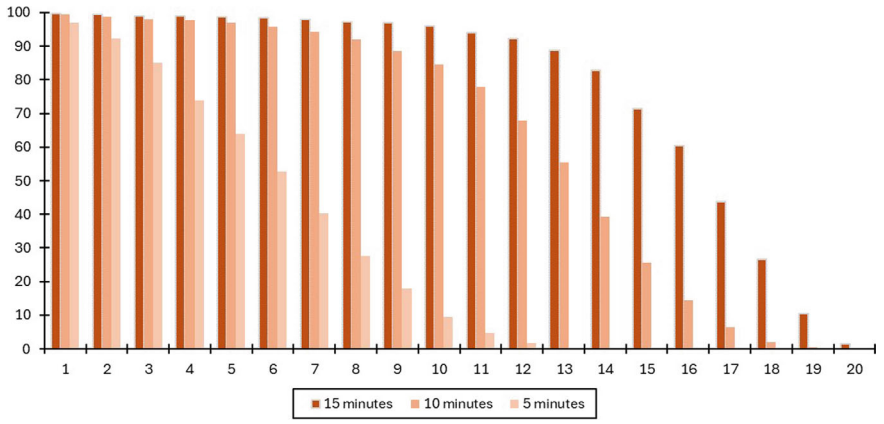

Fig. 3 The percentage of residents (*y-axis*) that can access at least a certain number of different services (*x-axis*) through a 5, 10 or 15-min walk

to assume that the 20-min threshold (often proposed as the target for low-density neighbourhoods) is probably inappropriate for dense cities such as Turin, if not for some services (like neighbourhood health centres, playrooms, registry offices and cinemas in the case study, which are currently accessible in 15 min only to less than 50% residents). In contrast, the 5-min threshold is probably excessively ambitious for most services, even though some (kindergartens, green areas, playgrounds and sports facilities) are already accessible through a 5 min' walk for over 50% of Turin's residents.

This makes it questionable if a unique time threshold is appropriate for all services, or whether different target thresholds for different services should be adopted (for example, 10 min for elementary schools and 15 min for libraries). This flexibility could compromise a key element of the success of this planning concept, i.e. its extreme simplicity; at the same time, it would allow to co-define with residents (through surveys, interviews etc.) maximum "desired" accessibility time thresholds, which can be different for each specific service. As highlighted by Capasso et al. (2020), accessibility is a metric, but what are acceptable parameters of what is considered accessible must be set through policies. For example, [31] showed that old people over 70 consider a 15 min' walk unsuitable for their age.

3.2 Is There Any Relationship Between the Number of Locations of a Certain Service and the Percentage of the Population It Serves?

In the case of most services, Turin's residents can reach more than one location within a given time threshold. For example, nearly half of the population can choose among over ten sports facilities accessible by a 15 min' walk from home; in the same time interval, 40% can walk to more than five different elementary schools and 31.1% to more than five social care services. Conversely, the offer of cultural service is quite low: only 8.7% of the inhabitants can access in 15 min more than one library, 13,9% more than one cinema (but 0.2% up to twelve cinemas), 19.9% more than one theatre (0.16% up to ten theatres) (Fig. 4).

Obviously, the percentage of the population served by a given service tends to increase with the number of its locations, even with some discontinuities. First, in the case of Turin, forty locations seem to be the threshold which allows 15-min accessibility for over 80% of the residents. Second, the current spatial distribution of locations could be rationalised. 151 locations of social care services are accessible in 10 min for 70.7% of the inhabitants, a percentage which is less than the 80.8% ensured by only 78 post offices. Similarly, 218 kindergartens are enough to ensure for all three time thresholds greater accessibility than 451 locations of sports facilities (Fig. 5).

These results suggest that the most appropriate time threshold for accessing services should be identified according not only to the demand side but also to

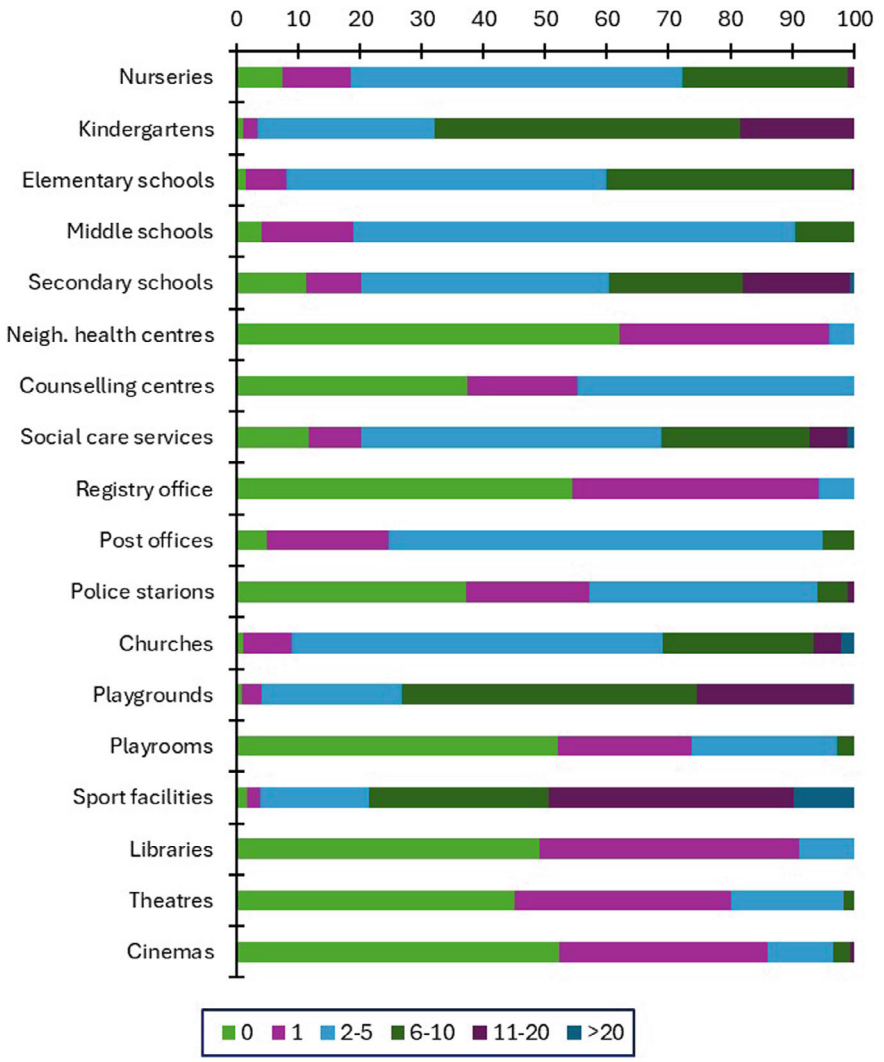

Fig. 4 The percentage of residents (x-*axis*) that can access at least a given number of locations for each service (*y-axis)* through a 15-min walk

the supply side. There is a trade-off between these two sides: for the demand, a high number of locations of service would reduce the time threshold to access them, but this implies the risk of worsening the cost efficiency of the service provision; for the supply, a limited number of locations would allow some economies of scale (in terms of cost reduction for example for water provision, garbage collection, heating etc.), but at risk of reducing the spatial accessibility of these locations for their users.

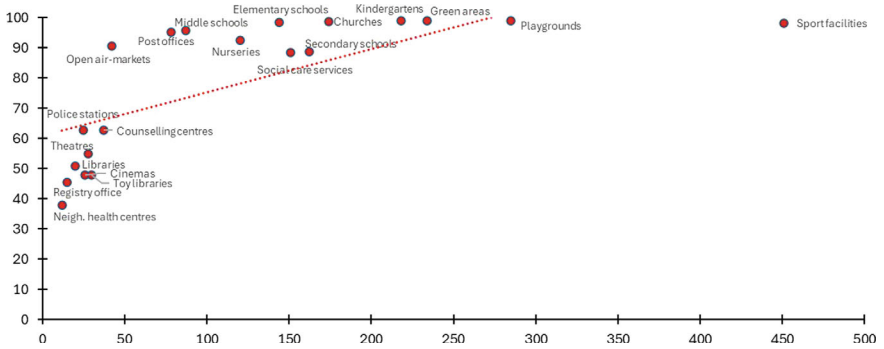

Fig. 5 The relationship between the number of locations of each service *(x-axis)* and the percentage of the residents served by these locations (y-axis) within a 15-min walk

In order to find a balance between the spatial demand and offer of services, accessibility indicators can be a useful tool, as they are well-acknowledged to link land use (i.e. the location and attractiveness of an opportunity, for example, a certain service) and transport variables (i.e. the generalised cost of travelling to reach that opportunity from a certain origin). Whereas most current approaches to implementing the 15-min city concept address mainly the transport variables (e.g., improving walkability), poor attention is generally paid to land use variables, i.e. the number and size of the service locations. Actually, as shown by the results of our analysis of the city of Turin, precisely the number of these locations is crucial in determining the percentage of the population which can access a service within a given time threshold. Moreover, these locations may differ in terms of "attractiveness" (e.g., number of stalls in an open-air market, number of plays in a playground, number of screens or seats in a cinema, books in a library etc.). For the demand, the attractiveness might make a location of a certain service more interesting for residents—even if farther away—than another. For the supply, the attractiveness size can require a minimum number of users/customers to compensate for service operating costs.

In this perspective, cumulative opportunities indicators (which simply sum up the number of locations inside an isochrone, as the ones used in this chapter) could be integrated with classical gravitational indicators. For example, [5, 7] proposed indicators that count for each census tract only service locations accessible within a certain time threshold (for example 15 min), but "weight" each location according to both its attractiveness and the generalized cost of accessing it. More complex indicators of accessibility were elaborated by [6, 13, 15, 26, 29]: they weigh the attractiveness of service locations in relation not only to their size but also to the number of their potential users.

3.3 *Are the 15-Min Accessibility Levels to Services Homogeneously Distributed Throughout the City?*

A final elaboration was aimed at calculating how many (among the twenty taken into account in the chapter) different kinds of services were reachable through a 15 min' walk from each census tract. As shown in Fig. 6, which illustrates the spatial distribution of these accessibility levels throughout the census tracts, the least served parts of the city are the outlying ones (in particular the eastern hilly area), where the census tracts are wider, the locations of service are less widespread and the road network is less dense. In the inner part of the city, there is not any clear gradient from the centre toward the outer areas; a polycentric distribution emerges, with greater accessibility in correspondence to those areas of Turin built before 1945, where the road grid is particularly dense.

The indicators mentioned in Sect. 3.2 can support identifying the optimal balance between the number, size and spatial distribution of service locations (given the spatial distribution of users). Except for private nurseries, theatres and cinemas, the services here considered are public and could probably be redistributed to other

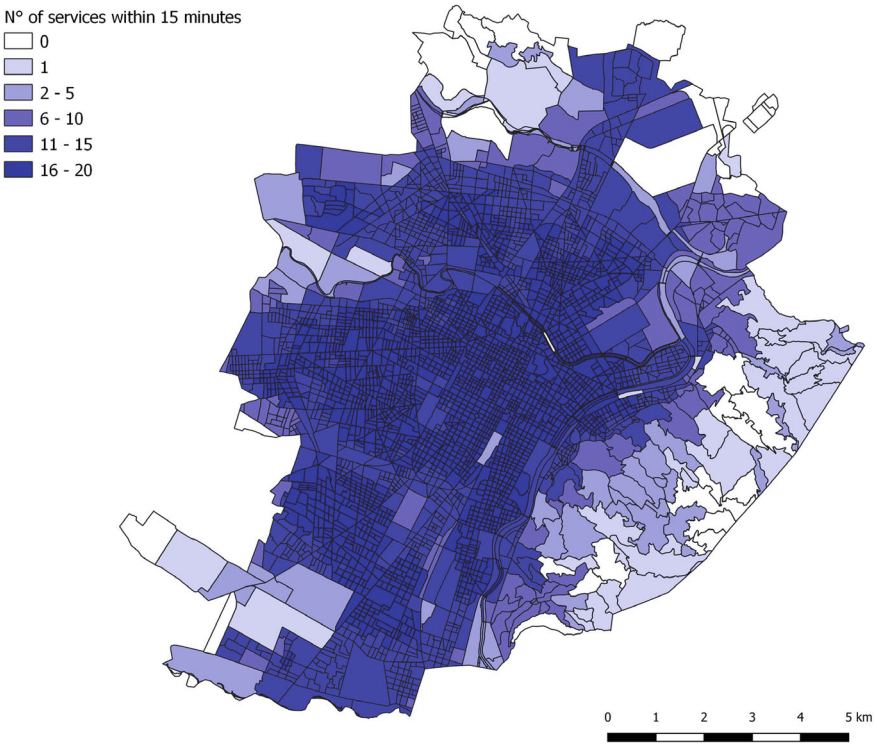

Fig. 6 The number of different services that are accessible from each census tract through a 15-min walk

abandoned areas [3] to serve the residents of the city more homogeneously and evenly.

4 Conclusion

In this chapter, a methodological framework has been proposed to analyse pedestrian accessibility to services in a typical dense and walkable European city such as Turin. Since just one case study has been examined, any claim of exhaustiveness and systematicity must be excluded; moreover, the analysis could be further developed by including other transport means (for example, cycling), more kinds of services, more disaggregated service users (children, the elderly etc.). Nevertheless, some general conclusions can be drawn.

First, the results show that the 15-min threshold cannot be always assumed as the necessarily most appropriate target, since often many services can already be reached by walking even in 10 min by the majority of the residents. Different thresholds can be set in different cities, or even in the same city for different services. Urban actors can be involved to acknowledge which local services are essential, and which time thresholds are acceptable to access each of them.

Second, in many European cities such as Turin, walkability is often already widely assured throughout the city, as nearly all streets have pavements and spaces reserved for pedestrians. The current levels of accessibility to services are significantly determined by other factors, such as the number and spatial distribution of the locations of the services. As anticipated in Sect. 2, this variable is currently given little consideration in the narrative, literature and practices of the x-minute city. In this sense, it could be useful to recover some tools and approaches to complexify the operationalisation of the x-minute city and plan it with reference not only to the demand side but also to the efficiency of the spatial distribution of services and opportunities.

Finally, in the last two decades, some researchers put in evidence that economic, social, and personal factors—behind the two dimensions of land use and transport—influence the actual accessibility (for example, in terms of affordability) of services and opportunities [16, 20]. These factors are often neglected in the x-minute city approach, even if they are crucial in determining the accessibility of those who often cannot use the car, such as children, the elderly, the disabled etc. A major challenge for future academic research on the x-minute city will then be identifying accessibility indicators to operationalise the concept in all its complexity, without compromising the simplicity and communicability of its narrative.

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Quality of the Walkability for Measuring Accessibility. The Case of the Elderly People in the City of Milan

Matteo Colleoni, Luca Daconto, and Simone Caiello

Abstract Walking is a key dimension for well-being in later life both indirectly—e.g. access to opportunities—and directly—e.g. active lifestyle and health. Consistent with these observations, transport, mobility and urban studies have been devoting increasing attention to walkability, which is considered a key contributing factor for reaching a liveable and age-friendly city. Research on walkability generally focused on the spatial features of the environment, taking into account the needs and preferences of an "universal" pedestrian. However, it is crucial to consider the variety of needs, preferences and capacities of individuals as well as the social and subjective factors, which are able to enhance or limit walking behaviours, in particular when taking into account an increased and differentiated population such as the older one. After a review of the literature on the topic, the chapter presents the results of the comparison between an adapted location-based walkability index (Kestens et al. in BMC Geriatr 16:96, 2016)—calculated through a GIS-based spatial analysis and the selections of opportunities of potential interest for older people—and the perceptions about environment's pedestrian friendliness of a sample of 288 over 65 years old residents living in the metropolitan city of Milan—collected through the ALPHA scale (Spittaels et al. in Int J Behav Nutr Phys Act 7:48, 2010). The results show a general assonance between the objective and subjective evaluation and a dissonance, namely in the case of women and oldest-old respondents. In this sense, we argue the need to focus more on the quality of walkability in order to contribute to an age-friendly city for all.

Keywords Walkability · Older people · Accessibility · Milan · Food

M. Colleoni · L. Daconto · S. Caiello (✉)
University of Milano-Bicocca, Milano, Italy
e-mail: simone.caiello@unimib.it

P. Pucci and G. Vecchio (eds.), *Questioning Proximity—Opportunities and Challenges for Urban Planning and Mobility Policies*, PoliMI SpringerBriefs,
https://doi.org/10.1007/978-3-031-66071-9_3

1 Introduction

1.1 Ageing in Contemporary Urban Societies

Population ageing is one of the most important trends in the contemporary world, together with population growth, urbanisation and international migration [49]. To understand the extent of the phenomenon, in 2019 in the global population there were 703 million persons aged 65 years or over and 143 million persons aged 80 years or older. According to the United Nations [49], "there are more older people than children under 5 years […]. By 2050 there will be more than twice as many people above 60 as children under 5". Moreover, "people aged 60 years or over will outnumber adolescents and young people aged 15–24 years" (p. 2). Regarding the single countries, the oldest nation is Japan (28.0% of over 65) followed by Italy (23.0%), Portugal (22.4%), Finland (22.1%), Greece (21.9%), Germany (21.6%) [49].

1.2 Older People's Mobility

In terms of overall mobility, "the current generation of older people is more active than previous generations of equivalent age" ([45], p. 344). Evaluating the number of trips, older people travel less and less far in comparison to younger generations [5, 33]. However, older people travel more and with longer distances in comparison to the equivalent age groups of the past [2, 24].

Concerning temporal attributes, in the Italian context, "on an average weekday, the daily mobility profiles of the elderly are desynchronised, compared to those of the rest of the population, only in the morning. Without significant gender and age differences, the elderly reach their mobility peak between 10:00 and 11:00 am, about two hours later than the rest of the population" (Istat 2008–2009 in [13] p. 127). With regard to travel purposes, it has been found that the greatest amount of time was addressed to leisure time, but also to family care for both younger elders and people over 75 [13]. Overall, older people have been found relying more on the car. However, people over 65 are those who used public transport, walked and cycled the most after people between 14 and 29 years old.

Active mobility implies regular physical activity as a means of transport. As a matter of fact, there is evidence showing that adults who engage in active transport have significantly higher levels of physical activity in comparison to adults who do not [10]. In addition, walking is a form of physical activity of moderate intensity and is the most common one among older populations [48]. For these reasons, many European cities have been promoting active mobility as a way to promote physical activity [18]. Nevertheless, despite its relevance, active mobility seems to be scarce.

1.3 The Need of Walkable and Age-Friendly Urban Environments

After a period in which urban and transport planning placed great emphasis on speed of travel, motorised private transport and, more recently, mass public transport [41], in the field of urban and transport studies, increasing attention is being paid to the walkability and walkability of urban environments, i.e. the possibility of places to be reached, enjoyed, crossed and visited on foot. In fact, numerous studies have highlighted walkability as an important means to increase the quality of life in cities, given its potential role in counteracting car-dependent urban development [27], promoting the health of citizens [19, 21] and increasing accessibility to services and opportunities. This allows the inclusion of the most vulnerable populations [7], the attractiveness and vitality of public spaces [20] and neighbourhood social relations [39].

The promotion of walking is even more central in the context of societies affected by the phenomenon of population ageing. Walking, like other forms of active mobility, is a physical activity that can prevent the onset of diseases and dysfunctions that can limit the autonomy and independence of older people [50]. In addition, walking is also the preferred form of mobility for the elderly, especially for those aged 75 and older [13], i.e. the main means of accessing and enjoying services and opportunities, and thus of participating in society. Intervening on the levels of walkability of urban contexts for elderly populations therefore means contributing to achieving the goal of the age-friendly city [51], i.e. a city able of promoting the well-being and quality of life of elderly populations by adapting "its structure and services to be accessible and inclusive for older people with different needs and capabilities" ([51], p. 1).

Within this framework, the essay presents the results of the 'Food Social Sensor Network—FoodNET' project in which the objective assessment of walkability levels for the elderly was compared with the perceptions of walkability in residential areas of a sample of residents in the city of Milan aged 65 and over to verify the assonance or dissonance between structural and subjective assessments of walkability. The presentation of the methods and results is preceded by a brief review of the relationship between walking, proximity and quality of life of the elderly, the determinants of walkability and the techniques used in the research for its detection.

2 Walkability Role in Elders' Quality of Life: Individual and Objective Drivers

2.1 Active Mobility, Walkability and the Older People's Quality of Life

In older age, mobility is a fundamental element of individuals' well-being and quality of life [3, 31, 35]. In fact, moving allows the elderly to access and enjoy urban opportunities [16], i.e. goods, services, activities, relationships, which allows individuals to satisfy not only basic needs but also the more complex ones associated with the needs for identity, relationships and social inclusion. Moreover, moving can also represent an activity associated with wellbeing in a direct way (e.g. the happiness and pleasure experienced during a walk with significant others in an attractive environment). The health benefits of active mobility are consolidated [10, 11] and linked to lower levels of depression symptoms [11, 28], cognitive and emotional health [11], quality of life [28, 38, 48] and, given that "the wellbeing of the elderly is closely related to the performance of out-of-home activities", subjective wellbeing ([29], p. 2). Furthermore, the possibility of walking outdoor enhances social participation and inclusion creating or fostering social interactions [28, 29, 48].

In general terms, it is well-established that the built environment is related to health [44]. In this respect, studies on the mobility of the elderly [34, 37, 42] have generally highlighted elements such as architectural barriers, height differences, uneven pavements, higher accident rates, the absence of pavements, pedestrian crossings and benches, which, in combination with spatial distribution of opportunities in terms of higher/lower proximity, can turn problems and inabilities of movement into handicaps and thus discourage mobility. Consistent with these observations, urban studies devote increasing attention to how to make cities enabling environments, able to guarantee accessibility to opportunities and the elderly people's quality of life. As all the studies show, enhancing walkability and strengthening the ability of people to access opportunities in the proximity is crucial to improve the elderly people's quality of life [4]. [1] proposed a hierarchy of walking needs within a socio-ecological framework. The environmental factors that influence the decision to walk or not to walk are ranked: the first and essential need is accessibility, then safety, comfort and, finally, pleasantness. In other words, the peculiar characteristics of the environment can expand or restrict personal capabilities. Spatial proximity can be conceived as the most sudden and best declination of accessibility, since it does not require, in 'normal conditions', specific tools or enabling factors for its realisation. It does not require, scarce, resources to be spent on vehicles, tickets, competencies in using technologies, allowing a wider audience to perform activities and to choose their own functionings, using a sennian conceptualisation [26]. Spatial proximity is then easily complementary to walking as a mobility choice and, as a consequence, to walkability as a common measuring dimension of its degree in urban space. This is true even if diversities must be recognised considering walkability as a broader concept

compared to spatial proximity, due to the fact of involving further dimensions like comfort, pleasureness, and other subjective features [43]. A similarity between the concept of proximity and walkability is kept if proximity is understood not only in spatial terms, but also as a relational property (e.g. environment felt to be close in terms of their feelings, values, preferences). In this sense, proximity may become a relevant feature for ageing in place, that is feeling to be in a familiar environment where it is possible for older people to walk in the community safely, independently and comfortably.

2.2 Walkability Determinants

There are nowadays numerous studies that attempt to identify factors associated with increased pedestrian mobility behaviours. In short, walkability is influenced by a set of interconnected environmental and individual factors. As far as environmental factors are concerned, some authors have suggested devoting more attention in spatial planning to the dimensions that most favour pedestrian mobility (the so-called 'five Ds'—Density, Diversity, Design, Destinations accessibility, Distance [17]. More recently, the thematic literature has been interested in the social and individual factors of walkability. A number of studies have investigated the perceptions of different populations and the influence of psycho-cognitive factors [30, 47, 52]. In other words, these studies highlight how walking, along with other forms of mobility, is the outcome of a complex process of appropriation of mobility potential, which in turn is determined by the relationship between socio-environmental, socio-demographic and socio-psychological factors [15, 23].

2.3 Methods for the Evaluation of Walkability

Walkability detection methods follow the multifactorial nature of the concept. Among these, it is possible to distinguish between location-based approaches, in which the focus is on measuring the characteristics of places and routes most associated with pedestrian mobility (e.g. density and land use, street connectivity, proximity of services, design and street furniture) and individual-based approaches, which focus on the subject's perceptions of walkability and individual behaviours.

In the first family, according to [40], two main groups can be distinguished: (1) indicators that assess forms and qualities of the street network to provide physical accessibility by proximity through active mobility (i.e. technical performance of routes and traffic safety), (2) the role of the urban environment in supporting social and relational practices (i.e. safety and social attractiveness of public spaces). The first group—the network indicators—includes variables related to the physical characteristics of pedestrian routes, such as the width of pavements, the presence of obstacles, lighting, traffic regulation. The second group—relational indicators—refers to the

social dynamics of spaces, including indicators such as population density, presence of social hotspots, quality of public spaces, density of points of interest, predominant land use.

Among the survey tools, urban audits are increasingly popular, such as the Senior Walking Environment Audit Tool—SWEAT [14], i.e. processes of systematically collecting information on physical, architectural and urban characteristics at the micro scale useful to reach a morpho-functional diagnosis of walkability [8] [25].

Individual-based approaches, on the other hand, include surveys conducted on representative samples of the population in which opinions and perceptions regarding the characteristics of the neighbourhood of residence in terms of walkability are collected, as in the case of the Neighbourhood Environment Walkability Scale—NEWS [12] and its adaptation for European cities, the ALPHA questionnaire [46]. Other methods in this family are behavioural observation techniques based on tracking [32], so as to be able to assess mobility and activity space (e.g. destinations, distances, routes, speed, acceleration) or on the travels shadowing [22], in order to understand emotions, definitions of the situation, feelings, any material and immaterial barriers encountered by the subject while moving.

Given the inherent limitations of each approach, some studies [6, 25, 36] integrate objective and subjective techniques, both quantitative and qualitative, in order to highlight the barriers that most impact on the actors' final behaviour.

3 Aims, Data and Methods

Aimed at identifying socio-territorial inequalities in the supply of levels of walkability and verifying the assonance/dissonance between structural and subjective evaluations of walkability, the study made use of open data sources, GIS tools and of the direct collection of information on a sample of the elderly population by means of a questionnaire administered in the presence of a surveyor.

The study was divided into three main phases: (1) analysis of the distribution of walkability levels within the municipality of Milan; (2) analysis of the perceptions regarding walkability of a sample of elderly (65 years and older); (3) comparison between objective and subjective evaluation of walkability and for some socio-demographic characteristics.

Walkability was measured through a location-based index that was constructed by adapting to the older population the method proposed by [25] already applied in Milan by [9]. First, the walkable area was circumscribed for each residential building, considering a 12 min travel at an average speed of 0,9 m/s calculated along the street network where pedestrian access is allowed. Then, within each walkable area, the presence of factors that the literature considers to be associated with a greater propensity to walk was analysed. Specifically, the following were considered: residential density, road connectivity (Nodes/Km^2); the incidence of walkable streets, according to the classification of OpenStreetMap; the availability of attractive services for the

elderly.[1] A walkability score was then calculated for each walkable area, resulting from the sum of the standardised values of the individual indices on a scale 0–100. The score of each area was then attributed to the corresponding house number and with an interpolation technique the values were distributed over the entire area of the municipality of Milan.

The sample survey that was carried out made it possible in parallel to collect data on the subjective dimension of walkability, with the aim of measuring it as perceived by elders living in different urban environments. This also allowed us to detect the divergences between objective proximity of urban opportunities and the subjective one. The non-probabilistic sample was divided by gender and according to three age groups (i.e. 65–74, 75–84, 85 and over) and reflects the characteristics of the older population in Milan.

Perceptions of walkability were collected by adapting the ALPHA (Assessing Levels of Physical Activity) [46] questionnaire. Specifically, the questionnaire used for the FoodNET[2] research included 25 items that refer to walking and the following dimensions of walking: (a) distance to local facilities (supermarket, market, fruit and vegetable shop, mini-market, public transport service stop); (b) neighbourhood's walking infrastructure; (c) maintenance of neighbourhood's walking infrastructure; (d) neighbourhood safety; (e) pleasure and aesthetics.

4 Results

4.1 The Location-Based Walkability Index

Figure 1 shows the distribution of the pedestrian index values over the territory of the municipality of Milan. As can be seen, the highest values are concentrated in the historic centre (Municipio 1) and in the neighbourhoods (Nuclei Identità Locale—NIL) adjacent to it. However, high pedestrian values are also present in the city's more peripheral areas. In fact, it is the centralities of each quarter where the highest levels of pedestrianism are found. In other words, the distribution of values suggests a demarcation that, excluding the highest class (in red), is not between central and peripheral districts, but between central and peripheral areas within each district.

[1] The selection of 'attractive' services was conditioned by the availability of data from the Municipality of Milan (2017), Lombardy Region (2017), OpenStreetMap Contributors (2017). The services considered were the following: public transport stops, pharmacies, supermarkets and neighbourhood shops, banks and post offices, general practitioners, leisure and social centres for the elderly, multi-service centres for the elderly, trade unions for the elderly, parks and gardens, libraries, theatres, museums and cinemas. For each service, the density (Nr. Services/Km^2) and standardised values were calculated. Subsequently, the individual values were summed up and given a different weight according to the assumed frequency of service use (daily, weekly, monthly).

[2] Food Social Sensor Network (FoodNET) is a R&I project supported by the Lombardy Region in the framework of the program POR FESR 2014–2020.

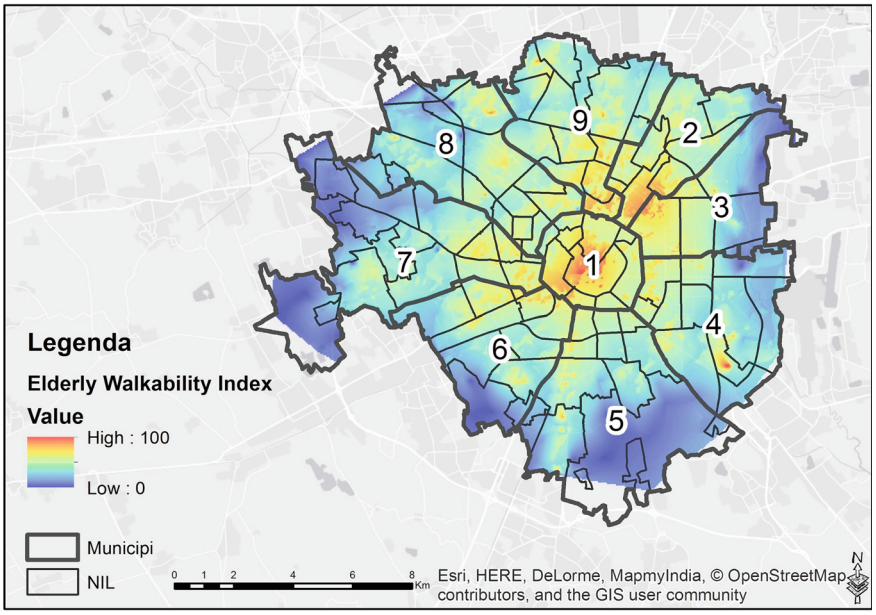

Fig. 1 Elderly walkability index in the city of Milan

4.2 The Older People's Walkability Perceptions

The focus then was shifted to the over 65 respondents' perceptions related to the walkability of their residential environment, the analysis showed the existence of a relation between the perceived walkability and several other variables. First, an overall similarity between subjective perceptions and the location-based walkability index. In addition, a significant positive relation exists between the Alpha Scale and the perceived health status, highlighting the relation between personal physical conditions and propensity to walk. This trend is somehow supported by the negative relation between perceived walkability and age: older the person (and potentially lower the health status), lower the level of respondent's perceived walkability.

Besides physical issues, higher the frequency of participation in social activities, higher the perceived walkability. A positive link exists also with the educational level: more educated respondents score also higher on perceived walkability.

No significant differences are recorded from the correlation analysis between perceived walkability and gender, the level of social capital and the household composition.

5 Conclusion and Discussion: How to Improve Walkable and Proximous Environments for Older People

Walking is an activity of fundamental importance for the wellbeing and inclusion of elderly populations, strictly linked with the degree of proximity (objective and subjective) of urban opportunities, that acts both as an enabler and a product of walkability of space. Planning and building walkable environments, i.e. appropriate to the needs, capabilities and preferences of the elderly population, is therefore an essential element in promoting quality of life in the context of ageing cities.

The spatial analysis of walkability has revealed a demarcation between central and peripheral areas: the former with the best walking conditions, while the latter being scarcely walkable. In addition to this main division, it is interesting that areas with a medium to high level of walkability can be found in every neighbourhood, even the most peripheral, of the city.

In order to build age-friendly cities, urban policies must focus not only on physical and infrastructural conditions, but also on certain profiles of the elderly population. The analysis of perceptions with respect to the walkability of the neighbourhood of residence did not reveal strong dissonances with respect to the structural assessment and found some differences in line with the thematic literature. Thus, are the more active individuals, with a better health status, who perceive urban spaces as more walkable, suggesting an association between practice and perception: those who walk and are more inclined to move consider the urban environment more accessible and walkable, and so to live a more "proximous city". It is then important, besides improving infrastructural elements, to act on awareness and perceptions about the actual conditions of the surrounding environment in order to promote walking and active mobility practices.

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New Metrics for Inclusive Accessibility by Proximity

Paola Pucci and Giovanni Lanza

Abstract Strategies to promote accessibility by proximity are affecting several cities around the words, aiming at creating the conditions, through planning policies, to reduce the spatial and temporal intensities and environmental impacts of daily travels by providing accessible services and opportunities in physical proximity to the citizen. In these experiences, proximity is generally declined in "functional" terms, thus conceived as the physical spatio-temporal distance to essential daily services and opportunities. The chapter proposes to enrich this concept by combining a functional dimension of proximity, measured through an infrastructure-based approach, with a relational one, focused on the exchange of resources and collaboration spontaneously activated in a community, sharing specific accessibility-related needs, problems and mobility opportunities. Both functional and relational proximities are relevant and complementary for better understanding and measuring accessibility by proximity as a condition for a more sustainable, resilient and inclusive city. Based on this, the chapter introduces an index for measuring both the functional and the relational proximity, called Inclusive Accessibility by Proximity Index (IAPI), to support policy for promoting forms of accessibility by proximity through the improvement of active modes-based access to essential services. Through a concrete application of the IAPI in the city of Bologna (Italy) and Mykolaiv (Ukraine), the chapter discusses how the proposed index, characterized by a high level of spatial detail, context-sensitivity, and high transferability, can be usefully employed for ensuring equitable access to services and opportunities in very different and challenging spatial conditions.

Keywords Accessibility · Proximity · Active mobility · Index · Transport justice

P. Pucci (✉) · G. Lanza
Dipartimento di Architettura e Studi Urbani, Politecnico di Milano, Milan, Italy
e-mail: paola.pucci@polimi.it

G. Lanza
e-mail: giovanni.lanza@polimi.it

P. Pucci and G. Vecchio (eds.), *Questioning Proximity—Opportunities and Challenges for Urban Planning and Mobility Policies*, PoliMI SpringerBriefs,
https://doi.org/10.1007/978-3-031-66071-9_4

1 Introduction

The concept of *accessibility by proximity* and its most popular configuration (i.e. Xmin city) has gained wide acceptance in several cities' political agendas aimed at creating the conditions, through planning policies, to reduce the spatial and temporal intensities and environmental impacts of daily travels by providing accessible services and opportunities in physical proximity to the citizen [7, 21]. As a consequence, the accessibility by proximity concept is intended as a driver to plan for more environmentally sustainable and inclusive cities and is today translated into broad urban visions and strategies [4].

In these approaches, cities are conceived as systems of well-connected pedestrian and cyclist-friendly urban districts where high-quality public and open spaces, of daily services for local living, and fast digital networks [3, 4, 21] are available.

In these experiences, proximity is generally defined in "functional" terms, thus conceived as the physical spatiotemporal distance to essential daily services and opportunities—including transport and communication supply—measured through an infrastructure-based approach. In this perspective, higher accessibility by proximity will be ensured based on the actual or planned endowment of easily and fast-reachable service facilities. The metrics adopted for measuring the levels of proximity may be described by Logan et al. [18] as amenity statistics and X-minute statistics, both based on travel time and threshold-based measures.

In the recent debate, however, proximity gains a new dimension complementing its functional interpretation as physical distance to specific activities worth participation: it can also be intended as the exchange of resources and collaboration spontaneously activated in a community, sharing specific accessibility-related needs and problems based on short networks of everyday life inscribed within wider networks of opportunities. We can define this type of proximity as "relational" [20].

Both functional and relational proximities are relevant and complementary for better understanding and measuring accessibility by proximity as a condition for a more sustainable, resilient and inclusive city. However, this assessment requires developing different and innovative metrics, considering at the same time the availability of services, their location, the spatial characteristics and social uses of public spaces and the existence of proximity-based forms of collaboration, meeting specific accessibility needs.

Dealing with these issues, this chapter presents the results of a research project[1] aimed at constructing an Inclusive Accessibility by Proximity Index (IAPI) to guide the design of policy measures to promote forms of accessibility by proximity through the improvement of active modes-based access to essential services. Two applications

[1] EX-TRA project, EXperimenting with city streets to TRAnsform urban mobility, involves five European universities (Amsterdam as coordinator, London Westminster, Ghent University, TU Munich, Politecnico di Milano) and six cities (London, Amsterdam, Munich, Ghent, Milan, and Bologna) and aiming to test useful actions to reduce car-based mobility (streets experiments, alternative mobility options, accessibility by proximity) to respond to a wide range of challenges in sustainability, inclusiveness, and urban resilience. https://www.ex-tra-project.eu/.

are proposed drawing on the experiences of concrete implementations of the tool in two extremely different spatial conditions: the case of the city of Bologna (Italy), and the case of the Ukrainian city of Mykolaiv.

These two test-beds allow to assess how said index, characterized by a high level of spatial detail, context-sensitivity, and high transferability can be usefully employed in guiding design measures for ensuring equitable access to services and opportunities, by active modes in the current situation and for addressing scenario construction.

2 New Metrics of Proximity

The concept of accessibility by proximity is at the core of both practical and theoretical interests.

In a practical domain, it guides several cities to consider the role played by active modes combined with transport supply and critical "basic" services in the functioning of the economic and social life and how accessible these services are to citizens. In the most popular experiences (i.e. the Xmin model), accessibility by proximity represents a "communicative asset" for supporting a city model not only environmentally sustainable but also more inclusive, because essential services and facilities are expected to be spatially distributed to be accessible at the neighbourhood scale; healthier than current car-centric city models because active mobility (particularly walking and cycling) is supported and encouraged; and more resilient, because the integration of different transport modes, sharing mobility options, and the diffusion of info mobility platforms (e.g. MaaS) to optimize the organization of daily mobility travels make diversified mobility solutions available and attainable to citizens.

This narrative finds its value in aligning different actors by providing them with a common time-based vision affecting different scales of the city and activating a different set of policies from the hyper-local street scale (i.e., Convivial public spaces, [2]) to the metropolitan region (i.e., Sydney metropolitan region 2020, and the strategical plans of Melbourne, 2017 or Portland, 2012) [25]. The consensus on this model can be traced back to gathering the interests of different actors and their activities.

For *decision-makers*, this model questions the planning processes by implying a comprehensive rethinking of the form, functions, and social relations in cities. It requires changing the use and shapes of public spaces, redistributing urban activities and reconsidering the role of transport infrastructure, reflecting on how these transformations should be applied at both the urban and regional scales.

For *urban planners*, this model develops and applies innovative analytical tools to understand the current conditions and simulate future scenarios for the 15mC implementation, assessing its impacts from a multi-sectorial perspective.

For *public and private investors and local businesses*, this model may nudge them to offer services, amenities and urban design features enabling active mobility and goods transport by creating demand for proximity. It may also generate economic

benefits for local businesses by supporting thriving local economies in attractive, walkable environments, and creating new job opportunities in proximity.

For *citizens*, this model may promote a fair and equitable distribution of daily services in cities, fostering also a behavioural change in citizens' mobility patterns towards healthier and more sustainable choices. The change will depend on how the mobility needs of different social groups will be considered in planning policy, as well as foreseeing forms of citizen participation and community engagement to provide accessible and inclusive cities.

In a theoretical domain, accessibility by proximity may support an "alternative model of urban development (…) as a new spatial planning concept" [21], because the emphasis on proximity induces a shift that privileges accessibility (and its contribution to overall social inclusion) over mobility [17], prioritizing the possibility for each individual to have access to basic opportunities over the possibility to move freely and independently of the destination or purpose of the trip.

Promoting proximity-based accessibility reorients transportation planning and land use activities from the traditional goal of improving transportation systems efficiency and capacity to the new goal of increasing the availability of services, activities, and social contacts in proximity to reduce mobility patterns toward less extensive but more active and sustainable forms, and helping to strengthen internal community ties [11].

Based on this, proximity should not only be understood (and measured) in physical and functional terms as a distance to specific services and opportunities through an infrastructure-based approach. Proximity can be also evaluated through different metrics as generative of communities of places, practices, and projects [20, 30] where forms of "relational proximity" constitute a resource for the emergence of new forms of social capital, interaction, and collaboration within communities toward a more localist and low-mobile society [12]. Relational proximity can be developed and nourished when a group of people share specific place-based mobility-related needs and goods within an organizational and spatial systems that are suitable for achieving or sharing them [19].

The spatial conditions became thus a support for the development and evolution of relational proximities based on their perceived quality, characters and social role. Conceiving proximity according to a functional and relational dimension implies searching analytical tools able to assess different metrics of proximities in terms of the effect of the spatial and social characteristics of the physical context that may (not) favour access to the main daily services and social interactions for population groups with different capabilities and attitudes.

By looking at the experimented approaches finalized to planning through accessibility by proximity, a supply-based and functional attitude prevails: it focuses on the selections of the daily services and amenities within Xmin reach, based mostly on the common categories proposed in the existing literature as education, healthcare, food-related services, financial services, public open space, entertainment and transport provision [4, 21, 26]. Less frequently these services are defined through participatory processes with inputs from citizens and stakeholders [3, 7, 29]. The access to the basket of daily services is measured considering their catchment size

in terms of density and average distance walked [13, 18] or calculating the average access times with isochrones by active modes to a basket of daily services in several time thresholds (ATOS in [8, 27]).

In these approaches both the selection of the basic relevant daily services along with the conditions to access them by active modes, often don't deal with the "relativistic dimension" of the accessibility which depends on "what we as a society, research academy, or policy-making agents, see as 'just' (or acceptable) (Farrington [10], p. 323), as much is about people as it is about place. Introducing a relational dimension of proximity allows to re-think accessibility by proximity assessment in terms of people's habits, needs, possibilities, preferences, and the spatial-physical context in which accessibility is measured, as both dimensions influence intensely an individual's level of accessibility. Consequently, it is possible to conceive different experiences of access, linked both to the existence of multiple opportunity types in terms of needed services to be accessible [28] and to the different ways in which the abilities and possibilities of individuals and community of practices will be confronted on a daily basis with the specific morphological, social, and functional characteristics of the proximity spaces in which they (do not) actively move. In this frame, the diagnostic tools developed to measure accessibility by proximity and promote related policies for accessibility improvement, should be able to identify both the relevance of the main daily services and the inequalities in their spatial accessibility by considering, in their assessments, the detailed spatial and social information—including subjective data about active mobility users' perceptions and behaviours—impacting on the diverse propensity for active forms of mobility along cities and neighbourhood's pathways and spaces [1, 5].

3 Measuring the Accessibility by Proximity: The Inclusive Accessibility by Proximity Index

Designing a city based on accessibility by proximity requires the introduction of innovative metrics and must at least consider two fundamental issues. The first concerns what services and opportunities should be equitably distributed and offered in proximity—or easily accessible by sustainable forms of transportation or through the Internet, or via a combination of both—to meet the diverse needs of different social groups while avoiding reproducing existing inequalities.

The second concerns how active modes of transport could become an advantageous and achievable option that can support a post-car perspective of the proximity needs—work, shopping, health, and culture [22]—of residents with different physical and cognitive capabilities that also affect their walkability and cyclability attitudes.

Dealing with these challenges and experimenting with an approach able to combine the functional (physical accessibility conditions) and the relational (perceived conditions of the social and spatial environment) dimensions of proximity, an Inclusive Accessibility by Proximity Index (IAPI) has been developed

[23]. IAPI is a GIS-based tool that measures the levels of accessibility by proximity at multiple spatial scales (from the neighbourhood to the whole city), considering three city users' profiles (pedestrians, cyclists, and people with reduced mobility), in order to support integrated transport and land use strategies for ensuring equitable access to services and opportunities. IAPI aims at:

- dealing with the diversified "mobility and access experiences" related to the quality of neighbourhood paths and spaces and the different abilities and needs of individuals;
- evaluating the different accessibility experiences for the three profiles and thus producing diversified mappings of accessibility levels;
- identifying potential imbalances in the ease of accessing neighbourhood services based on different physical attitudes toward active mobility as influenced by walkability and cyclability factors;
- guiding the construction of policy design solutions related to public spaces, streetscape, and the distribution of welfare services, aimed at improving walkability, and cyclability
- testing possible different scenarios related to active mobility and street design solutions.

Both the physical and perceived features of the street networks that may (dis)favor active modes and the basket of the essential daily services for supporting accessibility by proximity are detected, mapped and considered in the IAPI calculation through a combination of spatial data collected both from open data repositories and through interactive processes, involving citizens and local stakeholders for dealing with the perceived and "relational" dimension of proximity.

Since the methodological application is detailed elsewhere [16], the steps to build the index are synthetically described here (Fig. 1).

In a first step, walkability and cyclability indicators are selected to be included in the index calculation. The factors, inferred from a systematic review of the literature, are divided into two macro-categories resulting from a reworked version of the classification proposed by Jehle et al. (2022). The first is that of *network indicators* (Table 1), which are mapped on a highly detailed digital road graph, describe the technical conditions that make it easier, faster, and safer for the three users' profiles to travel along each street, thus influencing physical accessibility by proximity via active mobility to neighbourhood services.

Network indicators are combined with a set of *relational indicators* (Table 2) regarding the characteristics of the built and open environments surrounding streets and their role in supporting social and relational practices, including some subjective dimensions related to the quality, safety, and liveability of the neighbourhood spaces.

Both sets of indicators describe conditions to which people might react differently on their ability to move along the network and perceive the surrounding relational environments. Thus, specific impedance factors are applied to each indicator differentiating their value according to the different profiles to express how the described condition can have a low, medium, high positive or negative impact on walkability and

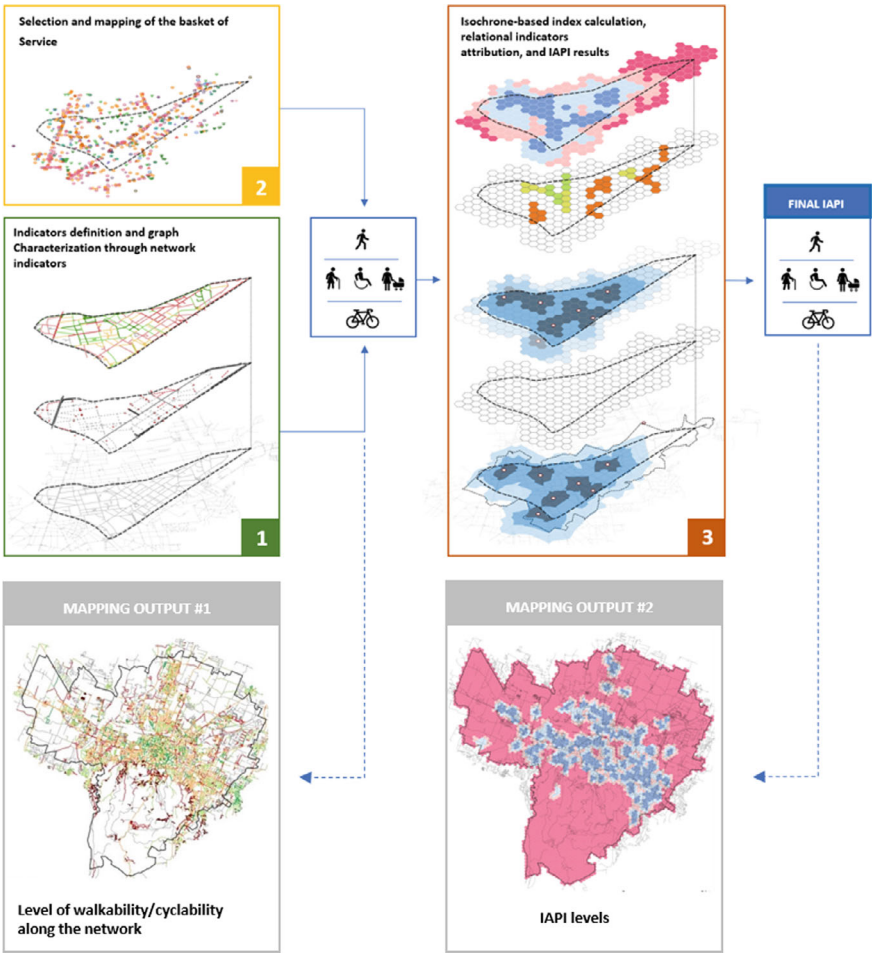

Fig. 1 IAPI methodological steps and outcomes. *Source* own elaboration

cyclability. In this way, different indicators can be compared and weighted according to their influence on active mobility.

The second step is finalized to select and map the basket of services deemed essential to the lives of neighborhood residents (Tab. 3), based on a re-elaborated version of Moreno's six social functions: living, working, healthcare/caring, education, commerce, and entertainment [21].

The comprehensive list of included services has to be selected based on their possible relevance in relation to the socio-demographic characteristics of the neighborhood, including information on their daily and hourly availability. Within the services considered, the proposed approach also foresees the mapping of the public transport supply according to the type of service (i.e., giving greater importance to

Table 1 Network indicators

Indicators family	Network indicator	Explanation
Path's technical performances	Pedestrian friendliness	Describing how much a route explicitly encourages pedestrian transit
	Cyclist friendliness	Describing how much a route explicitly encourages cyclists' transit
	Sidewalk width	Describing how the width of the pedestrian routes can have an impact on walkability and cyclability along an arc
	Presence of obstacles	Describing how easy it is to walk along an arc based on the presence of potential obstacles and barriers to movement
	Surface and smoothness	Describing how the type of path surface can obstacle walkability and cyclability
	Slope	Describing how the slope (%) of the pedestrian routes can have an impact on walkability and cyclability along an arc
	Lack of lighting	Describing whether an area is lit. Lack of lighting may result in bad perception, difficulties in displacing, and unsafety
Traffic safety and road impacts	Car traffic interaction	Describing the level of stress for pedestrians, wheelchair users and cyclists due to proximity to high traffic roads
	Traffic calming impact	Describing the sense of security related to the presence of vehicles marching at low speed by rule
	Number of lanes	Considered as a proxy to calculate difficulties in crossings vehicular roads

metro lines and the most important tramway or bus services) and frequency of service offered at each station/stop of the public transport network.

The third step calculates IAPI score through an isochrone-based measure (considering three-time thresholds of 5, 10, and 15 min) performed from each selected service (see step 2) using the street network characterized through the network indicators (see step 1). Consequently, the extent of each service's catchment area depicted by the isochrones will vary based on the three profiles and how their active mobility will be (dis) favoured by the actual street conditions. Subsequently, an hexagonal grid

Table 2 Relational indicators

Indicators family	Relational indicator	Explanation
Safety and social attractiveness of public spaces	Population density	Higher population density in the area is associated with a greater sense of safety and higher relational opportunities
	Poor maintenance of public spaces*	Describing the overall maintenance of public spaces in the area
	Presence of social hotspots*	Describing the presence of no-go or identity social spaces in the area impacting livability and walkability
Design and diversity of public spaces and the built environment	Presence of urban furniture	Describing the level of equipment and presence of street furniture that enhances the livability of public spaces in the area
	Predominant land use	Describing the presence of land uses facilitating stop over activities such as residential, commercial, and recreational in the area
	Point of Interest density (Shops and activities at ground floors	Describing the density of activity on the building's ground floors as makers of vitality in the area

* indicators requiring crowdsourced data about public perception

featuring the relational indicators overlaps with the isochrones, which are sampled by assigning higher values to the hexagon within the 5-min threshold and lower values to the remainder as the level of accessibility decreases. This value is finally combined with the relational indicators that insist on each hexagon obtaining the final IAPI score.

Given the characteristics of the methodology, IAPI can be used to calculate both the accessibility of a single service and of a selected set of services by the calculation of isochrones, summing n times of the isochrones as many as the services considered in the basket and then normalize the result to allow comparison between different areas in the neighborhood. Due to the cumulative principle, the result is a composite IAPI indicator in which higher values correspond to higher levels of neighbourhood accessibility understood both in physical and relational terms.

Table 3 Basket of possible services to be included in the IAPI calculation

Category	Service
Public open spaces	Gardens, parks Playgrounds
Commercial activities and services to the public	Grocery stores and supermarkets Bars and restaurants Street markets Kiosk Hairdresser, beautician Post office
Gathering and cultural spaces	Cultural, creative spaces Theatres and cinemas
Sport	Gyms Sport fields
Health and social care	GP, pharmacies, clinics Social services
Education spaces	Libraries Nurseries, Kindergartens Primary Middle schools
Public transport and sharing mobility	Metro station (if present) High frequency bus stop Low frequency bus stop Bike sharing station (if present) Car sharing station (if present)

4 The Scalability of IAPI in Two Test-Beds. Relevance for Policy Measures

The implementation of IAPI in two very different and challenging test-beds as Bologna (Northern Italy) and Mykolaiv (Southern Ukraine) has been the opportunity to test the relevance and the scalability of the index in addressing place-based policy measures [24].

The choice of these two pilot-cases is linked for Bologna to its participation as a pilot project in the EXTRA project; for Mykolaiv to the opportunity to test IAPI in a very challenging context of strong instability and fragility to understand how useful it can be in supporting a new urban mobility model.

In Bologna IAPI has been implemented to measure the current status of the streets in terms of comfort, and safety, to evaluate the access to the basic daily services in different neighbourhoods of the city and for different profiles of inhabitants, as well as to evaluate the impact of a street experiment in a public space, redesigned as a new playground.

In Mykolaiv—an Ukrainian city under bombing by the Russian army—IAPI has been calculated for depicting the pre-conflict scenario in relation to the walkability

conditions and the distribution and access to the basic services. This analytical framework supports an evaluation of the relevance and impact of the war destructions on the mobility network structure, and address future policy measures, in terms of priority interventions and design solutions for improving the active mobility paths and the availability of services at the district scale after the end of the conflict.

The scalability of the index has been tested in the selection of the indicators (Tables 1 and 2) and the services (Table 3), modified for a sensitive place-based approach through site-specific analysis.

The application in Bologna foresees the direct involvement of citizens by surveying their preferences about the conditions impacting active mobility choices and the relevance of the basket of daily services. Also, the survey includes a crowd mapping-based section to collect punctual information about the perceived conditions of the paths and public space of the city to build the relational indicators included in the IAPI application. Based on the results of the survey, the list of the indicators describing the technical and relational performances of the street network and public spaces and the relative importance of the daily services included in the basket have been re-calibrated accordingly to provide a context-sensitive IAPI evaluation [16].

In the case of Mykolaiv, peculiar attention has been played to the morpho-functional layouts of the street networks, characterized by post-soviet urban patterns, not comparable with other cities where IAPI was tested (i.e. street sections and the organization of the built environment is very different from western European standards) and affecting the criteria for the walkability conditions. In this context, the availability of the results of a online survey on the main conditions affecting safety conditions and supply of the city before and during the conflict supports the IAPI development that may be used as a scenario-building tool in a post-conflict perspective. Also in terms of usability for addressing policy measures, IAPI shows its versatility in the two test-bed.

In Bologna, IAPI was used in combination with other information layers to orient specific design urban policies (i.e. Città 30; progetto Impronta Verde), to assess the increase in accessibility to public open spaces following the implementation of specific street redesign interventions (e.g., through the tactical urbanism approach), in addition to assess the accessibility to selected types of services (e.g., schools), and provide a context-sensitive overview of the current 15 min city conditions considering all the services combined (Fig. 1).

In Mykolaiv, the analysis of walkability, complemented with the mapping of the main services for the final calculation of IAPI addresses the scenarios construction and related actions to reach the sustainable development goals set by the municipality (Fig. 2).

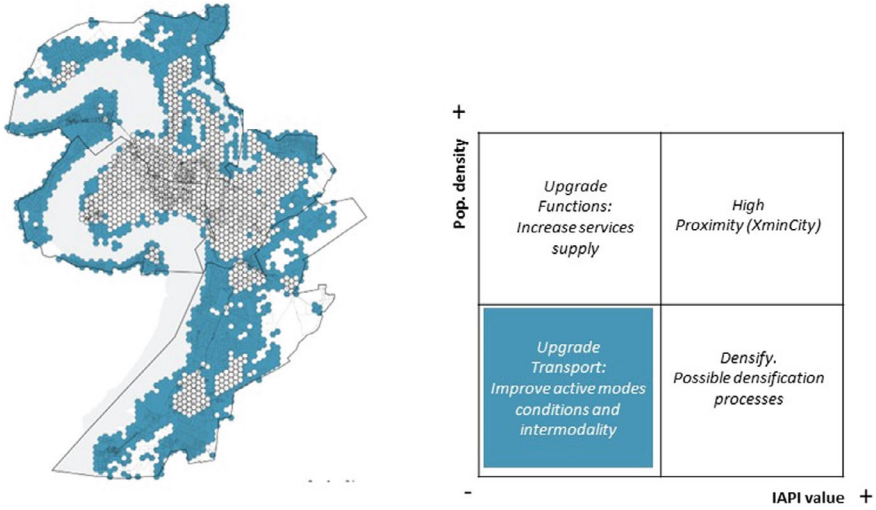

Fig. 2 One of the four scenarios for Mykolaiv. *Source* own elaboration

5 Open Issues

The implementation of IAPI as a tool for measuring the access and provision of a diverse set of neighbourhood services that can be accessed through active mobility offers insights into its ability to deal with at least three conditions that an appropriate diagnostic tool must guarantee.

The first is inclusivity. In the view of envisioning diffused accessibility by proximity, the tool should be able to identify inequalities in spatial accessibility by assessing the effect of the spatial and social characteristics of the context that may (not) favor active mobility for local social groups with different capabilities and attitudes. In this regard, IAPI can highlight the presence and spatial distribution of disadvantaged districts where policymakers should choose to prioritize measures to tackle existing inequality [6].

The second condition affects the focus on the essentiality of services and activities. The tool should consider what services and opportunities should be equitably distributed and offered in proximity to meet the different needs of different social groups while avoiding reproducing existing inequalities. In this case, IAPI through a digital survey for the collection of citizens' preferences about the comfort and safety of the neighborhood spaces and path, and the relevant services to daily life, contributes to a sensitive measure of the accessibility by proximity.

The third refers to the detail, legibility, and usefulness of the measurement. The tool should be designed using very detailed spatial information—including subjective data about active mobility users' perceptions and behaviours—but also easily implementable, legible—in terms of obtained results—and easy to transfer to multiple cases while ensuring a good level of customization by target users (primarily policy

makers and planning practitioners, but potentially also local community groups and citizens) to increase their context sensitivity.

If these conditions are relevant to make the tool more effective and sensitive to the contexts of application, the IAPI, possibly enriched with the collection of crowd-sourced perceptions, can be a useful evaluation tool for introducing new metrics for accessibility by proximity assessment supporting local authorities' planning activities. This is due to its predefined architecture that maximizes its flexibility and context-sensitivity since IAPI calculation can be easily modulated and adapted to simulate the experience of different user profiles in equally different contexts.

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Questioning Proximity in a Fragmented, Disorderly, and Complex Urban Region. The Limits of the 15-Min City Discourse and Frame for a More Realistic Understanding

Antonella Bruzzese and Alessandro Coppola

Abstract Conditions of accessibility by proximity are the extensions of variegated and metropolitan-scale residential, labor, and other functional geographies of movement. Notwithstanding its high density according to traditional metrics, the urban region of Milan is of great interest in this regard because its functional, morphological, and social variegation is very high. The presence of residential areas originally developed out of rural towns, sites characterized by still active or decommissioned industrial legacies in close proximity to residential settlements, local contexts marked by a variety of urban materials, and the lack of organized centralities well represent how the terms for achieving conditions of accessibility by proximity change profoundly if com-pared to more central and denser urban areas. The contribution addresses these issues by presenting and discussing some of the results of a three-year teaching and research project aimed at critically repositioning current discourses on the 15-min city/accessibility by proximity in relation to the variegated conditions of existing urban regions. We describe the methodology employed, the set of criteria for analysis and intervention elaborated in that context, and then draw some conclusions on the structural challenges faced by policies for accessibility by proximity in less dense contexts and on the need to focus on a variety of entry points—and not only accessibility by proximity—for re-localization strategies in these contexts.

Keywords 15-min city · Accessibility by proximity · Peri-urban conditions · Area-based strategies · Re-localization

A. Bruzzese (✉) · A. Coppola
Dipartimento di Architettura e Studi Urbani, Politecnico di Milano, Milan, Italy
e-mail: antonella.bruzzese@polimi.it

A. Coppola
e-mail: alessandro.coppola@polimi.it

P. Pucci and G. Vecchio (eds.), *Questioning Proximity—Opportunities and Challenges for Urban Planning and Mobility Policies*, PoliMI SpringerBriefs,
https://doi.org/10.1007/978-3-031-66071-9_5

1 About Proximity in Cities and Urban Regions: Questions, Cautions and Critique

Legitimized by growing environmental concerns, sustained by the rediscovery of the local scale by certain social groups and the urban middle classes in particular [5], amplified by the restriction of social life during the pandemic, and further supported by the success and spread of discourses on the "15-min city", the concept of proximity has returned crucial in academic debate [13–15, 25], as well as in the political agendas of several cities (see among others the 'Pacte Parisien de la proximité' 2021). At the same time, the discourses on proximity resonate with the perspective of re-localization in the sense of an increased relevance of the local scale in production and consumption as a limit to the ecological footprint of human societies [19].

This renewed centrality, on the one hand, is the outcome of questioning a globalized way of urban living, spread over the territory or between different cities, which has been associated in recent decades with the idea of the global, "infinite" or even "generic" city [4, 10]. On the other hand, it coincides with the attention to everyday life and practices and their relations with the spaces where they happen, which has its roots in sociological studies [8] and has later developed in the broader field of urban studies [1, 7, 16].

In the most reductive and common understanding, proximity in the urban context is meant as physical proximity, as a short distance *from*, or easy accessibility *to*, certain urban amenities and services, such as the primary and essential services of daily life, public transport nodes, or green areas. In recent years, however, the concept of proximity has been progressively enriched with a plurality of meanings that have challenged both the nature of the concept (what is proximity?) and its urban role (what is proximity for and for whom?).

Proximity is one of the themes underlying Carlos Moreno's theorization of the '15-min city'. In the wake of a general critique of the modernist planning model centred on the car and the functionalist separation of specialized urban zones, the 'nouveau chrono-urbanism' of the 15-min city proposed by Moreno is built around people and time. Moreno suggests an urban model, an ideal city, organized in 'neighborhoods' that are characterized by four primary qualities: *proximity* to services that make active and sustainable mobility possible, *mixité* of uses and functions, (a high) *density* of built volumes, *ubiquity* as the result of integration with the digital world and extensive use of information and communication technologies [15].

In particular, Moreno imagines a city where collective services can be reached by foot or bicycle in less than 15 min to ensure environmental, social, and economic sustainability. Although this is not a new proposal in the history of town planning (there have been many similar experiments over time in terms of content and objectives [3, 12, 23], thanks to its communicative simplicity, this image had an enormous diffusion in the public debate and has become an objective in the policies of several cities, such as Paris 2020, Portland, Melbourne, Barcelona, and Milan. It has also been promoted by the C40 network of cities, which has significantly contributed to its worldwide spread.

It is too early to assess the effectiveness of the policies and projects generated in relation to the 15-min city discourse. However, it is possible to underline a few critical elements and ways for a more complexity-aware use of this discourse.

On a first note, the most widespread understandings of the concept fail to adequately conceptualize and operationalize complex socio-spatial relations that are essential components of the workings of our cities. In a clear departure from traditional urban planning understandings of the role of the local scale, the 15-min city discourse conflates the latter with the idea itself of the city, leading to the ill-informed notion that *everything urban* can be performed at a local/neighborhood-like scale. While—naturally—for the large majority of city and metropolitan region's inhabitants, urbanity is necessarily a multi-scalar phenomenon and practice. This conflation has also led to confusion between the conditions of exceptional, concentrated functional diversity we can encounter in a selection of prime locations in city cores with the real possibilities in this regard in the context of other, less privileged and more widespread urban contexts and conditions. A possibility that is also related to the uneven ways in which work, and housing opportunities are distributed across the urban and metropolitan space for different social groups, posing the issue of *who is* and *who is not* in the conditions to access that kind of urban environment.

On a second note, it is possible to recognize that in the international scene, the discourses on the 15-min city helped renew the focus of policymakers and planners not only on proximity and local scale but also on the nature of that proximity. Taking time instead of distance as the unit of measurement between home and services—particularly the *walking distance*—means considering not the distance per se but how long it takes to travel that distance. Therefore, it means reasoning about *who* walks that distance, *how*, and *what kind of spaces* the covering of that distance implies. It ultimately infers recognizing the importance of the experience of displacement and the factors that influence it [21] and emphasizing the prominence of a qualitative approach to interpreting urban phenomena and their treatment. In both the analytical and planning phases, it "gives depth" to the concept of proximity and recalls the need for a qualitative approach, even in fields typically subject to quantitative measurements. Recent research on mobility, for example, questions more than in the past how to include aspects such as the perceptions of the different social groups, their preferences, the material quality of urban environments, and so on [11] in evaluations of accessibility (which is itself becoming a criterion for assessing the quality of neighborhoods).

Further and recent contributions on proximity have provided interpretative keys illuminating its various dimensions [9, 13]. Starting from studying the mechanisms leading to social innovation, Ezio Manzini introduces a social and relational dimension into the discourse on proximity. He redefines proximity as necessary for constructing social and community ties and emphasizes the importance of the relationship between the city, proximity, and care. He argues that we need a city capable of care and, thus, modifying the nature of services to include a more significant involvement of people in increasingly hybridizing spaces and services.

On a third note, it is also critical to underline how a thick, social, and institutional analytical perspective has always been at the core of urban planners' and sociologists'

reflections on proximity in cities. In urban planning, the concept of proximity has historically often been associated with the analysis, planning, and design of the "neighbourhood", broadly understood from the new towns of the Anglo-Saxon matrix to the self-sufficient neighborhoods experimented in Italy in the years of post-war reconstruction, from Clarence Perry's Neighborhood Units to those settlements that have grown up around historical nuclei, landmarks, and shared spaces that make them recognizable and nameable (think of the so-called Nuclei of Local Identity in the formulation of the Milanese urban plan PGT 2013). Situations in which physical proximity between dwellings and services added up to some kind of centrality, of a recognizable identity dimension, often characterized by practices of locally rooted care and social bonding. Building also on a long legacy in urban sociology, the super-local scale—and the urban neighborhood, more specifically—has also been a central object in over fifty years of reflection and intervention in the realms of urban and social policy [5], with the development of area-based, integrated strategies that attempted to strengthen the quality and relevance of proximate relations through interventions on local participation, access to services, housing, public spaces, and economic development.

However, neighborhoods, proximity, and 15-min city are not coincidental concepts. Neighborhoods do not homogeneously cover the urbanized territory, whereas if we assume proximity as the set of endowments and conditions that make living worthy and of 'quality' in the broadest sense of the term, having primary services available within a radius that does not force people to make unsustainable journeys in terms of personal quality of life and ecological footprint should be guaranteed everywhere. But is it truly possible? What happens in suburbs or lower-density urban contexts? And how does this relate to the conditions of social groups that have to resort to onerous commuting for reasons related to the housing and labor market? Can the idea of the 15-min city and proximity become the engine of a more general reflection on the local dimension in those territories where it is less obvious to find it? These questions animated the didactic and research experience of an Urban Policy Design Studio between 2021 and 2024 in the master's degree Program in Urban Planning and Policy Design at Politecnico di Milano on the territories of the Milanese urban region described below.

2 Testing the 15-Min City: A Didactic and Research Experience on the Milanese Urban Region

The critical perspectives expressed above have been the framework and the starting points of a teaching and research experience within the Urban Policy Design Studio, part of the master's degree in Urban Planning and Policy Design at the Politecnico di Milano.[1] The studio that the authors of this chapter have been co-coordinating

[1] The studio was coordinated by the authors with the participation of Antonio Jose Salvador and Nilva Karenina Guevara.

since 2021 adopts two distinct and complementary approaches with the aim to integrate urban policy and urban design both in the analytic-interpretative and the design phases, paying specific attention to the spatial, physical, governance, and policy-related dimensions of the territory and its management and transformation. Aware that the 15-min city discourse has circulated widely but is far from achieving either consensus or a clear operationalization, we used such discourse as an entry point into various issues. The field of investigation and project are portions of Milan's peripheries together with the municipalities of the metropolitan first belt (Fig. 1). They are areas characterized by a substantial variety of urban materials, such as neglected activities and functions, diverse housing supply, large infrastructures, and agricultural or open spaces, where phenomena—such as social and economic fragility, poor accessibility to services, and low quality of the built environment—can also be encountered.

The methodology adopted is multi-scalar, "by design", and recursive. The didactic experience developed throughout three years through more than 30 working teams composed of international master's students allowed us to test a method and criteria

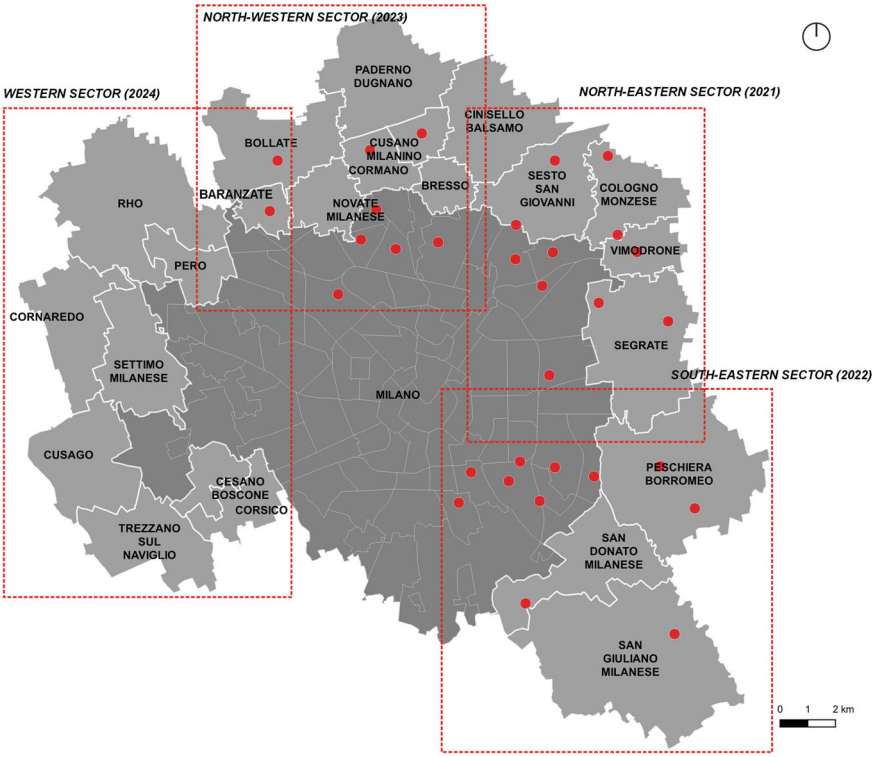

Fig. 1 The three first-ring metropolitan quadrants and specific locations addressed by the studio. Map elaborated by Antonio Salvador and Nilva Karenina Guevara

for reading and interpreting the conditions of proximity in a vast and diverse territory, of which we reconstructed a critical description at different scales.

The research developed in two phases corresponding to two scales of observation. Firstly, it analyzes one section of Milan's peripheral ring and its bordering first-belt municipalities from various analytical dimensions described below. The aim of this first phase is to assess, within the section, the feasibility conditions of building a 15-min city and to identify a limited number of smaller-scale areas to focus on in the second phase. This leap in scale and investigation tools helps build another type of knowledge (qualitative, first-hand, and interactive) of the variety of problems, fragilities, and potentials identified in more specific areas across the wider urban sector and design for them a *neighborhood action strategy to build 15-min city living conditions*. The design proposals for these neighborhood action strategies can be seen as a test in the perspective of a research-by-design working mode, i.e., as tools for testing and producing more complex types of knowledge.

Design, to be effective, must deal with feasibility. In particular, the design process progresses through "learning by doing", and it is based on experience, practice, and repetition, as in craft [20]. The initial assumption suggests a first simulation, which must be verified or falsified (how can it be realized?) to arrive at new formulations according to a circular and recursive path. The design is never the application of an abstract theory but an eminently practical, contextual, and processual activity driven by two apparently opposite forces: the visionary impetus able to imagine a different reality and the concreteness of understanding how to pursue it. This process represents an exceptional research tool because it reveals various aspects of the situation to change, becoming a "knowledge producer" [2, 24].

The research method described above helped us recognize that the urban region of Milan is far more uneven and variegated than generally assumed. Centered on its very dense and cohesive urban core—where conditions of accessibility by proximity are already present, and wealth is overly concentrated—current representations of Milan's metropolitan areas often fail to make these characteristics evident.

The great variety of urban conditions is the result of different factors rooted in *morphological and environmental characteristics* of the territory (the southern part, for instance, is a predominantly agricultural area where small, isolated, low-density, car-dependent settlements can be found, while the northern part is traditionally more industrial, representing a sort of urban continuum with higher-urban density urban and having experienced a more intense growth); in *economic processes* (deindustrialization, in particular, has been a significant factor in the stagnation and decline of specific areas, leaving behind large swaths of land that have been seldom involved in regeneration processes), and *demographic* features (a wider presence distribution of young or immigrant populations can be observed in certain areas due to worse but more economically accessible housing). In addition to that, the lack of relevant and effective spatial planning at the scale of the urban region contributes, not unlike other metropolitan regions in Europe, to the increasing polarization of the region towards the center, with consistent growth of residents, jobs, and real estate values within the perimeter of the city proper[6, 17, 18].

The great variety is even more evident in the urban materials recognizable in the first ring of the metropolitan area, which includes both areas within the city boundaries and municipalities outside them, where different situations can be identified in terms of *density* (from high to low), *functions* (predominantly residential, productive, agricultural, mixed), *position in the city* (urban continuum, isolated because surrounded by agricultural or industrial area or by infrastructure), *buildings typology and settlements morphology* (high-rise buildings, detached house, gated condominium, historical nuclei). Of course, social composition also varies considerably between these conditions, depending on several factors, such as the presence of lower-quality affordable housing or public housing. In the end, this great variety suggests the necessity of not having an abstract and universally valid recipe for the 15-min city and the need for a deeper understanding of the topic.

3 Building a Framework for Analysis, Intervention, and Reinterpretation

As we said, the work moved from the analysis of a section of an imaginary belt comprising the peripheries of the core city and the first ring of municipalities of the urban region of Milan.

Such analysis aimed to understand the broader characteristics of the section and the dynamics operating across it, thus selecting areas of intervention. This choice moved from the assumption that it is impossible to design area-based, neighborhood strategies if not within a fully aware and informed framing in a larger-scale set of socio-spatial relations and that area-based strategies—in a recursive way—can support larger-scale strategies.

To follow such an approach, it is necessary to have both a closer and broader look at actual socio-spatial conditions. Closer in the sense of how urban materials are assembled across space and broader in the sense of considering a range of dimensions that do not directly deal with "accessibility by proximity" but, in certain ways, act as preconditions/enablers of processes of re-localization, in the sense of an increased, self-determined reliance by city dwellers to the local scale at least for a basket of basic activities.

Based on these initial assumptions, we identified a set of criteria we used to assess the conditions and potential of the variety of contexts under exam, while at the same time orienting action and also contributing to a conceptual reformulation of what is now known as the 15-min city. It is relevant to note that it has been a highly *iterative* process and that the set of criteria has evolved over time. Over the years, new criteria were added based on what we did learn from the design of local strategies, while others were reframed.

At the same time, as we said, their use in the strategy-making process also changed. In early studios, criteria were used to build a hierarchy of places based on how *close* enquired locations could be considered in relation to "15-min city" ideals. Based

on how they performed against the different criteria, areas were sorted into three categories—"already there", "almost there", and "far from there", wherein "there" would be a condition of high proximity by accessibility—building an overarching representation of how the entire metropolitan sector under inquiry performed.

This hierarchization opened a classic dilemma in urban planning and policy, which is the alternative between a *needs-based* and a *potential-based* approach to public intervention [22] In this context, this meant choosing between prioritizing in formulating area-based strategies locations that were *far from there* or that were *almost there*, assuming that *already there* areas presented the typical characteristics of highly dense, multifunctional and widely accessible neighborhoods. As the choice of the first would have proved more realistic, as certain goals were more achievable, the choice of the latter would have proven both more *equitable*—because addressing those contexts where accessibility by proximity was the lowest—and ambitious because having to design how to fill a larger gap.

In this regard, it is also relevant to underscore another aspect: that the larger variety of criteria employed in the analysis over the years, as compared to established readings of the 15-min city, already twisted the selection of areas away in the direction of those more in need: i.e., some extremely accessible and functionally mixed neighborhoods would fail against the criteria of housing and services accessibility that, as we will see, we have assumed as an important one to define the mixed uses and social composition needed to an effective and equitable 15-min city.

Also based on these considerations, in the successive studios, we opted for a non-hierarchical and more design-oriented approach, choosing locations that—always based on the set of criteria—for a variety of reasons represented relevant cases to be addressed: with a more site-specific approach to select the areas we were better able to thicken the qualitative texture of our interpretations of what came out of the metropolitan sector's analysis while somehow partially eluding for the moment the needs-based/potential-based dilemma. Accordingly, the methodological strategies deployed to collect evidence were mixed, combining survey-like qualitative inquiries, direct engagement with local actors, and quantitative mapping. In the end, what emerged was a complex taxonomy able to convey the variety of concrete conditions of the ground across a specific metropolitan sector, suggesting there can be multiple ways to achieve increased accessibility by proximity.

In the end, criteria were gathered in five broad analytical dimensions: (a) local social inclusivity and responsiveness; (b) urban and metropolitan accessibility; (c) urban form and experience; (d) local metabolism; (e) local participation. Such analytical dimensions were explored based on a layer of essential information—such as socio-demographic structure, functional composition and land use, and morphological structure—that was shared by all working groups. Naturally, as in any exercise of such a nature, the objects of the five analytical dimensions are closely intermingled and partially overlap. Far from having the ambition of being exhaustive, they are intended as entry points into complexity. In the Table 1, it is possible to see a representation of the five dimensions and the descriptors that were used to conduct the analysis.

Table 1 The framework of analysis and intervention employed in the studio

Analytical dimension	Criteria	Descriptors
Local social inclusivity and responsiveness	Availability of housing options affordable to a variety of social and demographic groups	Current/evolution of housing market values, housing tenure distribution and tenure/price composition of the new housing supply
	Availability and quality of services and their ability to respond to a variety of social and demographic groups	Presence/distribution/evolution of a set of basic urban services, their levels of spatial and economic accessibility and responsiveness to the needs of several socio-demographic groups and, more specifically, to their local composition
	Availability of a variety of retail options and their ability to respond to a variety of social and demographic groups	Presence/distribution/evolution of the retail supply, its composition by supply typologies and level of spatial and economic accessibility, and their responsiveness to the needs of several socio-demographic groups and, more specifically, to their local composition
Urban and metropolitan accessibility	Availability of public transportation options	Presence, quality, and scale of public transport options (time needed to go to a range of locations; quality of the travel experience), their spatial distribution and economic accessibility (price)
Urban form and experience	Publicness and absence of barriers	Quantity and relevance of accessible open spaces, presence of underused/abandoned open spaces and physical barriers to walking in relation to a variety of social and demographic groups, existence and form of residents' mental barriers
	Levels of ground floor activity	Level of introversion/extroversion of housing developments and workplaces and of ground floor activity across space and time
	Presence of micro-centralities	Presence of land-marks and historical clusters (i.e., NAF, Nuclei di Antica Formazione) that can orient and give meaning to local life and the level of their social recognition
Local metabolism	Level of urban metabolism's localization	Presence of infrastructures, policies, and practices for the local sourcing and reuse of resources; presence of networks of local circularity of resources
	Local economic base	Relevance of the number of employed, the composition of employment sectors in the area and the level of their use of local services and retail, as well as a portion of the population that can work remotely

(continued)

Table 1 (continued)

Analytical dimension	Criteria	Descriptors
Local participation	Local participation and civic engagement	The presence of active local actors, the levels of participation in policy processes and representative democracy mechanisms and institutions, and levels, thickness, and inclusiveness of local forms of sociability
	Availability of gathering places and spaces	The availability of multi-functional spaces and infrastructures for local activities and causal counters and their level of use and their accessibility in spatial terms, in economic terms

The criteria illustrated above not only oriented the analysis of the sector under examination, as defined above, but at the same time propose a potential frame to understand better and give a more complex definition of the operationalization conditions and possibilities of the 15-min city discourse or more specifically, of accessibility by proximity.

4 Lesson Learned and Challenges

In this short chapter, we presented a framework and methodology designed and implemented in the context of an urban policy and urban design studio to explore the conditions for developing area-based neighborhood strategies aimed at achieving accessibility by proximity. In particular, we presented how the process was organized and the analytical dimensions and criteria employed to analyze and test these conditions of possibility. Although we could not enter in the discussion of specific places and area-based strategies that were developed, we can draw some short final lessons to inform further research and design.

The first lesson regards the relation between the wide, articulated variety of the urban materials and contexts we encounter in contemporary urban regions and the 15-min city discourse. A deep plunge in this variety—as the one we were able to make through the research and design process we described—shows how large swaths of contemporary urban regions are very far from the minimal initial conditions for developing policies aimed at establishing conditions of accessibility by proximity. And that, in the absence of deep, structural, and financially intensive changes—that do not depend solely on area-based strategies and rather rely on reformed higher-scale sectoral policies—many of these areas will never attain such conditions. The legacy and continuous influence of urban planning and policy choices that undermine conditions of accessibility by proximity are too significant to be overcome by limited interventions. What to do for these areas is therefore critical from a planning and policy perspective, especially considering that the lack of accessibility by proximity often, although not exclusively, intersects with social disadvantage and exclusion.

This is a critical reminder of the current limitedness of the 15-min discourse, which is at risk of describing more what successful areas already are than articulating a strategy for widespread change, starting from more extreme but not quantitatively marginal conditions.

The second lesson, linked to the latter, is that within this challenging context, places of residence cannot be the only entry points to build accessibility by proximity. Notwithstanding processes of centralization of jobs also linked to tertiarization, in contemporary urban regions, significant clusters of jobs and businesses—in manufacturing and logistics but also tertiary—are located in more peripheral areas at times not far from residential areas that lack the most accessibility by proximity. Area-based strategies can also be centered on these contexts, focusing on workers and their daily lives instead of residents.

The third lesson is that a larger framework of analysis, such as the one we employed in our work, broadens current discourses on accessibility by proximity to broader issues and goals of relocalization. In Milan, as in other contemporary urban regions, areas that relatively lack the former can present significant potential in terms of the latter. Relatively lower-density, peripheral areas can show conditions of great proximity to rural resources on which building policies to thicken residents' relations with the local scale. In general, issues related to the ecological transition of urban metabolisms can be pivotal in this regard, building on residents' practices to re-localize the production, consumption, and recycling of specific resources.

In conclusion, as we moved to operationalize the 15-min city discourse, we ventured into a journey that ultimately led us to a profound reconceptualization of its contents. What seems to us the more strategic concept around which to build a variety of planning and policy reflections and tools in contemporary urban regions is proximity, in the sense of a general relevance of the local scale in the life of metropolitan dwellers. Contemporary urban regions are highly uneven contexts, where proximity cannot mean everywhere the same thing and cannot be taken everywhere at the same level. However, some forms of increased proximity can be achieved through various ways, and not uniquely the ones related to "accessibility by proximity", which appear to be still very uneven and unlikely to significantly increase without high-level and substantial policy interventions.

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Planning for Accessibility by Proximity: Emerging Challenges

Evaluating Urban Proximity: The Slowness Quality Index

Federica Bianchi, Rossella Moscarelli, and Paolo Pileri

Abstract Slowness allows us to experience different practices and spaces of proximity, depending on the means, e.g. on foot or by bike, and on the intention of the movement, e.g. for daily activities or for leisure. Such relation between slowness and spaces, both at urban and territorial scales, opens up scenarios in which mobility is not just an act of transport, but also a possibility of living and designing the places. From this perspective, the contribution discusses a method of analysis to evaluate the quality and the usability of slow paths, by introducing the Slowness Quality Index (SQI). The chapter describes the index and shows its application in an urban context, by evaluating 24 daily pedestrian routes (hypothetical paths between home and school, park, or other pupils' activities) in the metropolitan area of Milan. The results obtained allow us to test the index and identify its possible developments and limitations.

Keywords Slowness · Index · Mobility · Urban quality

1 The Relevance of Slowness in Designing Places of Proximity

The chapter introduces the Slowness Quality Index (SQI), an indicator to measure the quality of slow paths. The main objective is to evaluate and rate both a path and its surroundings. The index integrates evaluation methodologies focused on the quality of slow paths [8, 9], and of places of proximity as well [6, 11]. This methodology highlights the idea that slowness is not just an alternative way of transportation from point A to B, even if more sustainable, but it is also a remarkable opportunity to have a fully immersive experience of the space [5]. Slowness is strongly related to places, as it accentuates the perception of the surroundings which, with their affordances, may affect people's behaviours, choices of mobility and health [1]. Consequently,

F. Bianchi (✉) · R. Moscarelli · P. Pileri
Dipartimento di Architettura e Studi Urbani, Politecnico di Milano, Milan, Italy
e-mail: federica.bianchi@polimi.it

P. Pucci and G. Vecchio (eds.), *Questioning Proximity—Opportunities and Challenges for Urban Planning and Mobility Policies*, PoliMI SpringerBriefs,
https://doi.org/10.1007/978-3-031-66071-9_6

the achievement of the quality of public spaces is a key issue in designing proximity walking and cycling routes: slowness and places influence each other [2, 3, 13] and we need to consider it when planning "projects of slowness" that combine strategies on the route and on the passed through territory [10].

Subsequently, the SQI considers both the features of the path and of the places of proximity starting from the following criteria (Fig. 1):

- Geometric criteria (G), which refer to the configuration of the space of the route (e.g. sidewalk width, interruptions, crosswalks, changes of section, obstacles, etc.).
- Functional criteria (F), which refer to the different activities in proximity (e.g. number and type of services, commercial activities, permeability of the ground floors, etc.).
- Perceptive criteria (P), which refer to the sensory and emotional stimuli on users along the route (e.g. noises from the surroundings, visibility, etc.).

The three criteria provide a synoptic evaluation of the path and the spaces of proximity (Table 1).

The combination between criteria and scores k_i (Table 2) form the formula of SQI (Level 1) as it follows:

$$SQI = \sum Gk_i + Fk_i + Pk_i \quad (1)$$

The formula can be applied and adapted to different types and scales of slow paths. In this sense, the index aims at improving other kinds of indicators already quite studied, such as those concerning the so-called walkability [4, 7, 12]. The main difference from other walkability indexes is the intention of finding a method of evaluation suitable to different slow movements. This wide application is essential as slowness can be experienced in several manners: on foot, by bike, etc.., with different intentions (daily activities, leisure) and in different contexts (in urban areas or countryside). The basic formula of the index is suitable for many practices of slowness thanks to the application of weighting systems and the selection of specific features (Table 2) with which we calculate the score related to each criterion.

This second aspect is best illustrated through examples of daily pedestrian routes in the metropolitan area of Milan, an urban context where the index was tested for the first time. A slow and daily pedestrian path defines also specific places of proximity in its surroundings, such as urban neighborhoods.

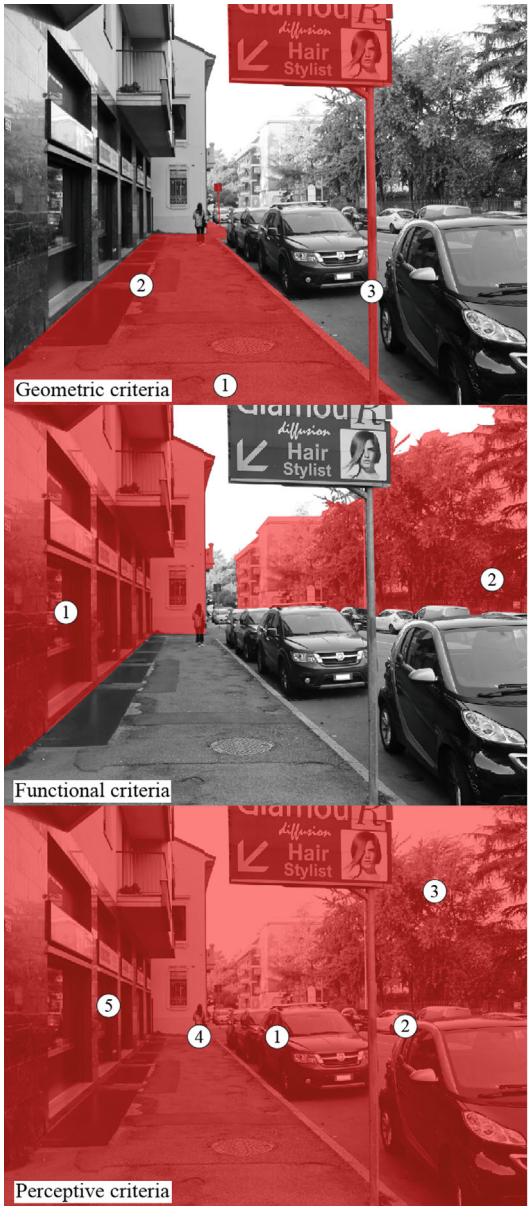

Fig. 1 Examples of the three criteria. **a** Shows geometric criteria: sidewalk width (1), discontinuities (2) and obstacles (3); **b** shows functional criteria: commercial activities (1) and a park (2); **c** shows perceptive criteria: obstructed visibility by cars (1), noises from the street (2), sounds of nature (3), presence of other people (4) and smells from shops (5). Elaboration by the authors

Table 1 Functions of criteria. Geometric criteria refer only to the slow path where movement occurs (e.g. the sidewalk and the elements within it); functional criteria refer to the spaces of proximity (e.g. buildings along the path); perceptive criteria refer to both (e.g. people encountered on the path, noises from the street)

Criteria	Areas of influence	
	Slow path	Spaces of proximity
Geometric	*x*	
Functional		*x*
Perceptive	*x*	*x*

2 Application of the Slowness Quality Index: A Sample of Daily Walking Paths in Metropolitan Milan

Once defined the practices of slowness, we need to articulate the criteria (Level 1) through specific features (Level 2). In the case study, the scope is to evaluate daily urban routes for children and young people. Therefore, we considered four essential features:

- Pedestrianity (geometric criteria), referred to the quality of the construction of pedestrian infrastructure;
- Practicability (geometric criteria), referred to the maintenance of the route and its ease of use by all users (especially the most inexperienced and fragile ones);
- Liveliness (functional criteria), referred to the multiplicity of uses of the route for different purposes and activities;
- Pleasantness (perceptive criteria), referred to the user's enjoyment of the walk.

Each feature (Level 2) has been analyzed quantitatively (Level 3), based on the value of scores assigned to the SQI formula. Below, Table 2 shows a summary of the three different levels necessary to calculate the SQI of slow pedestrian paths in urban areas.

Table 2 The three criteria (Level 1) that compose the SQI can be developed through specific features (Level 2) that describe slow paths and their surroundings. Each feature can be analyzed through quantitative measures (Level 3), which are translated into numerical values (score k)

Criteria Level 1	Feature Level 2	Quantitative measure (score k) Level 3
Geometric	Pedestrianity	Width of sidewalks (Sw): percentage of pathway with a width ≥ 1.5 m [%]
		Pedestrian crossings (Pc): average number of crosswalks [n/100 m]
	Practicability	Discontinuities in the pavement (Di): average number of discontinuities [n/100 m]
		Obstacles along the path (Ob): average number of obstacles [n/100 m]
Functional	Liveliness	Services/commercial activities (Ac): average number of activities along the path [n/100 m]
		Permeability of ground floors (Gf): percentage of pathway along permeable ground floors [%]
Perceptive	Pleasantness	Safety perception (Psaf): percentage of pathway protected from car traffic [%]
		Sensorial perception (Psen): percentage of pathway with positive sensorial perception [%]

In these slow urban pedestrian paths, geometric criteria have special importance because this aspect is more crucial than others, and a larger number of scores was selected (four contra two of the other families), becoming heavier. In other applications of the SQI, it is possible to prioritise the criteria by adding or removing scores for each of them.

Subsequently, each quantitative measure introduced above is converted into numerical scores to compose the SQI formula.

From the results of these criteria, the basic SQI formula is expressed in:

$$\mathrm{SQI} = \mathrm{Sw} + \mathrm{Pc} + \mathrm{Di} + \mathrm{Ob} + \mathrm{Ac} + \mathrm{Gf} + \mathrm{Psaf} + \mathrm{Psen} \quad (2)$$

The SQI formula was tested[1] on 24 pedestrian paths in the metropolitan area of Milan. Each path was 600 m long (including outward and return) between a school and a key destination for its pupils, with a total of 15,695 m analyzed. Among the schools, there were:

– 14 primary schools

[1] The test was developed within the university course "FestinaLente: planning and design of slow cycling and walking lines" of Politecnico di Milano, held by prof. Pileri during the academic year 2022/2023. Students divided into groups were guided through a series of analyses preparatory to the application of the SQI in proximity contexts familiar to them. A previous test was conducted by the authors in some schools in Varese province, as part of the MOVEON project, to establish a unified survey methodology.

– 7 secondary schools
– 3 high schools.

while the destinations were:

– 10 parks
– 7 squares
– 3 residential areas
– 2 cultural centers
– 1 oratory
– 1 train station (only for high school).

As mentioned before, not always the analyzed routes strictly overlap to the definition of connection between services of proximity. However, it is important to note that, in this first test, the application method itself is more relevant than the connections' objects.

Based on collected data, each quantitative measure was scored as shown in Table 3.

For the criteria, the maximum achievable scores are:

– Geometric: 20 pts

Table 3 For each quantitative measure are reported the scores necessary to calculate the SQI

Quantitative measure	Score
Sw: percentage of pathway with a width ≥1.5 m [%]	< 85% → 1pt =85–95% → 3pts >95% → 5pts
Pc: average number of crosswalks [n/100 m]	>1 → 1pt =1–0.5 → 3pts <0.5 → 5pts
Di: average number of discontinuities in the pavement [n/100 m]	>15 → 1pt =15–10 → 3pts <10 → 5pts
Ob: average number of obstacles along the path [n/100 m]	>7.5 → 1pt =7.5–2.5 → 3pts <2.5 → 5pts
Ac: average number of activities along the path [n/100 m]	<1 → 1pt =1–3 → 3pts >3 → 5pts
Gf: percentage of pathway along permeable ground floors [%]	<25% → 1pt =25–50% → 3pts >50% → 5pts
Psaf: percentage of pathway protected from car traffic [%]	<25% → 1pt = 25–50% → 3pts >50% → 5pts
Psen: percentage of pathway with positive sensorial perception [%]	<25% → 1pt = 25–50% → 3pts > 50% → 5pts

Table 4 Application of the scores presented in Table 3 to the case study (average results)

Quantitative measure	Average value	Score (pts)	Criteria (pts)
Width of sidewalks (Sw)	83%	1	Geometric: 8
Pedestrian crossings (Pc)	1,1/100 m	1	
Discontinuities in the pavement (Di)	8,5/100 m	5	
Obstacles along the path (Ob)	11,3/100 m	1	
Services/commercial activities (Ac)	1,9/100 m	1	Functional: 4
Permeability of ground floors (Gf)	33%	3	
Safety perception (Psaf)	12%	1	Perceptive: 4
Sensorial perception (Psen)	37%	3	

– Functional: 10 pts
– Perceptive: 10 pts.

This means that an urban pedestrian path of 600 m in optimal condition will have a SQI equal to 40.

A summary of the results is in Table 4, which reports the average values obtained considering the totality of the paths analyzed, the respective scores and the scores for the criteria.

By entering the data within the formula, the SQI results of 16 out of 40 points.

$$\text{SQI} = (1 + 1 + 5 + 1) + (1 + 3) + (1 + 3) = 16 \tag{3}$$

The results indicate that some aspects are more critical than others. For example, the width of sidewalks and crosswalks (pedestrianity), obtained minimum scores. Also, the presence of obstacles along the path is more problematic than discontinuities in the pavement, which define most of the score of the whole geometric criteria. Regarding functional criteria, the score is defined primarily by the permeability of ground floors, while the presence of services/commercial activities seems to be rarer. Finally, regarding perceptive criteria, safety perception has been detected in only 12% of the path, indicating that 88% of the route is perceived as unsafe, while a positive sensorial perception has been detected in over a third of the overall case study. The comparison of the different scores acquired allows for finding priority areas for interventions: this is the main merit of the SQI.

3 First Reflections on the Slowness Quality Index: Potentialities, Limitations, and Further Developments

The chapter has introduced the SQI to evaluate slow paths. The index has three main peculiarities:

– The definition of criteria, to analyze both the path and its context (slowness and spaces of proximity are seen as correlated aspects);
– The applicability of a variety of characteristics that slow lines may have. Evaluation of urban daily routes for commuting, extra-urban routes for leisure, on foot and by bike.
– The adaptability to reflect the specific characteristics of various cases: the distinction in the three determining criteria makes the required intervention clearer. Such methodological simplicity, expressed also in the gradual articulation of 3 Levels, is essential since the index has been conceived as an easy tool for administrators, and scientific studies alike.

The results of the first application of the index confirm the usefulness of the method. The analysis underlines the extent to which the practice of slowness is hindered by current urban design.

This study has revealed that the SQI has four areas where development is required:

– analysis of a wider sampling in order to determine more precise and reliable benchmarks and thresholds of data collection and results;
– analysis on different contexts, both urban and extra-urban;
– test and definition of a standard sample length to which to apply the analyses;
– further standardization of measurements that could vary based on the subjectivity of each data collector, i.e., the quality of the walking experience.

Beyond these modifications, additional steps involve the computation of a numerical value associated with different results obtained for each criterion. This will allow comparison between different paths within similar contexts.

Acknowledgements The part written by R.M. is a result of the study carried out within the MOST—Sustainable Mobility National Research Center and received funding from the European Union Next-GenerationEU (Piano Nazionale di Ripresa e Resilienza (PNRR)—Missione 4 Componente 2, Investimento 1.4—D.D. 1033 17/06/2022, CN00000023). This manuscript reflects only the author' views and opinions, neither the European Union nor the European Commission can be considered responsible for them.

Author Contributions The authors shared the concept of the chapter. F.B. and P.P. conducted the analysis. F.B. wrote paragraph 2. R.M. wrote paragraph 1. Together, F.B., R.M. and P.P. wrote paragraph 3.

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Starting with Schools: Proximity as a Space of Governance in Both Urban Planning and Educational Policies

Paola Savoldi

Abstract In the history of urban planning, the relationship between schools and cities has two dimensions. The first concerns ensuring the right proportion of planned new inhabitants and new schools. The second concerns providing all public facilities on the neighborhood scale and foreseeing the relations between schools and other services, according to a proximity metric. In the last few decades, the conditions of proximity are weakened and require rethinking, particularly in the context of new proportions in the relationship between the size of the neighborhood, the number of school-age residents, and school buildings. A new balance in the organization of access to schools to reduce processes of segregation and new responses to the new needs expressed by new profiles of inhabitants in terms of access to public spaces and facilities should similarly be considered. This essay proposes to rethink the proximity metrics by paying attention to schools and the possible coordinated action in urban space by urban planning and educational policies, starting with schools' role in re-establishing equitable access to school services.

Keywords Proximity · Urban planning · Educational policies · School segregation

1 Houses, Schools, and the City

Among the viewpoints from which it is possible to discuss the concept of proximity, this contribution explores the relationship between schools and cities.

Except for a few phases in the history of modern urban planning, the relationship between schools and the city is not a frequently discussed topic. School spaces played a relevant role in the theories and planning experiences for the new neighborhoods of the industrial city [10, 27]. The metric of proximity, based on the distance between home and school, is a real unit of measurement from which to design the spatial layout and number of inhabitants of a new neighborhood.

P. Savoldi (✉)
Dipartimento di Architettura e Studi Urbani, Politecnico di Milano, Milan, Italy
e-mail: paola.savoldi@polimi.it

P. Pucci and G. Vecchio (eds.), *Questioning Proximity—Opportunities and Challenges for Urban Planning and Mobility Policies*, PoliMI SpringerBriefs,
https://doi.org/10.1007/978-3-031-66071-9_7

Subsequently, however, schools were not directly the subject of transformation forecasts and strategies from an urban perspective until the first decade of the 2000s. Once supply becomes proportionate to demand, the issue is no longer on the agenda. Only recently has a direct interest re-emerged in both the material conditions of school spaces and the possible role of educational institutions in local development, particularly in the most fragile urban contexts. The effects of the pandemic have emphasized and accelerated a process of reform in the organization of urban public spaces near schools [17, 25].

In this perspective, proximity is thus a conceptual and operational tool that has had normative value to the design of urban spaces. This condition concerns both urban planning and educational policies. The principle of proximity contributes to the organization of educational policies in urban space. For educational services, the school catchment area refers not only to the number of students enrolled in an educational institution but also to the area in which they dwell. It thereby considers the distance of the home-school route and the time required to travel it, depending on student's ages. We can thus argue that, when the concept of proximity incorporates the relationship between schools and the city, policies and programs under different local government sectors are aggregated. However, over time, some structural changes and reform processes have caused changes in the use of the concept of proximity.

The discussion of the concept of proximity, concerning processes that affect the organization of cities and educational institutions, can be conducted by reconstructing the changing role of proximity in the relationship between urban planning and school infrastructure planning (Sect. 2), and by the change of specific regulatory mechanisms functional to the spatialized definition of educational policies at the urban and territorial scale (Sect. 3) in parallel. This excursus makes it possible to understand that schools can be places where social injustice and territorial imbalance progressively accumulate, manifesting through the reduction or substantial homogeneity of enrollment in a certain school. To deal with this order of urban problem, it is necessary to swing from close observation of the dynamics and conditions of individual contexts (sphere of proximity) to an overall look that allows one to recognize in urban spaces the incidence of critical phenomena affecting schools. In this direction, Milan seems to have initiated some attempts at intervention, albeit insufficiently coordinated with one another (Sect. 4).

2 Urban Planning

While greatly simplifying, it is possible to recognize several different phases that occurred in Italy between the post-World War II to the present. These include, on the one hand, the nexus between city planning and organization and on the other, school building planning and design on the other has emerged explicitly in Italy.

The first phase is rooted in the experiences initiated in the Anglo-Saxon context by Howard on the Garden City [13], by Perry for the New York Regional Plan [20], and by Abercrombie regarding the Greater London Plan [1]. The extent of the

neighborhood unit coincides with the catchment area of the elementary school. This, in turn, coincides with the practicability of the pedestrian route from home to school and ensures a sufficient degree of proximity to facilitate social relationships in the local community [7, 16].

The second phase is between the second half of the 1950s and the early 1980s. Planning new schools in urban settings was related to constructing new housing districts and was functional in implementing important national laws. In the Italian context the first was the introduction of compulsory school attendance up to the age of 13 in 1962 [8], which implied the need to build new school buildings. The second was the decree establishing "urban standards" in 1968 which, based on the experience of the Ina-Casa Plan [11], establishes the minimum standards of spaces and services to be provided through the urban plan [15, 21]. The third is a ministerial decree of 1975 that updates the standards dedicated to school construction and refers to "urban functionality indices", emphasizing the relevance of the time and ways needed to get to school, and foreshadowing issues of proximity and mobility [3] [Fig. 1].

In these phases, the design of new neighborhoods aims for autonomy in the daily life practices of the child population and those who cared for them: women. The spaces of proximity are thus both the site and the tool of social organization based on the separation between a female reproductive sphere and a male labor sphere [12].

In the following years, the progressive increase in women's education and employment rates contributed to the transformation of the daily use practices of proximity spaces. In addition, economic growth has slowed down since the late 1970s; in Italy, the demographic trend records a decline that will be confirmed in the following decades [23], household members are decreasing [14, 24], migratory movements at least partially offset the demographic contraction and represent a challenge in reorganization and coexistence within neighborhood spaces.

Two trends emerge among the implications of these dynamics. On the one hand, we are witnessing a weakening of the practice of proximity that had the school as one of its most potent centers of gravity. This is especially the case in dense, centrally or semi-centrally located urban areas inhabited by middle- or upper-middle-income populations, often with cultural and solid capital. On the other, there is a kind of inexorable re-centering of everyday living spaces within the neighborhood of residence, mostly in decentralized areas, often inhabited by low-income populations, some of them with migrant backgrounds. Educational services are an essential presidium, but they suffer from multiple criticalities including poorly maintained conditions of the material spaces of the school and its surroundings and unbalanced distribution of users with effects of polarization and segregation [19].

What can urban planning do? Urban planning no longer designs new urban areas but instead, it regulates spaces and services planned with proximity principles at least 50 years ago. These spaces are used today by inhabitants quite differently from inhabitants of the past. Available resources are limited, and the needs and behaviors of inhabitants are more diverse and less stable over time.

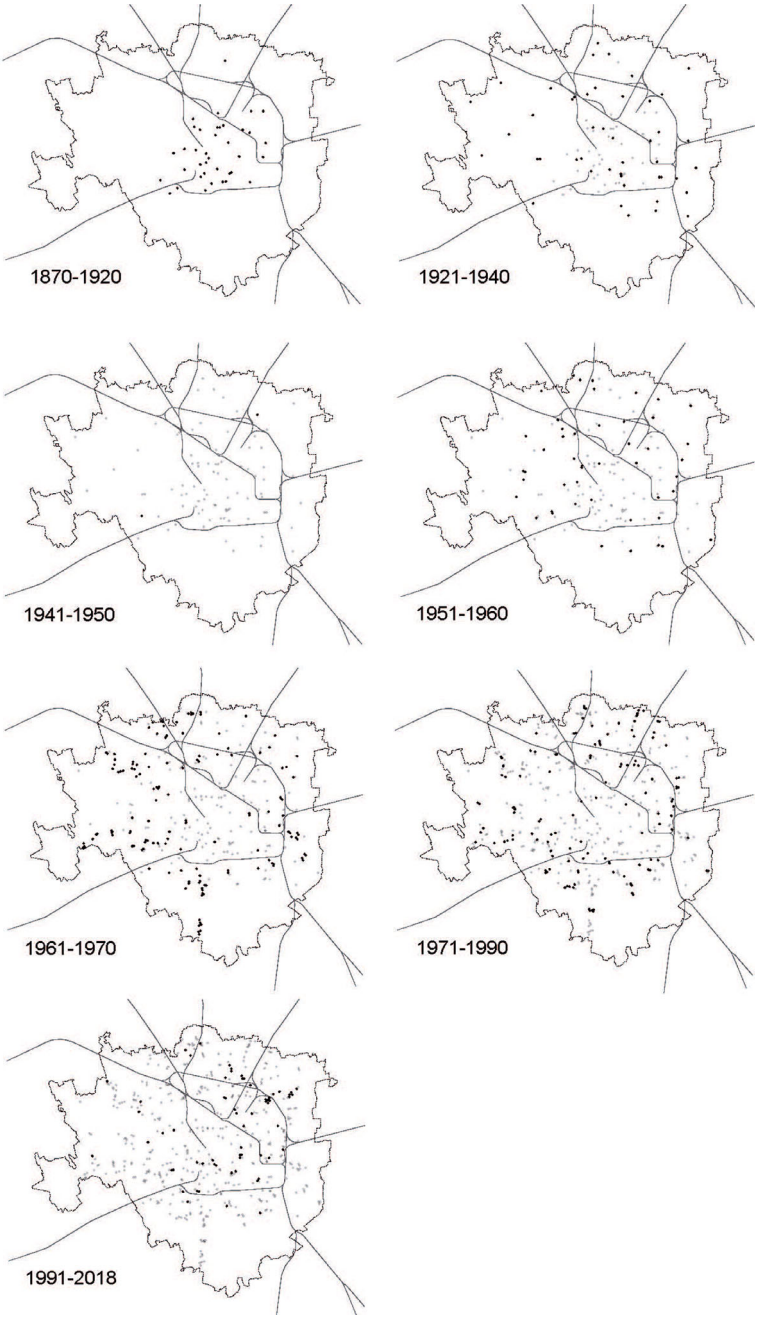

Fig. 1 The evolution of school buildings in Milan; in black are the new buildings at each of the identified periods. Elaborated by Federica Rotondo

3 Education Policies

In Italy, the last century's urban development phase supported a widespread educational system and consolidated the organization and management of educational services by two main public actors: the Ministry of Education and local authorities. Regarding the relations between this process and the proximity dimension, it is helpful to focus on the services dedicated to the 0–14 age group (early childhood services and first-cycle schools).

The Ministry of Education manages the teaching, technical, administrative, and auxiliary staff active in first-cycle schools. Local governments own the properties of most first-cycle public services and are required to manage enrollment processes. The watershed is a controversial reform that began during the 1990s and recognized greater autonomy for educational institutions [6]. We will focus on one aspect of the reform that significantly impacted daily life practices and their gravitation area.

As in other European contexts, the governance of first-cycle educational services in Italy has long been linked to the definition of school basins. These catchments define an area whose extent is established according to school capacity and the distance between the school and the users' residence. Before the school autonomy reform, the school catchment area was regulated by local governments and drew a geography of local gravitation, in which residents insist on the same school and their daily travel has converging trajectories. Thus, historically, there is consistency between the design of neighborhood units and the administrative management of educational services. The school district is the spatial order through which educational policies apply the principle of proximity.

The transition initiated by the school autonomy reform decouples the proximity scale from the gravitation area of home-school routes. Students' parents can choose a school close to their residence or a school they prefer because of its educational approach, reputation, quality of space, or proximity to their place of work. In this new scenario, school catchment areas stop being a local government device [9].

The freedom of enrollment movement that the reform legitimized has had noticeable consequences. Some recent studies show that although forms of housing segregation are less severe in the Italian context than in others, school segregation is more intense and is correlated to the choices of Italian schools [4].

In the most socially disadvantaged neighborhoods of the city of Milan the likelihood of Italian families enrolling their child in schools outside the catchment area reaches 40 percent. This contributes to an increase in the concentration of the most disadvantaged pupils who are also the least likely to move to schools located in neighborhoods different from their residence [18].

Viewed through this lens, the loosening of the principle of proximity guaranteed by school catchment areas appears to increase the risk of territorial inequality. In contexts more strongly marked by the phenomena of housing segregation, on the other hand, school enrollment systems are supported by allowing for the mixing of different catchment areas to create conditions of social mix [2]. It is clear then that the dimension of proximity (1) does not refer exclusively to ideal conditions of

urbanity and social mix; and (2) can help reduce or exacerbate conditions of fragility, depending on the way social organization takes place in the city.

4 Experiences

The interventions to fight school segregation concern several dimensions: experimenting with innovative learning approaches, organizing activities aimed at all levels of citizenship, and transforming public spaces close to the school [22]. Italian experiences occur in different ways: the central government supports some [26], and others are local initiatives [17].

Regarding municipal initiatives, the Milanese experience may provide a helpful example [5]. In July 2020, the Education and School Services Directorate of the City of Milan launched a public call inviting comprehensive schools to propose new furniture projects in school spaces. The program is a tool that, through schools, reconciles a proximity perspective with an urban perspective. The call introduces evaluation criteria in which two contextual variables weigh in: school segregation value and school attractiveness value.

On the one hand, this approach rewards the best projects related to the spaces of each candidate school. On the other hand, it recognizes a social and spatial geography of educational institutions aspiring to affect the critical local conditions. Through interventions in schools, the quality of school service improves to the benefit of those who reside nearby and the city implements a urban rebalancing strategy.

Parallel to this, there was an initiative related to the Municipal Urban Planning Department. This call dedicated tactical urban planning interventions to public spaces, providing access to schools. The public notice "*Piazze aperte per ogni scuola*" calls for projects to be proposed by those who attend schools and the spaces near schools, in the neighborhood.

Civil society, third-sector entities, and educational institutions are responsible for the outreach dimension. The program is being implemented. There are numerous candidate projects, only some of which have already been initiated. The city administration has identified the feasibility conditions of the proposals as the only priority criterion. The interventions will be the outcome of a process in which the mobilization capacity of individual contexts has weighed first and foremost [Fig. 2].

The challenge and opportunity may lie in engaging the two initiatives or hybridizing their approach. If proximity becomes central to some of the policies and interventions promoted by the city administration and if one shares the idea that spaces in and around schools can once again play a role in recomposing inequalities, then one must be able to choose where to intervene as a priority. A rationality (system), similar to that used by educational services, to define the sequence and distribution of resources needed to implement urban interventions, must be used.

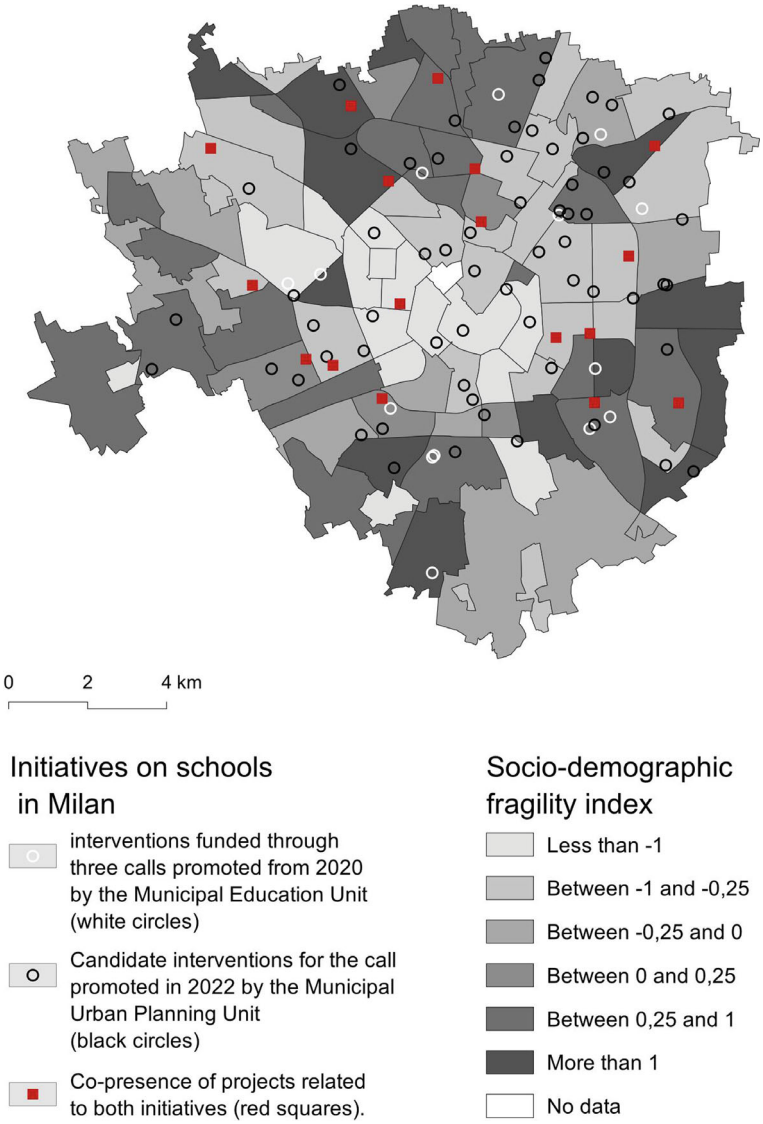

Fig. 2 Projects on school spaces in Milan in 2023. The map distinguishes the different degrees of socio-demographic fragility* for each of the Nuclei di identità locale** and allows us to read the relationships between projects and context conditions. Elaborated by Carla Baldissera. *Socio-demographic fragility index, composition: % foreign residents (2021), % renter households (2011), % overcrowding (2011), % low educational qualification (2011), % elderly (over75) at risk of isolation (2021). The index was composed by summing the standardized scores of the basic variables and then calculating the standardized score of the sum. **__Nucleo di identità locale (NIL), Local Identity Cores__: They are portions of the territory with at least partly similar features regarding history, spatial arrangement, and vocation. On Milan's territory, 88 nuclei of local identity are planned, including through the organization of public services of proximity

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About the Distribution of Daily Services and Commercial Opportunities

Luca Tamini

Abstract In the domain of the urban planning, social and economic set-up, a new virtuous relationship between retail services, along with last mile logistics and urban regeneration projects acquire a role transcending the simple spatial accumulation of different productive activities. They provide the local population with a qualitative endowment of services, generating urbanity, as well as a space of interaction, aggregation and collective time. Few key factors and the contextual conditions that have orientated the diversification and complementarity of the urban supply and the projects of the new urban centralities—oftentimes closely related to the residential proximity areas—have brought to the fore a marked complementariness between the following compositional and settlement elements: spatial integration and urban mix; town planning and architectural quality; settlement regeneration and substitution; public relevance of urban retail services; unified coordination of retail aggregates (district intensity). These dynamics underway open up a planning reflection on the strategies of enhancement of proximity services that, from a gravitational viewpoint, are capable of attenuating the extended outflows of expenses towards the extra-urban territory by projects aiming at the revival and competitive repositioning of historical centres, at the creation of local services districts, channeled by the activation of a public/private structures of coordinated management of large, medium and small-size retail vacancies.

Keywords Economies of proximity · Services of general interest · District intensity · Retail vacancy · Planning tools · Urban regeneration

L. Tamini (✉)
Department of Architecture and Urban Studies, Politecnico di Milano, Milan, Italy
e-mail: luca.tamini@polimi.it

P. Pucci and G. Vecchio (eds.), *Questioning Proximity—Opportunities and Challenges for Urban Planning and Mobility Policies*, PoliMI SpringerBriefs,
https://doi.org/10.1007/978-3-031-66071-9_8

1 A Possible Interpretation of Proximity Economies in Urban and Building Transformation Initiatives: The Case of Milan

Within the framework of a collaboration agreement in October 2023 between Politecnico di Milano and the Urban Economy, Fashion, and Design Project Directorate of the Municipality of Milan, aimed at defining a set of urban-commercial indications, guidelines, and proactive contributions to support and revitalize proximity services and urban economic activities in Milan neighborhoods, a study was conducted by Urb&Com Lab of the Department of Architecture and Urban Studies on the role of urban economies and new forms of entrepreneurship within the revision activities of the Territorial Government Plan, which assume an essential role among the initiatives for strengthening the proximity city/neighborhood city, spatially organized in nuclei of local identity, in urban districts of commercial services, and in a system of new centralities and urban squares.

The objectives of the collaborative process—in line with the programmatic lines of the municipal administration and the priorities related to the realization of the "15-min city" aimed at supporting the development of the proximity economy, neighborhood commerce, historic shops, and, in general, experiences of "civil economy," capable of combining economic and environmental sustainability and positive social impacts—focus on:

- defining an interpretative analysis that identifies the competitive positioning of neighborhoods in relation to commercial and service offerings, taking into account the evolving dynamics of the central area of the city and its territorial context (metropolitan and regional);
- identifying medium-term strategic objectives aimed at defining active urban and economic policies to support and revitalize proximity services and economic activities;
- promoting relationships between the university, the Municipality of Milan, and other territorial actors to share knowledge and skills and promote stakeholder engagement.

Within this general framework, the project is divided into three main activities:

(a) Cross-analysis of available databases aimed at an interpretative reading of the current context of supply and trends in the local and neighborhood economy
(b) Definition of a set of urban-commercial indications, guidelines, and proactive contributions
(c) Design and implementation of a stakeholder involvement path.

From a methodological standpoint, the activity carried out has developed mainly along two lines of work:

- Definition of proximity economy through theoretical and interpretative insights useful for building a knowledge base for the drafting of municipal guidelines for

the agreement of proximity economic activities in the system of facilities and equipment of general or public interest in Milan;
– Interpretation and processing of existing and/or to be collected databases to provide a comprehensive and effective framework regarding the consistency of retail trade and, specifically, of neighborhood businesses.

In the development of a strategy for the promotion and development of neighborhood economies, the need for initial theoretical and interpretative clarification on the definition of the proximity economy has emerged, aiming to identify the types and characteristics of both activities and services and the nature of economic entities and operators in the field. These elements are conceived as "proximity" (spatial, functional, relational) and therefore as a potential object of agreement in the system of facilities and equipment of public or general interest, an element of potential innovation in Milan's urban policies.

As an interpretative background to this phase of the study, concepts of proximity and urban economy were further explored by reading and analyzing materials produced by the EU and the Municipality [4]. A literary research was conducted to identify definitions and additional keywords regarding the concept of "proximity" in the context of a critical review of the "15-min city" concept; keywords were extrapolated to remark the difference between urban economy and proximity urban economy, and reflections and proposals on the concept of proximity service for commercial functions and other urban economic activities were presented.

The research reveals, for example, that from various European and international experiences the "15 min" emerge as a variable quantification that should be sized considering different intervals ("x-minute city") to be defined depending on the type of service [5] and the specific characteristics of a city (territorial size), consistently with the well-known concept of chrono-urbanism or the consideration that the quality of urban life is proportionally inversely related to the amount of time spent on transportation, especially if using motor vehicles [6] (Fig. 1).

An additional complexity is introduced by adding variables beyond the simple presence of a particular service, such as:

– Types of functions/activities/services;
– Quality of the offered oods/service;
– Access to a multitude of similar services (comparison).

This research has allowed to outline more clearly the concepts of "proximity urban economy" and "urban economy" and to develop synoptic diagrams useful for conceptualization and comparison with the Municipality of Milan (Figs. 2 and 3).

Which of these activities play a role as a "proximity service"? Can a value be identified depending on the type of activity? What factors should be considered? To answer these questions, the identification of different families of economic activities that perform a proximity service in different ways was proposed (Table 1).

City	Time	Definition/metric
Copenhagen, Denmark.	5 min	A maximum 5-minute walk to all amenities and public transport (State of Green, 2016)
Melbourne, Australia.	10 min	"20-minute return trip to all amenities" (Victoria State Government, 2021)
Shanghai, China.	15 min	A maximum of 15 min to walk to all amenities (Wu, Wang, et al., 2021)
Paris, France.	15 min	A maximum of 15 minute walk or bike to all amenities (Yeung, 2021)
Milan, Italy.	15 min	A maximum of 15 minute walk or bike to all amenities (C40 Cities, 2020)
Christchurch, New Zealand.	15 min	The possibility of accessing basic services within 15 min by walking and public transport (Christchurch City Council, 2021)
Portland, OR, USA	20 min	A maximum of 20 min to walk, bike or public transport trip to all amenities (City of Portland, 2010)
Hamilton, New Zealand	20 min	A maximum of 20 min to walk, bike or public transport trip to all amenities (Hamilton City Council, 2020)
Tempe, AZ, USA	20 min	"One-mile walking distance, a four-mile bicycle ride or a 20-minute transit trip" (Arizona State University, 2021)
Ottawa, Canada	15 min	A maximum of 15 min to walk to all amenities (City of Ottawa, 2021)
Glasgow, Scotland	20 min	A maximum of 20 min to walk to all amenities (Glasgow City Council, 2021)
Detroit, USA	20 min (neighbourhood level)	A maximum of 20 min to walk, bike or public transport trip to all amenities (excludes work) (Twenty-Minute Neighborhoods, 2016)
Madrid, Spain	15 min	A maximum of 15 minute walk or bike to all amenities (C40 Knowledge Community, 2020)
Milan, Italy	15 min	A maximum of 15 minute walk or bike to all amenities (Iolov, 2021)
Seattle, USA	15 min	Various distances and time measures depending on zoning (Seattle City Council, 2020)

Fig. 1 World cities and definition of "x-minute city". *Source* [5]

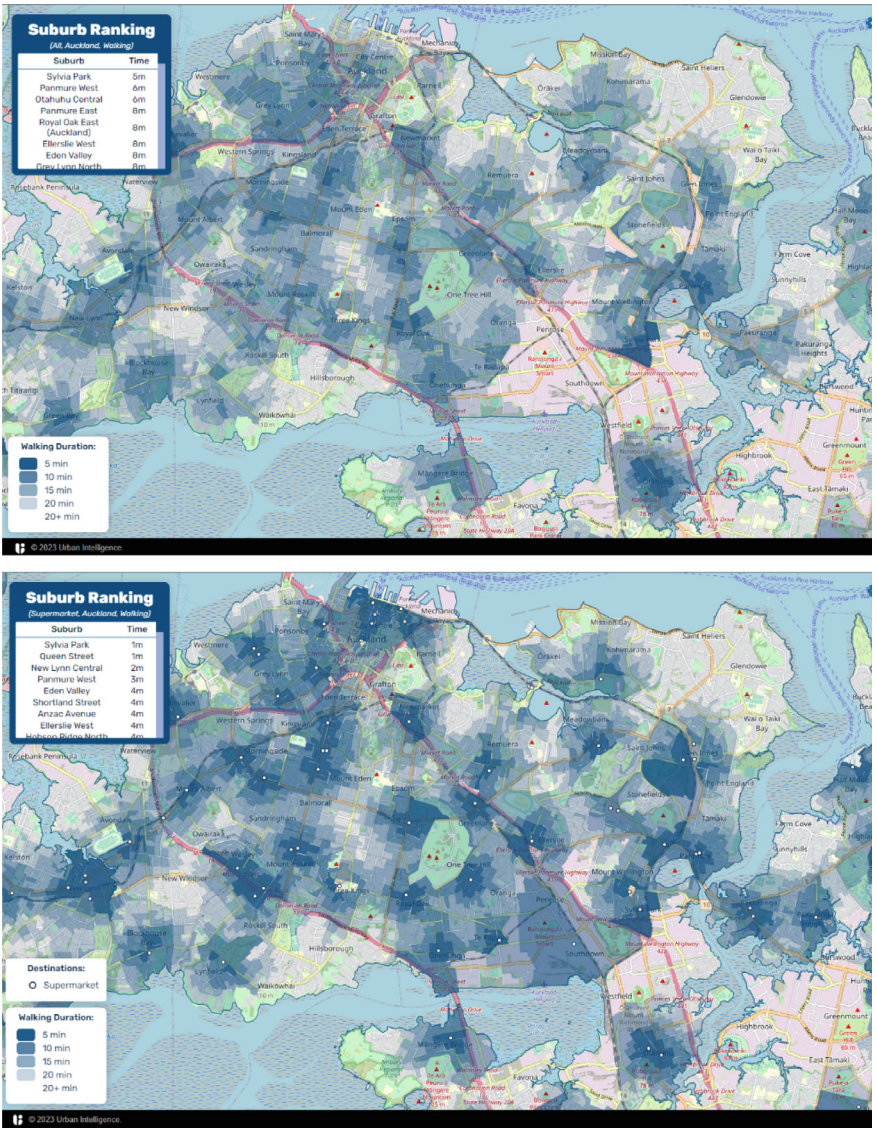

Fig. 2 Proximity to services: application in the context of Auckland (NZ). *Source* [5]

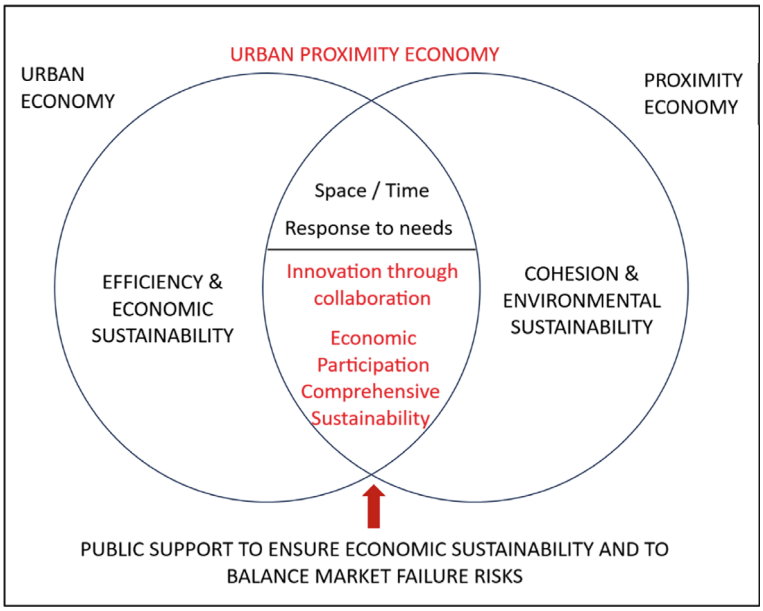

Fig. 3 Relationship between urban economy and proximity economy (*Source* Author's elaboration, 2024)

2 First Results: How Many Proximity Business Are There in Milan, and How Are They Structured?

One of the outcomes of this initial research phase has been the definition of the composition of the proximity economy in Milan, carried out through a selective elaboration of data provided by the Milan Chamber of Commerce, Monza Brianza and Lodi (Business Register as of December 31, 2023), which revealed the presence in Milan of approximately 43,600 business units, accounting for 18% of business units, with 132,000 employees equivalent to 13% of active employees at the municipal level. Of significant interest is the articulation of urban proximity economic activities: 27.5% female-owned businesses, 24% youth-owned businesses, 25.5% of foreign origin, with an overall increase compared to 2019 both in business units (+1.91%, equivalent to approximately 13,350 units) and in employees (+1.87%).

The study of the variation from 2019 to 2023 of proximity businesses operating in Milan emphasized a contraction in retail trade (−3.38% of business units compared to 2019 and −8.35% of employees compared to 2019, amounting to 33.000 units) with a significant percentage reduction in supply, determined—in several merchandise sectors—also by the vertical competition of e-commerce platforms: −11.98% for toys, −11.73% for meat and meat products, −11.35% for clothing and footwear, −10.74% for hardware, −6.17% for bookstores, −5.49% for flowers and plants. On the other hand, from 2019 to 2023, a set of urban economic activities increased their

Table 1 Urban economic activities and proximity service: a preliminary taxonomy (*Source* Author's elaboration, 2024)

Proximity retailing	**Food and mixed goods with a predominance of food** (convenience stores and minimarkets only)
	Non-food items (cultural, recreational, artistic, collectibles, clothing/footwear and second-hand goods; household items, home furnishings and accessories, computer equipment, tobacco, herbalists, pharmacies
Craft activities	**Food products** (bakeries, pastry shops, pasta factories, ice cream parlors, delicatessens, rotisseries, pizza by the slice)
	Non-food products (tailors, shoemakers, costume jewelry shops, bookbinding shops, framing shops, artistic and musical laboratories, carpentries)
	Personal service (hairdressers, beauty centers, laundries)
	Repair and maintenance of personal and household goods (tailoring repairs, shoemakers, watchmakers, upholstery, musical instruments, computers and electrical appliances)
Food and beverage service establishments	Bars and restaurants
Rental of goods	Equipment for sports and recreational activities
Cultural and creative activities	Cinema
	Theaters and concert halls
	Design, fashion and graphics
	Artistic production
	Photographic laboratories
Sports activities (private)	Sports clubs and gyms
Service activities (private)	Specialist medical services
	Clinical analysis laboratories
	Veterinary services
	Training activities (cultural, sports-recreational, and qualifying)

presence in the territory as a response to changes in purchasing and consumption behavior post-Covid emergency: +27.61% for minimarkets-convenience stores, + 21.41% for phone accessories, +11.86% for fish products, +9.09% for pet products, +8.46% for fruits and vegetables, +6.16% for pharmacies and drugstores (Fig. 4).

Counterintuitively, another point of interest regarding the evolutionary scenarios of urban supply from 2019 to 2023 is the growth of proximity craft activities characterized by the presence of approximately 11.900 businesses/local units with

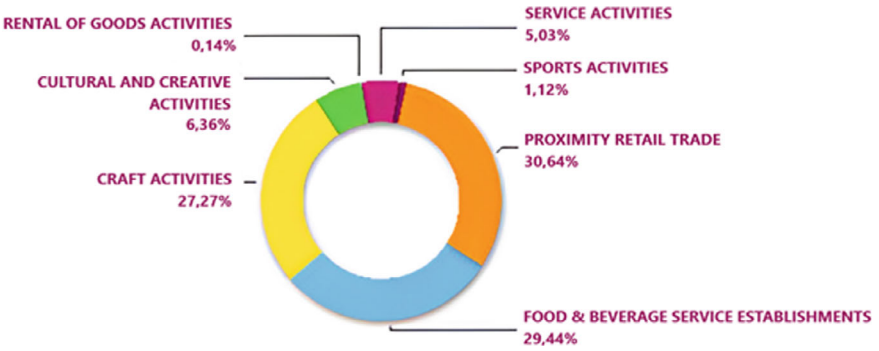

Fig. 4 The composition of the proximity economy in Milan. *Source* elaboration on data provided by the Studies, Statistics, and Programming Unit of the Milan Chamber of Commerce, Monza Brianza and Lodi based on Business Register data (31.12.2023)

28,350 employees (+2.14% of business units compared to 2019 and +3.90% of employees compared to 2019), with some sectors experiencing contraction (−8.96% for repair and maintenance, −4.91% for non-food products) and others with significant percentage increases (+13.27% for food products, +3.02% for personal services), often resulting from the replacement process of previous unused and vacant neighborhood businesses [7].

Lastly, within this context, food and beverage service establishments have grown from 2019 to 2023, characterized by the presence of 12.850 businesses/local units and 54.200 employees, with an increase of +2.20% of business units compared to 2019 and +3.08% of employees compared to 2019, with a substantial reduction (−10.35%) in bars and an increase of +15.65% in restaurants, considered by commercial operators one of the most profitable economic activities in Milan.

3 What Policies and Design Challenges for Proximity Economies?

Regarding intervention actions, a first shared outcome of the ongoing study has been the definition of a series of policy recommendations aimed at the project integration between the monitoring of urban economic settlement dynamics, public regulation [1], and active policies for proximity economies, focusing on the following emerging issues:

(a) *Proximity economy is not just neighborhood commerce*, a statement supported by empirical evidence that current supply dynamics in Milan are strongly oriented towards mature pluralism and concrete complementarity between different urban economic activities.

(b) *Governance and active policies of proximity economies* articulated in synergy between non-sectoral integrated actions and coordinated management of local supply systems starting from the projects and skills already developed by urban commerce districts.
(c) *New relationships between public and private city* focused on the activation of variable geometry steering committees, the positioning of proximity businesses as public or general interest services, the strategic use of urban bonuses in territorial governance instruments.
(d) *Technological and organizational innovation* where digital transition represents a significant enabler of services and an important omnichannel interaction space towards users, in a process of hybridization of physical spaces and online functions that reset sector logics.
(e) *Urban logistics and last-mile delivery* as guardians of proximity, through innovative solutions capable of addressing ongoing changes and managing new flows of goods from an economic sustainability perspective (reducing costs), environmental sustainability (reducing emissions and vehicular traffic), and social sustainability (reducing income and wealth inequalities).

Starting from these specific reflections and the geographies of proximity activities, the Municipality of Milan will implement a Triennial Program for Proximity Economy in the triennium 2024–2027 [3], organized into 30 actions aimed at the qualitative and experimental redefinition of the relationships between urban economic activities and proximity and the possible plural ways of treating proximity economies on the territory, with an investment of 15 million euros, articulated in the following eight lines of intervention:

1. *data and information* to understand how the neighborhood economy changes, in relation to city transformations. Planned actions: integration of available databases, multidimensional analysis of city areas, identification of areas at risk of commercial desertification, analysis of demand and supply for proximity services.
2. *shops and boutiques* to support micro and small proximity businesses in areas at risk of commercial desertification. Envisaged actions: non-refundable contributions for business start-ups, non-refundable contributions for investments of already established businesses, low-interest loans granted by the Municipality, training and support.
3. *street showcases* to reactivate vacant commercial spaces in peripheral and semi-peripheral neighborhoods. Planned actions: public–private partnerships with "results-based" contracts, acceleration services for proximity businesses, census of vacant commercial spaces, placemaking and interventions on public spaces, meeting between demand and supply of commercial spaces.
4. *historical activities and markets* to enhance economic activities that contribute to defining the identity of neighborhoods. Ongoing actions: enhancement of historical and traditional business registers, regeneration of covered municipal markets, awareness campaigns to support neighborhood shops.

5. *neighborhood alliances* to encourage collaboration among local economic operators. Planned actions: revival of the 13 urban commerce districts, collaboration agreements between citizens, businesses, institutions, and non-profit organizations at a micro-local level; civic crowdfunding for animation projects and socio-economic revitalization of neighborhoods.
6. *civil and circular economy* to support economic activities capable of generating a positive social impact in the neighborhood. Consolidated actions: contributions for new non-profit activities in neighborhoods; training and support for the first year; community between new and existing activities; contributions to investments to activate spaces, services, and activities with a social impact in neighborhoods; measurement of generated impact.
7. *meeting places* to network and strengthen local businesses that offer spaces and opportunities for community aggregation. Actions: networking of socio-cultural hybrid spaces active in neighborhoods; co-designing of services to improve the economic sustainability of spaces and the generated social impact.
8. *low-cost spaces* to use urban levers and provide commercial spaces at controlled rents. Actions in the implementation phase: recognition of proximity economy as a service of public and general interest; urban planning agreements for the settlement of proximity businesses in commercial spaces at controlled rents; measurement of the economic, social, and employment impact generated by settled businesses.

In this complex framework of actions and relationships between economic activities, urban commerce, and proximity, a unique issue in urban economic governance and management policies is posed by urban planning agreements for services of public or general interest, representing a concrete way of involving urban proximity economies in processes of improving individual and collective quality of life, responding to potential needs generated by ongoing urban transformations regarding quality, usability, and accessibility factors.

It should be noted that the Milan 2030 Territorial Government Plan recognizes some important urban planning advantages to private projects (individual owners, construction companies, real estate developers) that realize new services or infrastructures of new construction (or in requalified buildings) recognized by the Municipality as "of public or general interest." The aim is to use this tool to obtain low-cost commercial spaces to house local micro- and small businesses operating in the neighborhood commerce, crafts, and proximity services sectors, through evaluation criteria [2] that concern the following elements:

(a) Quality of the service provided, also in relation to national or regional standards;
(b) Accessibility to special categories of users who have difficulty accessing services, with fees similar to civic services (e.g., facilitated rate coinciding with rent below the market average);
(c) Relationship with the territory, especially with the neighborhood, also through collaboration with associations and non-profit entities;
(d) Economic balance between public and private benefits, ensuring that the service provided is comparable in monetary terms to the advantage obtained by the

private operator (e.g., calculation of the difference between the facilitated rent and the average market rents in the reference area), whose positive evaluation by the Municipality may possibly result in exemption from payment of urbanization charges and the contribution to construction costs (technically through the exclusion of the service from the calculation of gross buildable area),

which taken together represent a new and pragmatic research theme in public regulation and urban policies, marked by real opportunities and emerging potentials aimed at generating a greater spatial and gravitational control of urban economic activities and proximity services in the current transformative dynamics of the city.

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Flexible Working Arrangements and New Proximity Dynamics

Ilaria Mariotti and Chiara Tagliaro

Abstract Technological developments, globalization and the COVID-19 pandemic have accelerated changes in the way people perform their work from a spatial and temporal point of view, while introducing new and more flexible working arrangements which affect the usual idea of proximity. These forms of work can be performed at the first place (home), second place (office), and third place (e.g., collaborative and coworking spaces). This chapter explains flexible working arrangement typologies (remote working, hybrid working and digital nomadism) that have become more and more common in the past few years. Their effects are reviewed as reported in the literature at micro, meso, and macro levels. Despite a generally positive narrative associated with the broad adoption of such flexible arrangements, they bring also negative impacts on individuals, organizations and territories. Eventually, the chapter discusses whether and how near-working strategies might mitigate the dangers and enhance the opportunities associated with the new proximity dynamics made possible by flexible working arrangements.

Keywords Flexible working arrangements · Remote working · Hybrid working · Digital nomadism · Near working · Effects

1 Introduction

Flexible Working Arrangements (FWA) include: (i) "**remote working**" (RW), that is when employees perform all or most of their tasks and duties from a location other than the office [14], (ii) "**hybrid working**" (HW) which is a subset of RW and involves employees going to the office a certain number of days per week or month

I. Mariotti
Dipartimento di Architettura e Studi Urbani, Politecnico di Milano, Milan, Italy

C. Tagliaro (✉)
Dipartimento di Architettura, Ingegneria delle Costruzioni e Ambiente Costruito, Politecnico di Milano, Milan, Italy
e-mail: chiara.tagliaro@polimi.it

P. Pucci and G. Vecchio (eds.), *Questioning Proximity—Opportunities and Challenges for Urban Planning and Mobility Policies*, PoliMI SpringerBriefs,
https://doi.org/10.1007/978-3-031-66071-9_9

and spending the other days working elsewhere [11], (iii) "**digital nomadism**" (DN) which allows employees and freelancers to work remotely and travel at the same time, independently choose where to work, and visit at least three non-residential locations per year [9]. All these types of FWA usually include the working from home (WFH) practice, which entails using one's own home as a workspace, therefore merging (sometimes only temporarily) the first and second place. In addition, FWA are often hosted in third places [19] such as coworking spaces (CS), defined as places where people –predominantly freelancers and solopreneurs– can work alone together [24]. These FWA are becoming widespread and call for new proximity dynamics. A paradigm shift is happening as workers gradually recognize the advantages of their workplace being located closer to home. Within this context, third places play a crucial role because they are dispersed across the territory and allow people to work near the place they live and conduct their private life (near working strategy).

Before the COVID-19 pandemic there was a wide variation in the adoption of FWA throughout Europe, with northern European countries showing the highest rates of RW and HW [23]. This diversity stems from a few structural elements: enterprise size, specialisation in knowledge- and innovation-intensive industries (professional, scientific, technological, financial, and insurance and public administration), organisational culture, and, of course, the various regulatory frameworks that have a big impact on how businesses run their operations [17]. The extent to which employees can adopt Flexitime or Flexiplace arrangements (i.e., respectively, when an employee's regular work schedule can be altered, and when some or all work activities can be performed from a worksite other than the location where the employee is mainly assigned to by the company) [25] has affected the traditional relationship among the three places (first, second and third) from a temporal and spatial point of view [11, 12], thus recalling a new need for proximity. After the pandemic, most office employees report the adoption of HW, being at the office 3–4 days per week [18].

Finally, DN represents an "extreme" form of FWA [13]. Coined by Makimoto and Manners [15], the notion of 'digital nomadism' characterizes individuals that are not tied to any specific place or itineraries as a home base and travel while working.

Notably, these multiple types of FWA can overlap, for instance, digital nomads sometimes are remote employees working for a global company [3]. Each of these alternative but also complementary FWA have different impacts on multiple scales.

2 Effects of Flexible Working Arrangement at Micro, Meso, and Macro Scales

FWA have an impact at the micro-(worker), meso-(firm) and macro-(territory) scale. At the **micro-scale**, there is no conclusive evidence about the effects of FWA on workers. The analyses by Alfano et al. [2], mainly carried out during the pandemic, found positive effects of RW on gender gap, well-being, and work–life balance

satisfaction. FWA played a crucial role in work–life balance satisfaction because they gave employees greater control over managing work and multiple non-work activities [2]. Conversely, extended working hours and working during free time worsened work-life balance [10]. FWA have pros and cons on an individual level. Flexible working hours and autonomous decisions are appreciated, whereas lack of community and motivation are common drawbacks in this type of work practice. Moreover, they can create inequalities. In particular, if DN originated in the scope to subvert the capitalist corporate system, it ends up being the prerogative of a privileged elite who can afford to travel [3].

At the **meso scale**, with FWA companies are looking for smaller spaces (in London about 15 to 20% smaller than in the past), but higher quality including sustainable performance, proximity to public transport, availability of amenities, green open spaces, and the possibility for green commuting, e.g. cycling paths and showers [22]. Moreover, flexible space characterizes the new requests for offices, meaning shorter lease terms. If this has several economic and environmental advantages for companies, it has a direct influence on the real estate sector. According to McKinsey's [18] forecasts, by 2030, in superstar cities demand for office space will be 20% lower than it was in 2019 and the total value of office space will decline between 26 and 42%. This will result in a surplus of office space, especially low-quality old buildings. Besides, managing human resources remotely calls for new managerial strategies to overcome the shortcomings of multilocated teams [26].

Finally, considering the **macro scale**, FWA affects the territory. A recent study about the effects of RW in a large city like Milan outlines three alternative scenarios [6]: (i) the Gentrified City, when knowledge workers live close to their workplaces located in the centre, and the city becomes more and more expensive thus expelling lower income inhabitants outside; (ii) the Doughnut City, when a potential pool of knowledge workers would leave the city and move to the suburban area if allowed to work remotely (e.g., New York and San Francisco, see Barrero et al [5]); and (iii) the Intermediary Cities, when some remote workers move to second-tier cities, reducing territorial disparities. Research by McKinsey [18] proves that cities where real estate demand has decreased the most share some common characteristics. The business mix plays a role: cities with higher numbers of knowledge workers, large companies, higher ratio of commuters to residents, and more cultural acceptance of remote work are declining, given these factors triggering altogether lower office attendance. Moreover, the urban structure seems crucial, as well: office-dense cities or neighbourhoods with little mixed-use development and green space, characterized by expensive housing, tend to encourage out-migration.

FWA allow for the inflow of workers in peripheral and rural areas with positive and/or negative effects. On the one hand, remote workers and digital nomads can be a vehicle for social integration and economic growth [4]. On the other hand, studies underline that remote workers and digital nomads who wish to leave cities and move to rural areas for their amenities rather than aiming to become part of the local community can be viewed as a danger: the villagers may endure the immigration of newcomers as an "invasion of urban hipsters" [8].

Clearly, FWA bring many advantages for individuals, firms and territories; still, there are negative effects on multiple scales that should be addressed, given the fast diffusion FWA on a global scale.

3 Near Working Strategy as a Possible Way Out?

The rise of FWA has changed the geography of work [16], with work moving again closer to the workers. In effect, for most of the history, people used to work at home, or very close to home and the boundaries between home and workplace were fleeting along with the rhythm of private and work life [20]. The approach to work and the spaces for work has gone through a radical development, which has diffused at scale thanks to the pandemic's push. Not only people have re-started to work from home, but also have firms opened new branches and offices geographically dispersed, and closer to their workers, thus enabling a new work mode called "near-working" (NW).

Within this context, third places like CS may play a key role since they counterbalance the issues inherent to WFH. A few studies show that the "sense of community" experienced by CS users (the coworkers) helps them overcome the problem of social isolation, enhance the likelihood of collaborating with other users, and feel part of a group [21]. Coworkers can exploit the proximity typologies a là Boschma [7] (social, institutional, cognitive, and organisational proximities) that might enhance their economic performance, work-life balance, and well-being [1]. Thanks to their flexibility, CS are ideal tools to experiment with new proximity dynamics between the first and second place.

Some **policymakers** have understood the importance of working in third places. In Italy, the municipalities of Bologna (Smart Bo initiative) and Milan (Milano Strategia di Adattamento 2020), permit public administration personnel to work from home in CS in both urban and suburban locations. The French government supports the National Association of Third Places, "Tiers Lieux", to expand NW and lessen traffic, pollution, and commuting in big cities. By making it easier for employees or companies to relocate from major urban centres, the National Connected Hubs Network in Ireland, which is a part of the Rural Development Policy 2021–2025, encourages RW in rural areas. Sometimes, similar strategies are initiated by **private entities**. This is the case of the Milano Smart City Alliance involving fourteen private enterprises in a public–private partnership with the Milan Municipality. The partnering organizations make their offices available to the employees of the other enterprises in the community, thus encouraging short commutes from people's homes to the workplace for at least a few days a week. On a single company level, in 2018 Unicredit launched an innovative corporate real estate strategy to decentralize the main location of work by allowing employees to work for most of the week from dispersed hubs, either head offices or branches closer to their homes. This way 90% of office space could be moved outside of the city centres with the results of saving 19 km and 45 h per person of home-office commuting on a yearly average.

This literature review underlined several effects of FWA and the role NW strategies can play in both the public and private sectors to enhance work-life balance satisfaction, reduce commuting, congestion and pollution, etc. Nevertheless, specific analyses and tailored policies need to be developed to better disentangle positive and negative effects of FWA, with specific attention to reducing social and economic inequalities that can be produced by new proximity dynamics.

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On the Proximity Scale. How Can It Be Applied in Peri-urban and Rural Areas?

Luca Velo

Abstract Nowadays in Italy, especially in peri-urban and rural areas, trying to offer an answer to the issue of the criteria for the comparative evaluation of active mobility imposes the adoption of some equivalence parameters (PRIT—Integrated Transportation Master Plan 2025 of Emilia Romagna). These parameters go beyond the criteria of a peculiar specialization typical of road and transport policies. Urbanized areas featuring low population density, characterized by mixed uses and often located in not fully flat territories, are particularly complex to consider as study cases for accessibility implementation solutions because they require the identification of parameters that combine at the same time the extension of spaces reserved for active mobility, bicycles, and/or pedestrians with the presence of forms of traffic moderation (safety) and pedestrian areas open to bicycles (accessibility). Here there is a more articulated design challenge than readily defining the specialized space for the pedestrian, cyclist, or those who practice forms of micromobility. In addition, in the street space resides a challenge that is not only technical but also cultural, involving practices and a new way of sharing the street by adjusting the speeds of vehicles and routes for different users. In the perspective of ecological transition, the contribution discusses how these places need a future-oriented vision for accessibility, recognizing that times, environments, and practices are changing rapidly and knowing that in reaching the EU carbon neutrality goals, nothing can beat active mobility as a field of technological and social innovation.

Keywords Accessibility · Active mobility · Mobilities · Mobility planning · Practices

L. Velo (✉)
Iuav University of Venice, Venice, Italy
e-mail: lucavelo@iuav.it

P. Pucci and G. Vecchio (eds.), *Questioning Proximity—Opportunities and Challenges for Urban Planning and Mobility Policies*, PoliMI SpringerBriefs,
https://doi.org/10.1007/978-3-031-66071-9_10

1 Proximity Scale

Accessibility by proximity as a policy not only favours active mobility (cycling and walking), but also offers everyone access to proximity services, contributing to building cities and neighbourhoods that are more accessible and therefore more egalitarian and inclusive [10]. This chapter aims to reflect on the identification of a proximity scale that could be used to define a set of project applications and policies for active mobility in peri-urban and rural settings. The field of observation and research, based both on experience and studies carried out, involves areas such as the Veneto region, characterised by low population density and a heavy dependence on the car [15]. In the light of the climate and economic crises, the need to identify and give a value to forms of mobility that go beyond the sole use of the car is gradually leading to a re-assessment of the paradigms around which the forms and functioning of large areas of the territory have been structured, especially outside metropolitan contexts (Fabian [3], pp. 267–300). Along with the lifestyle, it is the social and economic make-up of the society of a region like Veneto, with the ageing of its population (according to the data of the permanent census in Veneto, the ageing index considered as the percentage of population aged 65 or over compared to the population aged 0–14 rose from 144.5 in 2011 to 179 in 2019), that is being questioned in the long term. Also, there is the change in some economic models, moving increasingly away from distributed small manufacturing companies towards slow tourism and the food industry that are triggering renewed focus on the territory, often leading to recovery and rediscovery actions that echo an increase in the forms of active accessibility. The underlying question lies in the need to see and understand the changes, even the most radical ones, in today's policies, projects and social practices in order to understand the direction they are taking. These changes refer more or less directly to theories and scenarios that presuppose conditions that could be defined as post-car. The examples taken from the literature, all based on the common assumption of a depletion of fossil fuel resources, regard strategies and conceptual actions that reassess and expand 'mobility systems', both in the physical and material sense [13], or establish visions that start from the bottom, emphasising the role of social practices in deconstructing the car movement system by demonstrating its economic limits in the future, working on communication and education [6]. Other reflections fall within the framework of the steadfast will of politics to favour public transport [8], or a technological breakthrough in autonomous electric-powered vehicles [1], or radical rethinking of the possible reuse of the space occupied by mobility infrastructure [16].

2 It's Time to Move

Unlike in more advanced European countries, in Italy, active mobility, understood as a combination of walking and cycling, is rather patchy and differs from city to city. There are local situations that are consistently on a par with the best continental

experiences and others where the minimum requirements for bicycle and pedestrian accessibility (safe crossings, signposting, pavements, cycle paths, etc.) are still very difficult to implement.

The reasons for this are difficult to pinpoint, but at least two stand out: on the one hand it is a cultural issue while, on the other, the reasons are political. While countries such as France, Denmark, the Netherlands and Germany have been reorganising their ministries to meet the needs of a new mobility that is not only more sustainable, with a special focus on peri-urban and metropolitan areas, but also healthier for the population, for some time now, our country has only recently achieved some results in a really patchy manner. In May 2023, France approved the Cycling and Walking Plan 2023–2027 (Plan Vélo et Marche—Ministère de la Transition écologique, 2019) which has three main objectives: first, to make cycling accessible to all, from early childhood and throughout life; second, to make cycling and walking an attractive alternative to the private car for local journeys and, in combination with public transport, for long-distance journeys; and, finally, to make cycling an economic lever, supporting French operators in the sector. It is clear that this is the result of a wide-ranging policy [7] which, through a targeted investment programme, touches not only on the various sectors (social, health, economic, educational, etc.) but is above all geared to the long term. So, the question of long-term planning becomes a requirement in guiding projects and 'setting in motion flows' [14] of alternative and innovative thought in terms of mobility.

For some territories, in the light of the considerations and policies being implemented in some European countries, an approach that attempts to go beyond the idea of a city capable of guaranteeing the presence of basic services within a fifteen-minute radius, drawing on the ideas of neighbourhoods that hark back to early twentieth-century experience and urban planning theories, appears necessary. The importance that these experiences have assumed since then is indisputable. Some scholars have studied the town planning standards that have legally defined and regulated certain minimum requirements needed to guarantee the criteria for liveability [4]. At the centre of our attention therefore, with an approach that appears more operational than critical, it is perhaps necessary to highlight the importance of the reachability and accessibility of certain services without the presumption of being able to completely redesign the city and the territory, thinking we can mobilise huge resources with impacts on the existing situation, on the consumption of new land and without the necessary experimentation. Territorial reorganisations are modifiable in the long and medium term, but inertia and complexity become the starting points every day for planners and technicians on which they can define useful solutions to develop customised projects and explore adaptation to the existing situation.

The long term has without doubt determined a profound process of 'road expansion' [2] of the contemporary city, guaranteeing cars the space to move and park that they need to multiply. This process has been studied at length, and while it has resulted in the construction of large new car-friendly parts of the city (such as manufacturing and commercial areas), it has also resulted in a substantial redesign of public space in the existing city. The central areas of all urban centres in the Veneto region, for example, have offered a high capacity for car infiltration, eroding and limiting

public space and allowing, even in the most central urban areas, the expulsion of non-car drivers. It appears clear that this situation inevitably creates problems related to safety, habitability, health, comfort and accessibility, considered also in terms of the practicability of public space, but also in terms of social, economic and generational inclusion. Based on these assumptions, it is interesting to observe how large the set of policies and projects that can attempt to reduce the monopoly of the car in favour of mobility for all could be.

3 How Are We Moving?

In Italy, the history of modernisation has traditionally coincided with a history of motorisation, but perhaps the time is ripe to reverse the trend and move towards principles of de-motorisation (Hatherley [5], pp. 221–226). The reasons for Italy's late start are mainly to be found in the lack of a strong role of national politics that has traditionally shunned a major reform of active mobility, leaving it up to local and regional administrations to address the issue in their own budgets or not. There is therefore a tangible difficulty for public administrations to undertake, within clear policies and competences, a real reform of a framework involving aspects related to legislation, technological innovation, but also social and cultural changes, as well as a polycentric territorial structure with large portions of low-density suburban areas in contexts that are not always entirely flat. Yet these cannot be the only reasons.

Some regional realities such as those of Emilia Romagna can be compared to more advanced transalpine contexts.

The General Regional Transport Plan (Emilia Romagna Region), PRIT 2025, promotes verification of the overall management of the main network, also applying 'regulatory rights', generally understood, in order to improve a general sustainability of the system to reduce the contribution of the transport sector to climate change and its negative impacts (Fig. 1). For PRIT 2025, the planning and programming choices of all plans, and at all levels, must take into consideration more complex mobility patterns, related to the different types of movements and their breakdown, as well as to the different players involved. This generally entails the acquisition and processing of adequate data and statistics, the presence of local-scale actions able to respond to different needs and the introduction of criteria to verify their effective adoption within the plans themselves (Relazione tecnica PRIT 2025, 2021). Such a cognitive level (data and their process) can be linked today to the great opportunities (but also to the risks) offered by technological innovation. Leveraging the paradigm of innovation in its various aspects (technological, organisational, system), it appears feasible to set in motion a more profound transformation of mobility models even in the most marginal contexts, re-launching public transport and favouring its integration also with correct forms of sharing mobility, as well as taking action to make logistic processes more efficient, which must become forms of governance of economic/territorial relations, acting on the organisation and flows of goods both in industrial districts and in 'short supply chains'. The basic idea behind this approach is a compensation policy that

looks at the nodes, large or small, of the system in ways that focus more on the intangible content of processes, and their impact, rather than on infrastructural responses. Major works must be accompanied by renewed attention to connections with the territory, i.e. to the ancillary actions that ensure the optimisation of the 'last mile' commute: improvement of the so-called 'minor' connections, new rules of access to the most congested and environmentally fragile areas and better general conditions of operation of the system. Considering the short and medium term perspective of the plan's validity, a series of important issues related to 'who' or 'what' will govern overall mobility in the future will probably have little effect in this timeframe, but what makes the difference is the implementation of compensating and equivalent measures that are offered precisely by virtue of the possible proximity scale adopted. Indeed, PRIT2025 adopts the principle of the need for ecological compensation of the impacts produced by the transport infrastructure system on ecosystems and their functionality in relation to inhabited areas. As a matter of priority, the compensation measures must have an environmental-territorial and not merely a patrimonial nature, giving the elements of environmental continuity (wooded areas, floodplains, park systems, etc.), and therefore the supports available for active mobility, a leading role.

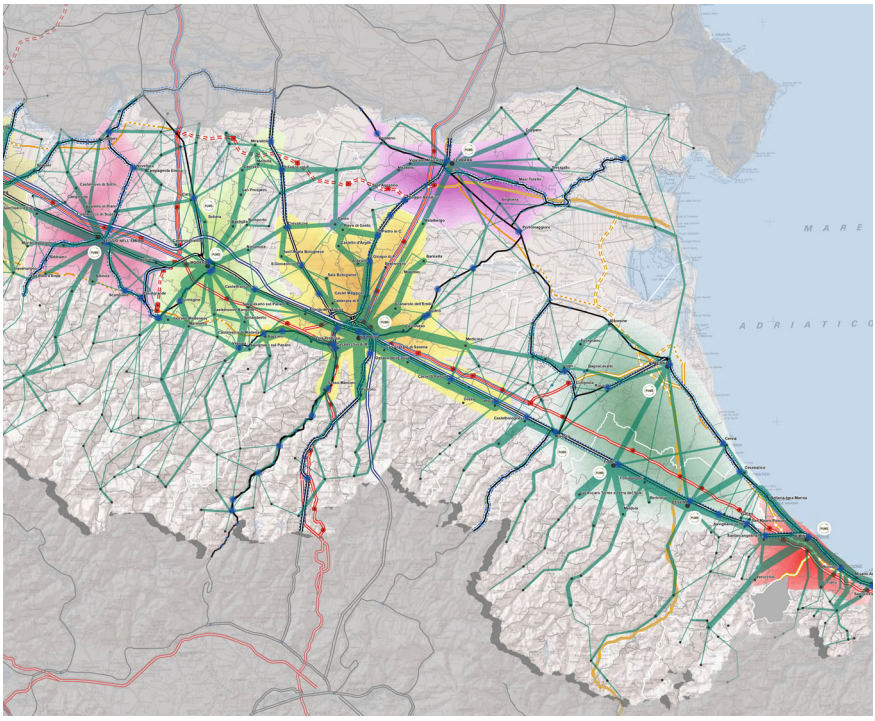

Fig. 1 Part of the integrated mobility planning system map illustrating the connections with peri-urban areas, PRIT 2025—Piano regionale integrato dei trasporti for Emilia Romagna Region [11]

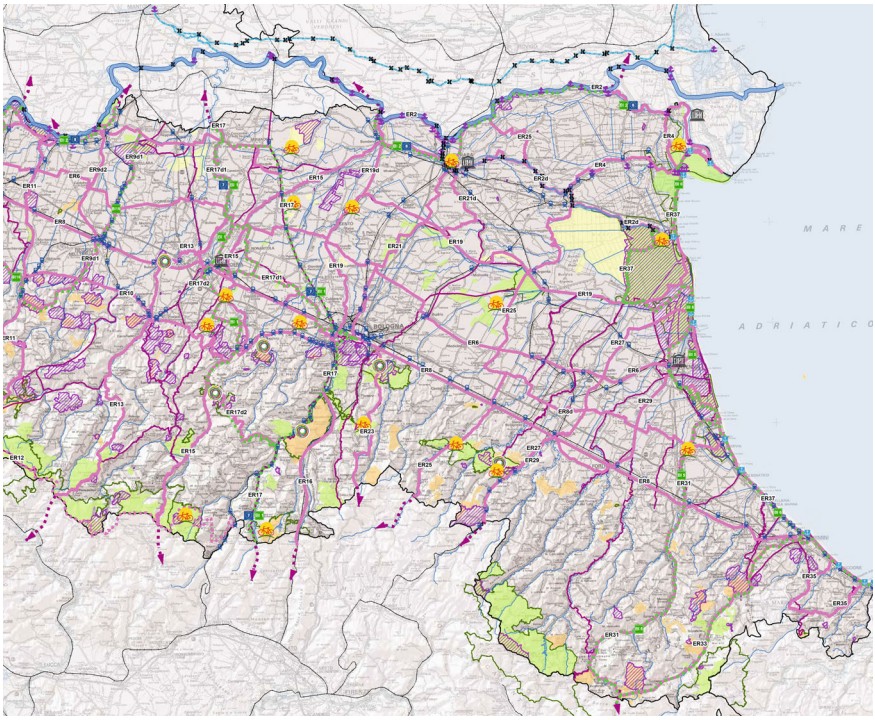

Fig. 2 Part of the integrated mobility planning system map illustrating the main active mobility connections with peri-urban areas, PRIT 2025—Piano regionale integrato dei trasporti for Emilia Romagna Region [11]

Cultural sensitivity to this type of issue implicitly expresses a form of 'care for the territory' that also redefines the various forms of active accessibility (Fig. 2) that have a real capacity to redesign the territory in terms of accessibility to services, hubs and public, educational and health-related spaces, giving administrators, categories, the third sector and individual citizens space to move.

4 Still a Long Way to Go

Most of us can tell when a place feels or doesn't feel pedestrian friendly, but we struggle to describe this feeling objectively or support it quantitatively.

The Institute for Transportation and Development Policy (ITDP) has a new website called 'Pedestrians First' that offers a set of tools to help measure walkability. Walkability and cyclability are aspects that cannot be measured solely in terms of the extent of infrastructure support, pavements or lanes. Indeed, the reasons are much more complex and involve assessing the quality of the works, connections, comfort,

signposting, the presence or absence of trees, potential parking or shelter points, accessibility to various services, especially at intersections. Indeed, the observation of urban space represents a much more complex and comprehensive design challenge. Two directions allow for the adoption of a more functional approach.

If even in Italy, despite the complexity of the various sites, projects have been undertaken in recent years that include concepts such as 'traffic calming', a preliminary approach to implementing accessibility in peri-urban contexts is to encourage the coexistence of different road users through a generalised reduction in car speed rather than building new pavements or cycle paths. In other words, it is a question of going back to an idea of semantic extension of shared space, understood both as a public crossing space and as an effective functional device to control the movement of vehicles. This type of approach requires work on the road section and profile, making room for active mobility and public means of transport by recognising both through resectioning activities and then implementing a whole series of devices for traffic control, crossing and safety, and by limiting the degree of car penetration in certain areas. A second direction refers specifically to the peri-urban territory through a multiplier approach able to identify and expand the spaces that can or may host forms of active mobility. Indeed, it is a project that requires the synergistic implementation of policies, bottom-up actions and projects able to develop and give form to the minute network of paths, road widening points, interstitial spaces, paths, trails, dirt roads, riverbanks and banks of watercourses that today, through more or less spontaneous processes, some urban populations are increasingly rediscovering and reusing by moving on foot or by bicycle. What comes into play is a network of crossing spaces that are not merged with the road network as pavements and cycle paths, but which are separate from it because they serve the logics of individual movement and lead to the formation of a primary infrastructure network. It is an extensive and often scattered network that reuses passages and narrow openings, often off the main thoroughfares and in the form of paths that creep into courtyards, porticoes, arcades and property boundaries. A network that is often created from practice rather than policies [9] and that involves first of all the economically weaker, think of caregivers, but also athletes able to intercept that *espace of the effort* that characterises daily movements [12].

Here is a more complex challenge for design than finding an ad hoc space for pedestrians or cyclists or people practising forms of micro-mobility. Once again, in the physical space lies a cultural challenge involving not only practices but also a new way of sharing the road, adapting speeds and routes to what is around them. In any case, the city is a future-oriented space: it is important to realise that time and the environment are changing rapidly. As regards the carbon neutrality goals that the EU has set for itself, however ambitious and difficult they may be to achieve, nothing can beat active mobility, abetted by constant fuel price increases and a new generation that is more open to new technologies and innovation.

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Planning for Proximity: Who, What, Where, When, Why (and How)

Paola Pucci and Giovanni Vecchio

Abstract Proximity is a recurring concept in urban planning. Neighbourhood units (as defined by Clarence Perry), pedestrian pockets (proposed by Peter Calthorpe) and 15-minute cities (coined by Carlos Moreno) are just some of the definitions under which the idea of promoting places and lifestyles based on proximity emerges now and then in the academic, professional and public debate. Nonetheless, to implement such an urban model through urban plans and policies, it is necessary to address several dimensions, deal with potentially tricky definitions and recognize the range of action of proximity. We intend to introduce them briefly, discussing the who, what, where, when (and how) of strategies intended to promote sustainable neighbourhoods, cities and regions through proximity.

Keywords Accessibility · Proximities · Accessibility by proximity · X-min city

1 Who

Proximity is potentially a concept suitable for all the different population groups that live in a specific place. The short distance from the living place of a person and the wide range of activities that people should be able to access from their homes easily make proximity appealing to different subjects, independent of their income,

P. Pucci (✉)
Dipartimento di Architettura e Studi Urbani, Politecnico di Milano, Milano, Italy
e-mail: paola.pucci@polimi.it

G. Vecchio
Instituto de Estudios Urbanos y Territoriales, Pontificia Universidad Católica de Chile, Santiago, Chile

Centro de Desarrollo Urbano Sustentable (CEDEUS), Pontificia Universidad Católica de Chile, Santiago, Chile

G. Vecchio
e-mail: giovanni.vecchio@uc.cl

P. Pucci and G. Vecchio (eds.), *Questioning Proximity—Opportunities and Challenges for Urban Planning and Mobility Policies*, PoliMI SpringerBriefs,
https://doi.org/10.1007/978-3-031-66071-9_11

gender, age, or race differences. Nonetheless, the famous scheme of Paris as "the city of the quarter of hour" [1] shows a set of activities—such as work, leisure and basic services—that seems to refer mainly to the everyday life of an adult, healthy working person with good socioeconomic conditions. Moreover, central urban areas show more favourable conditions for promoting proximity. Here, inhabitants are potentially more affluent due to the dynamics of expulsion from central areas and suburbanisation of poverty [2, 3, 34]. Nonetheless, as several studies show [11, 31, 37], other groups such as children and older people may benefit too from proximity, considering their potentially lower levels of autonomy and the higher need to access significant opportunities without covering high travel costs. Consequently, a possible tension between universalist and targeted policy approaches emerges when considering who can and should benefit more from proximity. Universalist approaches may promote proximity for everyone, considering relevant destinations and reasonable travel time thresholds that may apply to a wide range of subjects. Targeted approaches instead would focus on specific groups that are more in need. The latter approach would be in line with the call for prioritarianist approaches in transport planning [22, 35], focusing on those areas and groups that may benefit more from enhancements in their level of accessibility but would also require defining with an intersectional approach what are the groups that are more in need. Moreover, individuals do not necessarily move alone, significant forms of interdependence emerge between subjects [15, 24, 29]. The accessibility needs and mobility practices of interdependent subjects thus require a relational definition of the subjects who may benefit more from promoting proximity.

2 What

Land use and transport are the central elements that shape accessibility, defining the possibility that people have to participate in certain activities. The transport component is more straightforward to address since most discourses and academic works on proximity focus on active mobility—walking and cycling—as the modal choices that should contribute to accessibility by proximity [28]. As a consequence, the quality of public space too is fundamental to promote proximity [4]. Instead, the urban opportunities that proximity should make available are more challenging to define. Currently, the works devoted to the 15-minute city take into account a wide range of amenities, such as schools, health facilities, shops, and leisure spaces [28], instead, a compulsory activity such as work is usually not considered within accessibility-by-proximity. The definition of the relevant opportunities to which grant access is a first issue. The literature on transport-related social exclusion promotes basic accessibility, focusing on providing access to those services that prevent from social exclusion [18]. A few but relevant opportunities should be the focus of evaluative and operational approaches, based on informed decisions whose content may change spending on the examined place: for example, a football field may be a fundamental leisure space in one country

but not very relevant in another. The treatment of workplaces and economic activities in general is a second issue. While most research on the 15-minute city does not consider them, work is undoubtedly an activity most people need not to be socially excluded. Moreover, people access many everyday activities from their workplace rather than from their home: they may leave the office and buy their groceries or exercise in a gym before going home, showing that workspaces play a fundamental role for proximity [20], generating possible proximity economies [33]. Finally, a deeper problem refers to the extent to which the promotion of proximity can transform imbalanced urban structures, characterised by deep inequalities. Probably, this is the main issue in the debate on urban proximity (see [10] for a well-structured, critical approach to the 15-minute city) and the main reason for discarding proximity in wide, unequal urban settings such as Global South metropolises. The criticism on the value of proximity as a panacea for urban problems are undoubtedly correct, but probably it is necessary to reframe the contribution of proximity in a more realistic way, understanding that it is one—but not the only—possible guiding principle to adapt existing urban settings.

3 When

The time dimension, declining proximity as a '15-minute city' or 20-minute neighbourhood, transfers into an easily transmissible model the idea that the time needed to reach essential, everyday services can be calculated within an acceptable time threshold. The Chrono urbanism models [23] are among the best-known examples of this vision, which introduces new metrics for accessibility by proximity assessment and has inspired strategic planning for several cities worldwide [17]. However, the time threshold must vary according to the contexts, needs, attitudes and socio-cultural preferences characterising different urban situations. The spatiotemporal distance to essential daily services, measured through an infrastructure-based approach, highlights a functional dimension of the proximity, now under discussion. Not only it is ineffective to deal with the variety of socio-spatial contexts, mobility habits, and the changing needs that everyday practices trigger, but also structural and individual factors influence proximity; it is not by always decisive in destination choice and people may choose to travel beyond the nearest option [27]. Alongside a functional proximity are emerging new forms of proximity as generative of different metrics able to challenge also the analytical tools for measuring proximity. It is not only a condition of being physically close in space, but also "as a feeling arising from the awareness of sharing something with someone" [19]. These forms of "relational proximity" constitute a resource for producing social capital through interaction and collaboration within communities toward a more localist and low-mobile society [12], providing relevant elements also for evaluative approaches applicable in different settings [30]. This commoning proximity [1, 26] through sharing and exchange of services, resources and goods may provide new mobility solutions able to complement functional accessibility, especially for specific suburban communities where

the lack of basic services and transport supply does not allow a fairer accessibility transition through a X-minute city.

4 Where

The experiments undertaken for implementing accessibility by proximity measures [7] as well as the guidelines produced to identify the founding principles of this model [6], mainly refer to urban contexts already characterized by density, diversity of uses and practices, as well as by quite good public transport supply combined with sharing mobility options. The same urban context may show different morphological, functional and social features, depending on varied urban development trajectories [5]. Principles for generating accessibility by proximity in peri-urban and suburban contexts, where the conditions of compactness, densities, diversities and transport supplies are not in place, may be re-defined according to different metrics and forms of proximity [38]. In peri-urban and low-density contexts a functional proximity based on the forms and conditions of access and participation in nearby activities must be associated with a relational proximity based on communities of practices [40] which share needs, but also goods and opportunities linked to accessibility. In this case, collaborative forms and services can be activated on the basis of "short networks of daily life inscribed in wider networks of opportunities" [19].

5 Why

The renewed attentiveness to the relationship between accessibility and proximity has arisen both in planning theory and practice, questioning the usual strategic focus of planning on promoting and facilitating seamless spatial mobility. The concept of accessibility by proximity and its implementation in the most popular configuration (i.e., the X-minute city) aims at reducing the spatial and temporal intensities and environmental impact of daily travel by providing accessible services and opportunities in physical proximity to the citizen [8, 23]. The dominant narrative attributes to this model the possibility of reducing the social, spatial, and environmental effects of forms of hypermobility [13, 14, 16], supporting a city that is more inclusive, because the primary daily essential services are available in spatial proximity, more sustainable, because active mobilities combined with public transport and shared mobility options are supported; more resilient, due to the digital devices and mobility platforms for an effective orchestration of daily travels. Despite these positive externalities, the oversimplified implementation of the accessibility by proximity model in some policy practices [7] raises some issues regarding the effectiveness of this model with possible unexpected effects. The first issue is related to the inclusivity. Even if this model aims to redistribute opportunities at the urban scale, the risk of standardising people's needs and underestimating the demands of different social groups

may reproduce existing inequalities. At the same time, further social inequalities can occur in terms of increased land use values or gentrification processes and household replacement. The second issue concerns the promotion of sustainable mobility. Even if this model increases the opportunity for active modes and limits the need for mandatory travel, less attention is devoted to the different physical and cognitive capabilities toward active mobility. Moreover, urban goods transport and logistics are often overseen as an essential part of a sustainable and liveable city. The third issue focuses on the mono-dimensional resident-oriented perspective of this model, with a lack of attention to both the localisation of work and study places as well as to the needs of essential workers for whom remote work is not an option [39]. Finally, the fourth issue concerns the planning process and the tools for the implementation of this ambitious transformative vision that aims to change the functioning, forms, rhythms, and spaces of cities, raising conflicts between different stakeholders.

6 How

Probably, proximities—and not proximity—should be the focus of plans and policies intended to guide the adaptation of existing urban settings to more local, sustainable lifestyles. Proximity should not be a one-size-fits-all solution but requires adaptations considering the specificities of different places and inhabitants. Just like the 15-minute of Paris becomes the 20-minute city in Melbourne, the travel time thresholds, the sets of basic opportunities and the overall expectations attached to proximity should adjust to different urban environments and the manifold needs of diverse urban communities. Within the same setting, proximity may have different meanings depending on the population group taken into account or the kind of need examined: the everyday needs of a single parent are different from those of an older person, and while a person may want to have a grocery store a few blocks from her house, in the weekend the same subject may be willing to travel longer distances to reach a park. Therefore, participatory processes should define proximity's features in a specific setting, combining expert assumptions with individual preferences and perceptions in procedurally and epistemically fair processes [32]. The involvement of citizens is also crucial to show that proximity is not a cage, and it does not exclude mobility: people should be able to access basic opportunities where they live, but they must be free to move farther if they are willing to do so. Such a statement is not obvious considering the manifold conspiracy theories that originated around the 15-minute city [21], becoming an example of paranoid urbanism [9] that associates a mainly technical idea with unspeakable political purposes. Implementing proximity-based urban strategies requires thus careful forms of citizen involvement to communicate simple ideas, build shared definitions, and construct the conditions for consensus across an increasingly fragmented citizenry.

7 Conclusion

Proximity is a powerful, plural concept. The transformation of the debate on how we should plan and adapt urban areas demonstrates the power of proximity: despite being a pretty traditional idea in urban planning [10], the revival promoted by the 15-minute city has influenced the public debate, the academic discussion and the operational approaches to urban and transport planning. In this sense, the COVID-19 pandemic opened a window of opportunity to change the public debate and implement urban experiments aligned with the proximity ideal [25, 36]. The plurality of proximity instead emerges from the manifold academic works devoted to its definition and assessment and the manifold operational applications that adapt it to different settings. The importance of proximity makes it necessary to discuss and even question this concept. In light of the existing inequalities affecting huge metropolises and left-behind areas, proximity is insufficient to promote the structural transformations many places require to be more environmentally and socially sustainable. Moreover, discussing the manifold meanings of proximity is essential, which otherwise would apply only to the shining central areas of affluent cities. Proximity can frame the debate on feasible urban transformations and adaptations without depending on complex technology, huge investments or people of goodwill. Nonetheless, a realistic approach must recognise the potential, multiplicity, and limitations of proximity to avoid becoming the umpteenth buzzword, transforming the discourse on cities but leaving their spaces as they are today.

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