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Special Issue 2.2022

Mobile phone data for exploring spatio-temporal transformations in contemporary territories

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Published by

Laboratory of Land Use Mobility and Environment
DICEA - Department of Civil, Architectural and Environmental Engineering
University of Naples "Federico II"

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Editor-in-chief: Rocco Papa
print ISSN 1970-9889 | online ISSN 1970-9870
Licence: Cancelleria del Tribunale di Napoli, n° 6 of 29/01/2008

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Special Issue 2.2022

MOBILE PHONE DATA FOR EXPLORING SPATIO-TEMPORAL TRANSFORMATIONS IN CONTEMPORARY

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TeMA Special Issue 2 (2022) 39-56

print ISSN 1970-9889, e-ISSN 1970-9870

DOI: 10.6092/1970-9870/9309

Received 12th July 2022, Accepted 16th November 2022, Available online 30th November 2022

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www.tema.unina.it

Exploring the “15-Minute City” and near working in Milan using mobile phone data

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Abstract

This paper investigates the changes in neighbourhood attractiveness during the Covid-19 pandemic (2020) compared to the year before in 2019 in the city of Milan. Central neighbourhoods recorded a drop in users from -63% to -47%, while the peripheral areas showed a relatively steady presence during the day. Indeed, remote working and the fear of public transport led to rethinking commuting and re-value working close to home. Semi-peripheral and peripheral neighbourhoods have gained a renewed role in attracting remote workers, and coworking spaces represent a valuable alternative for those willing to improve work-life balance through near working. Within this context, the paper aims to: (i) measure the presence of remote workers at the neighbourhood level; (ii) explore the accessibility to coworking spaces within 15 minutes of walking and cycling distance; (iii) focus on three peripheral neighbourhoods which show the lowest number of city users loss, do not host CSs, and present different levels of essential services and access to subway stations. The three cases are explored to understand whether they are considered feasible locations for hosting a neighbourhood coworking space. The change of the city users' presence in the Milan neighbourhoods in 2019-2020 is analysed using «TIM Big Data – Data Visual Insight», which includes the presence and mobility of the TIM mobile network's users.

Keywords

Remote working; Covid-19 pandemic; 15-minute city; Coworking spaces; Near working; Milan; TIM mobile phone data.

How to cite item in APA format

Mariotti, I., Giavarini, V., Rossi, F. & Akhavan, M. (2022). Exploring the “15-Minute City” and near working in Milan using mobile phone data. *Tema. Journal of Land Use, Mobility and Environment*, 39-56. <http://dx.doi.org/10.6092/1970-9870/9309>

1. Introduction

The health emergency caused by the spread of the Covid-19 pandemic transformed the way we live and work. The needs and functions of companies' spaces for commercial or office use were redefined, and the need to guarantee social distancing emptied the offices, forcing the employees to work from home (Florida et al., 2021). It is estimated that this remote working trend will continue after the health emergency, therefore, many companies are redefining their spaces: rather than single offices or individual workstations, open, shared, or hybrid spaces are designed. Besides, companies are opening new offices/hubs in dispersed locations closer to their employees' homes (Mariotti, 2021)¹.

The geography of occupation is expected to change since suburban and peripheral areas will likely become more attractive places to live and work. Commuting to central areas will decrease, and walking and cycling will become predominant for the city's mobility, to help people maintain physical distance (Zecca et al., 2020; Fenu, 2021; Cirianni et al., 2022).

Thus, the suburban areas of cities will gain attractiveness (Mariotti et al., 2022b) and real estate values are expected to rise (Mariotti, 2021). Moreover, as argued by Florida et al. (2021), the pattern of urbanisation is unlikely to be changed. However, the pandemic could lead to significant intra-metropolitan, neighbourhood-level, and daily life changes in cities. Indeed, cities might increasingly become cultural and civic gathering places, rather than shopping destinations or office hubs, with fewer people commuting five days a week at peak hours.

A new demand for coworking spaces (CSs) to host remote workers, and favour near working (Tajani, 2021; Pais et al., 2021), has arisen. By using such spaces, workers can combine their professional and personal needs and reduce commuting trips, which positively impact environmental sustainability in terms of traffic congestion and pollution reduction, and contribute to improve work-life balance (Manzini Ceinar & Mariotti, 2021; Mariotti et al. 2022a). A new demand for "neighbourhood coworking space" (Pais et al., 2021; Mainieri et al., 2021; Mariotti et al., 2021b) offering freelancers, employees, employers, remote workers, etc., the chance to work closer to home, has arisen. The neighbourhood CS represents a proximity based service to inhabitants promoted by the 15-minute city strategy (Moreno et al., 2021), and suggested by the Municipality of Milan with the "Milano Strategia di Adattamento 2020" (Milan 2020 Adaptation strategy) to cope with the Covid-19 restrictions (see also Pinto & Akhavan, 2022).

According to the Eurofound Covid-19 survey (2020), during the pandemic, Italy climbed the European ranking of working from home frequency; indeed, in 2019, only about 8% of employees worked from home, while during the lockdown in 2020, about 40% started working from home (Sostero et al., 2020). However, home-working is not suitable for all occupations. Based on the remote working index of the National Institute for Public Policy Analysis (INAPP; Barbieri et al., 2021), the economic activities characterised by greater ease of working remotely are professional, scientific, and technical activities; finance and insurance; ICT; real estate and public administration.

In Italy, the number of remote workers rose from 570,000 in 2019 to 6.58 million in March 2020 (during the strictest lockdown), decreasing to 5.06 million in September 2020 (Osservatorio Smart Working, 2021). The Osservatorio Smart Working (2021) showed that the home is not always considered the ideal workplace. Indeed, workers complain about technology as not being adequate (29%), having a sense of isolation (29%), difficulty in work-life balance (27%) and feeling of being constantly connected (26%). In this context, the new workplaces (first, coworking spaces -CSs-) represent a valid alternative by offering support services, flexible

¹ This is the case of Assolombarda, the association of companies operating in the Metropolitan City of Milan, and in the provinces of Lodi, Monza and Brianza, and Pavia which has offered its employees working in the head quarter in Milan to work near their homes in the Assolombarda offices outside the city (www.assolombarda.it). Besides, other companies which headquarter is in Milan have offered their employees to work closer to their homes in decentralized offices (i.e., Price Waterhouse Cooper which head quarter is in the skyscraper Torre Libeskind in City Life neighborhood has opened an office in Monza because most of its employees live in Brianza area, where Monza is located).

spaces, and carefully managing hosted professionals' well-being and health. Moreover, CSs are spread over the territory, also in Italy, and, therefore, more accessible for workers living far away from the companies' premises (Mariotti et al., 2021b; Lo Russo & Mariotti, 2022).

The paper discusses the case study of Milan, which has a polycentric urban structure, with dense historic cores and a comprehensive functional system with human-scale dimensions (Deponte et al., 2020). It is the Italian economic capital city, characterised by huge commuting and tourist flows, alongside with crowding and congestion problems on local public transports, roads and public spaces (e.g., Navigli waterfronts, Parco Sempione, etc.) (Balducci et al., 2017). The city of Milan and Lombardy NUTS2 region were hit by the Covid-19 pandemic, especially during the first wave in March-May 2020, from a public health and economic point of view. Thousand business meetings were cancelled, leisure and cultural activities stopped, and iconic events were postponed (e.g., Milan Design Week, etc.).

Since the first Prime Minister Decree of 4 March 2020 (Gazzetta Ufficiale Serie Generale n. 55/2020), Italy progressively closed non-essential economic and institutional activities to face the pandemic. The most restrictive period was from March to May 2020 (the first strict lockdown), when only "essential activities", such as health and personal care, specific manufacturing activities, and agriculture involved in food provision and retail, were allowed to operate. Then, during the summertime, the previous restrictions and containment measures were gradually eased, and economic activities reopened. Finally, from November 2020 to March 2021, Italy lived through a second lockdown.

There was a progressive closure of specific activities, differentiated across the Italian regions depending on the number of infection cases (Mariotti et al., 2022b).

Within this context, the present paper investigates the changes in the neighbourhood attractiveness in Milan during the Covid-19 pandemic compared to 2019, using TIM mobile phone data and Piano dei Servizi di Milano (PGT) data, and analyses whether and how peripheral neighbourhoods satisfy the "15-minute city" paradigm. Specifically, the aim is threefold: (i) measure the presence of remote workers at the neighbourhood level; (ii) explore the accessibility to CSs within 15 minutes of walking and cycling distance; (iii) focus on three peripheral neighbourhoods which show the lowest number of city users loss, do not host CSs, and present different levels of essential services and access to subway stations. The three cases are explored to understand whether they are considered feasible locations for hosting a neighbourhood CS, thus improving the level of essential services. The paper is organised into six sections. The Introduction is followed by a brief review of the studies on the 15-minute city paradigm. Section 3 presents the analysis of the leave of people from the Milanese central neighbourhoods during the Covid-19 pandemic, and the attractiveness of the peripheral areas to remote workers. Section 4 focuses on the CSs in Milan, exploring their dynamics and location patterns, and briefly describes the "Milano 2020 Strategia di Adattamento" promoting the 15-minutes and near-working concepts. Section 5 presents three peripheral neighbourhoods (Niguarda-Parco Nord, Gallarate, Baggio) not hosting CSs, characterised by different levels of essential services and access to subway stations, and registering a steady presence of people during the pandemic compared to the year before. Specifically, it is investigated whether they are considered feasible locations for a neighbourhood CS hosting remote workers. The concluding section discusses the results of the analysis of the three neighbourhoods, and puts forward further research.

2. The 15-minute city concept: origins and characteristics

In light of the Covid-19 pandemic, one of the urban planning approaches that immediately caught public attention is the 15-minute city concept, coined by the French scientist and university professor Carlos Moreno in 2016 and then applied by the mayor of Paris, Anne Hidalgo, in 2020 (Reid, 2020). One should note that this idea is not entirely new. The origins of this concept can be traced back to several neighbourhood schemes and ideas about proximity and walkability starting from the early 20th century. Sharifi (2016) studied the

evolution of planning and design at the neighbourhood scale, which is essential for achieving sustainable development. He recognised five planning movements in the past century to mitigate the issues caused by unregulated urbanisation: Garden City, Neighborhood Unit, Modernism, Neo-traditionalism, and Eco-urbanism. In particular, the 15-minute city can be associated with the movements such as New Urbanism, Transit-Oriented Development and Smart growth, for long been used as schemes related to Neo-traditional principles (Furuseth, 1997).

All the past movements are rooted in the Neighborhood Unit concept introduced by the American planner Clarence Perry in the early 1900s (Perry, 1929). He proposed design principles for a neighbourhood's functional and structural organization for public services and urban amenities (e.g. school, library, retail store, community centre, etc.), a hierarchical street network, green and public open spaces and a residential area. In the early 2000s, Farr (2007) updated Perry's Neighborhood Unit and presented the 'sustainable neighborhood unit', where he added elements such as car-free housing, neighbourhood retails, third places (where people meet, develop trust and form associations), car-sharing, etc.

Moreover, Smith (2011) discussed the importance of neighbourhoods as the spatial context that frames people's lives, where residents meet their basic needs, interact and communicate. Yet, policymakers have neglected critical aspects of a prosperous neighbourhood, and there is a need to understand further the services and spaces that cities currently provide and future functions that can contribute to developing sustainable neighbourhoods (Di Marino et al., 2022).

Moreover, long car-dependent urban planning goes hand in hand with rising social and economic inequalities, leading to unsustainable practices (Newman, 2017).

Alongside this literature, planners reflect on the compact city models and the characteristics of urban developments in suburban areas. In particular, Mouratidis (2018) examined the impact of the compact city on neighbourhood liveability, finding that essential components of the compact city (such as LPT, accessibility to city centre and land use mix) show a positive association with neighbourhood satisfaction. Moreover, our cities are increasingly characterized by mixed-use locations (Batty, 2021), where "more than one activity or function exists in the same location and/or at the same time" (Batty et al., 2004). However, this concept holds only if we consider a neighbourhood or time interval in which these activities exist together. Indeed, multi-functionalism is a relative concept, dependent upon the spatial and temporal scale. In this sense, the current paper focuses on three specific Milanese neighbourhoods before and during the Covid-19 pandemic.

During the pandemic and due to health measures, periodic lockdowns, and mobility restrictions, neighbourhoods have acquired new dynamics. Moreno et al. (2021) introduced the 15-Minute City model (also known as "la ville du quart d'heure") as an alternative planning approach to confronting the aftermath of the Covid-19 pandemic, to respond to the city's need for a radical re-thinking and the necessity to provide proximity-based services to inhabitants. The authors refer to similar approaches for modern cities, such as the 15-minute walkable neighbourhood proposed by Weng et al. (2019) and the 20-minute model by Da Silva et al. (2020), who follow the principles of the "chrono-urbanism".

Moreno's 15-Minute City model insists on the importance of urban rhythms and the quality of life in cities and calls for increased proximity, social interaction, digitalisation, and diversity pillars which may reinforce community ties.

The original concept supports a spatial layout where residents can access all of their essential needs at distances reachable within 15-minute by foot or by bicycle. Moreno defines six essential urban social functions to sustain a decent urban life: (1) living, (2) working, (3) commerce, (4) healthcare, (5) education and (6) entertainment (Moreno et al., 2021, p.100).

To embrace the 'new normal' brought by the pandemic, Moreno's 'modified 15-minute city' framework revisited the four main dimensions of (a) density, (b) proximity, (c) diversity and (d) digitalization. His original model was tested in Paris. It has been considered a successful urban planning concept to boost the economy,

enhance social cohesion and create sustainable ecosystems in cities. Following the 15-Minute City model's popularity, other cities have replicated some of the features of this idea.

Recently, Abdelfattah et al. (2021) discussed the potential of Milan to become a 15-minute city with sufficiently walkable neighbourhoods, by investigating the relationship between neighbourhood walkability and population distribution as a way to gauge distributional inequalities between levels of walkability across the city. Moreover, Bocca (2021) evaluate how urban transformations can be elements in support of the 15-minute city and how transformative placemaking can be part of the strategy.

Until today, only two studies have combined the concepts of a 15-minute city and the new working spaces, in particular CSs. The first, published in 2021, is the project Milan Collabora (Mariotti et al., 2021c), which has explored the case of near working and CSs in Milan as enhanced by the Milan "2020 Adaptation Strategy". The second, recently published, is carried out by Mina di Marino et al. (2022) focusing on the cases of Oslo and Lisbon. The authors based their discussion on chrono-urbanism and the current planning debate on new urban models for sustainable neighbourhoods.

3. Potential remote workers in Milan: an estimation

The present section aims to measure the presence of remote workers at the neighbourhood level before and during the pandemic. To reach this goal, an experimental methodology based on TIM mobile phone data was applied to investigate the Milan neighbourhoods that have lost city users during the pandemic and to identify those that have not lost and/or have gained users. These data show the presence and mobility of TIM mobile phone users in a definite territory and time².

Specifically, data are analysed at the neighbourhood level, identified by one census area (ACE, as defined by ISTAT), which groups adjacent census sections with 13-18 thousand inhabitants. Since data are available for a few months before the pandemic spread and some months after the limitations imposed by the health emergency, specific neighbourhood dynamics can be identified.

A similar approach based on big data was applied by Gorrini et al. (2021).

They gathered data for seven months (January to July 2020) through a network of 55 Wi-Fi sensors distributed in several department stores, shops and public services in Milan. Their results show a significant decrease between the daily average number of mobile devices detected before the Covid-19 spread and those witnessed during the lockdown phase. Fig.1 and 2 show the difference (in absolute terms and percentage, respectively) between April 2020 and April 2019 in the people's presence within Milan neighbourhoods.

The central neighbourhoods (in purple) have the highest loss of people (about -63,000 people / -63%), but the decreased numbers are observed in a large area of the city. Since, by definition, the ACE average population is equal to 15,000 inhabitants, a loss of more than 10,000 people represents a substantial impact on the neighbourhood. This phenomenon is related to the urban distribution of significant attractors (e.g., railway stations, universities, etc.) in specific areas, which suffered the highest decrease in the number of users due to the movement restrictions imposed by the health emergency. Instead, the neighbourhoods coloured in yellow showed variation between -5% e + 5%, suggesting that the more peripheral areas suffered less from the effects of the first lockdown.

The spatial structure of these trends may suggest development policies promoting proximity services and coworking spaces in areas closer to people's residences, rather than only in the central or more attractive ones. In this way, reducing congestion and crowding on local public transport (LPT) and public spaces would be indirectly supported. Moreover, spreading local services represents an important opportunity for developing and revitalising peripheral areas, reducing existing inequalities.

² TIM mobile network users represent about 30% of the national mobile-phone users (AGCOM, 2022). These data are weighted to be representative of the entire population using mobile phones.

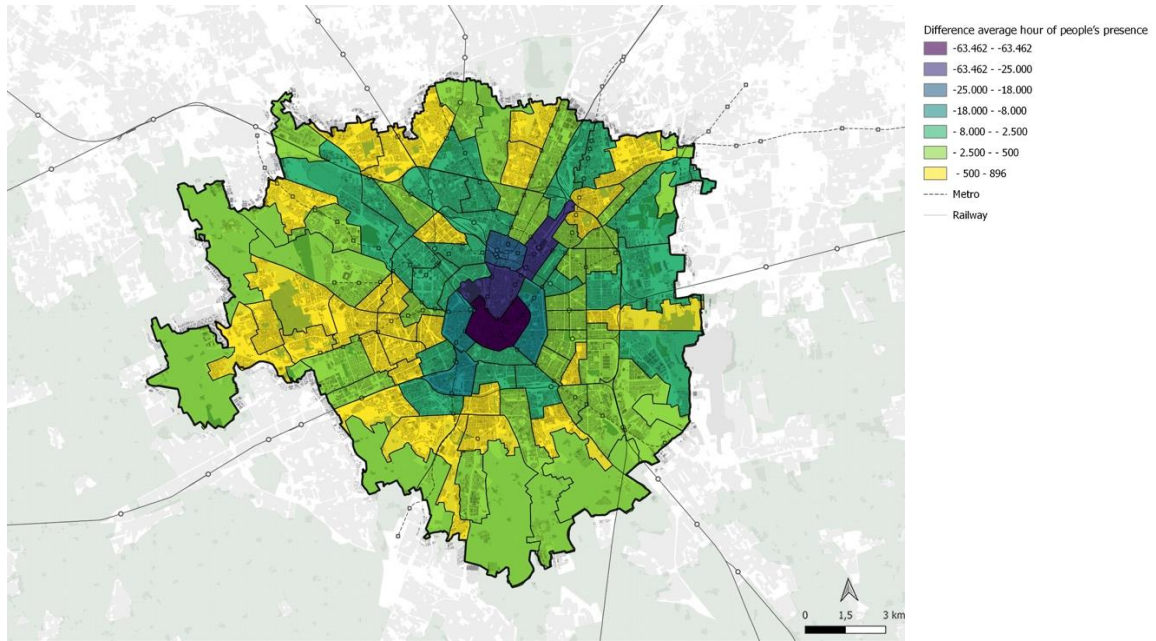


Fig.1 Difference (in absolute terms) of the monthly average hour of people's presence in Milan (April 2020 and April 2019 by neighbourhoods)

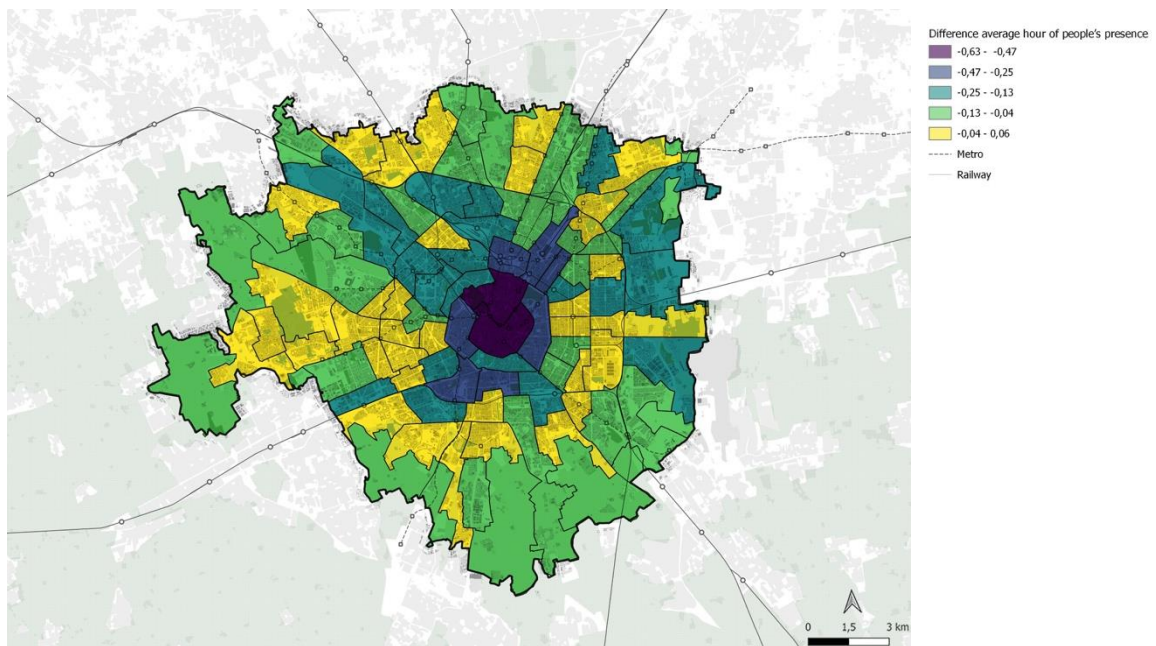


Fig.2 Difference (in percentage) of the monthly average hour of people's presence in Milan (April 2020 and April 2019 by neighbourhoods)

4. Coworking spaces and near working in Milan

This paragraph and the next one are dedicated to the exploration of the peripheral neighbourhoods that may host a coworking space that can satisfy the local demand for remote workers. Moreover, the essential services these neighbourhoods offer within the "15-minute city" paradigm are analysed through the calculation of proper accessibility indicators and mapping methods.

The Covid-19 pandemic has reduced people's mobility and the fear of contagion, favouring the re-discovery of the neighbourhood. Among the public policies adopted in the last year at an urban level, there is the "15-

minute city" paradigm, described in section 2, allowing residents and city users to reach the primary services in 15 minutes of walking and cycling distance by reorganising functions and spaces (green spaces, services, workplaces, etc.).

This issue was recently mentioned in the "Milano 2020 Strategia di Adattamento"³ ("Milan 2020 Adaptation strategy") to cope with the Covid-19 restrictions (see also Pinto & Akhavan, 2022). This strategy, indeed, promotes the neighbourhood dimension, guaranteeing the primary services within that distance, hybrid spaces for the community (shopping, facilities for the community) and tactical urbanism to improve the use of public spaces. Besides, it supports mobility based on LPT with a reduced capacity, smart working and reorganising the timetable for several activities to avoid gatherings during peak hours. Specifically, it focuses on strengthening remote working as an ordinary system to carry out at home or in third places (coworking spaces), thus ensuring work-life balance. Finally, it aims to improve air quality through slow and sustainable mobility (bikes, push scooters, electric motorvehicles, also in sharing). These transformations could represent an opportunity to re-imagine the neighbourhoods and to rethink the centre-peripheries relationship (Mariotti, 2021). Within this context, the Municipality of Milan has promoted the "near working" strategy by offering its employees a place to work close to their home, thus reducing the sense of isolation and improving their work-life balance. The employees could work in decentralised branches owned by the municipality, disused offices of large local companies belonging to Assolombarda⁴, and in private coworking spaces (Tajani, 2021).

But what is a coworking space, how many are they, and where are located in Milan? Coworking spaces (CSs) are shared-collaborative-flexible workplaces, which are becoming popular among freelancers, startups, employees, and self-employed workers, from diverse professional profiles and competencies, ranging from the creative industry (such as architects, designers, journalists, etc.) to engineering and digital sectors (namely IT, software developers, consultants, etc.) (Akhavan & Mariotti, 2018; Gandini, 2015; Spinuzzi, 2012; Mariotti et al., 2021a). CSs usually apply a membership-based model that allows coworkers to have temporal access to the facilities and services offered by the space.

The first Italian CSs were born in 2008 during the economic recession, and they started growing significantly only in 2013/2014. According to Italiancoworking (2021), 660 CSs were recorded in January 2019 and 779 in January 2021 (Figure 3). Likewise other countries, the Italian CS is mainly an urban phenomenon: in 2021, about 51% were concentrated in the 14 metropolitan areas, with Milan in the lead, hosting 119 CSs (Italiancoworking, 2021).

Among the factors influencing the CSs location choice are the density of activities (urbanisation and localisation economies), the size of the current and potential market, and the presence of productive amenities (e.g., good access to customers, availability of specialised services, presence of universities and research centres, good accessibility to transport networks), as well as non-productive amenities (e.g., presence of bars and restaurants, shops, cultural and entertainment activities, good urban quality) (Mariotti et al., 2017).

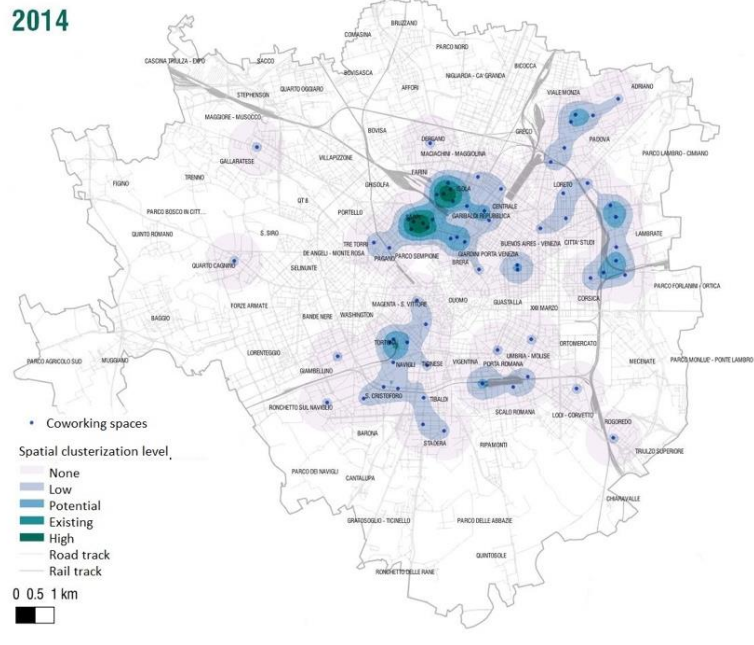
Since 2008, the number of CSs in Milan has grown significantly more than in any other Italian city. The diffusion of CSs was also promoted by the Municipality, which has actively supported CSs and their coworkers since 2013.

Between 2014 and 2021, the number of CSs in Milan rose from 68 to 119 units (+75%), with some agglomerations strengthening and the emergence of new CSs in peripheral neighbourhoods (Fig.3). In both years, it was confirmed the attractiveness of the central and semi-central areas with good accessibility (i.e., Garibaldi-Repubblica-Centrale) and the areas characterised by gentrification processes (i.e., Porta Romana).

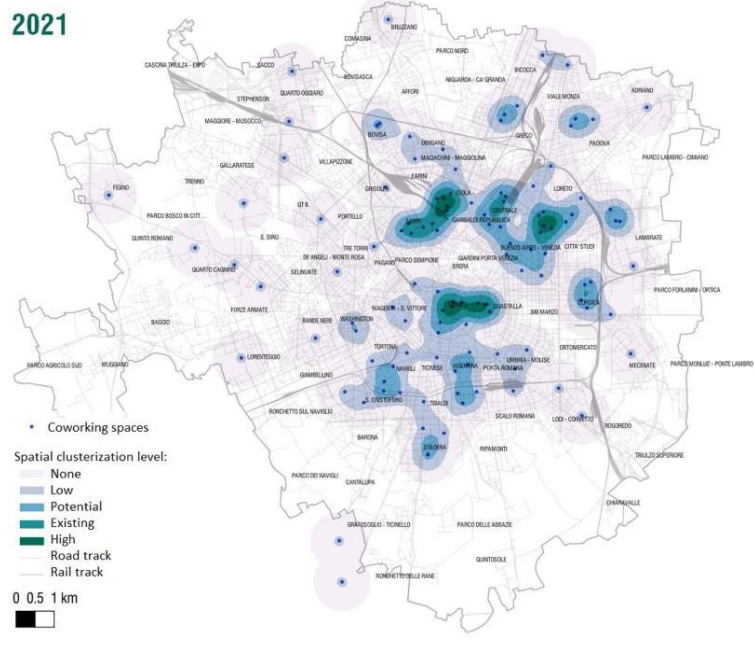
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⁴ Assolombarda is an association of companies operating in the Metropolitan City of Milan and in the provinces of Lodi, Monza and Brianza, and Pavia (www.assolombarda.it).

In contrast, other peripheral areas (i.e., Bruzzano, Mecenate, Figino, Quarto Cagnino, Quarto Oggiaro) became new attractors.



(a)



(b)

Fig.3 Agglomeration dynamics of coworking spaces in Milan (2014-2021)

In a survey on coworking managers in 2020, Pais et al. (2021) found that 35% of CSs in Milan had new customers or requests from the neighbourhood inhabitants; 25% of the spaces wanted to invest in the neighbourhood potential demand in the future, and 20% started or planned to start new partnerships with neighbourhood's commercial activities and cultural associations. Within this context, the 'neighbourhood coworking' can contribute to the "15-minute city" logic.

To establish if the current 119 coworking spaces in Milan can be seen as 'neighbourhood coworking', the 15-minute accessibility by foot and bike was calculated (see Fig.4 and 5). This analysis allows us to map, at the urban scale, the level of accessibility to CSs and highlight the city's grey areas from which CSs are inaccessible

through sustainable means. Accessibility was measured by means of isochrones to CS (for further details on the methodology, see Manfredini and Di Rosa, 2018).

Fig.4 shows the pedestrian access to the CSs in Milan, using an isochronous⁵ representation. Dark green highlights areas where CSs can be reached in less than 5 minutes by foot. The decreasing green colour intensities indicate, respectively, a travel time between 5 and 10 minutes and a travel time between 10 and 15 minutes. The map shows heterogeneous pedestrian accessibility within the city. Specifically, a poor level of accessibility is observed in the urban fringes.

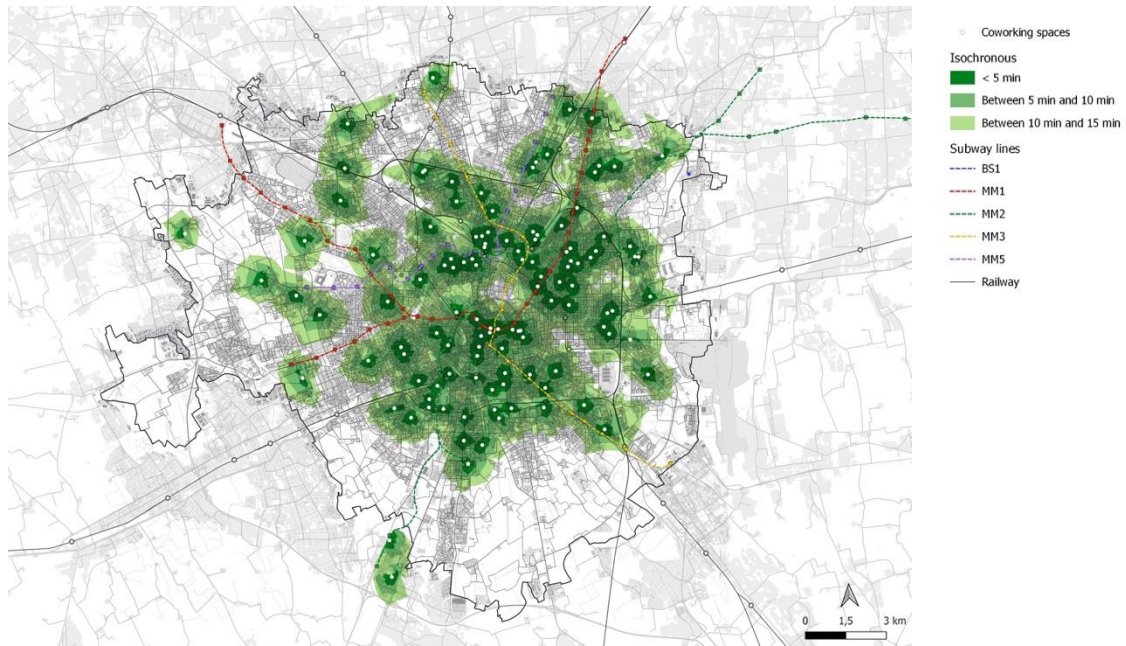


Fig.4 Pedestrian access to coworking spaces within 15 minutes in Milan

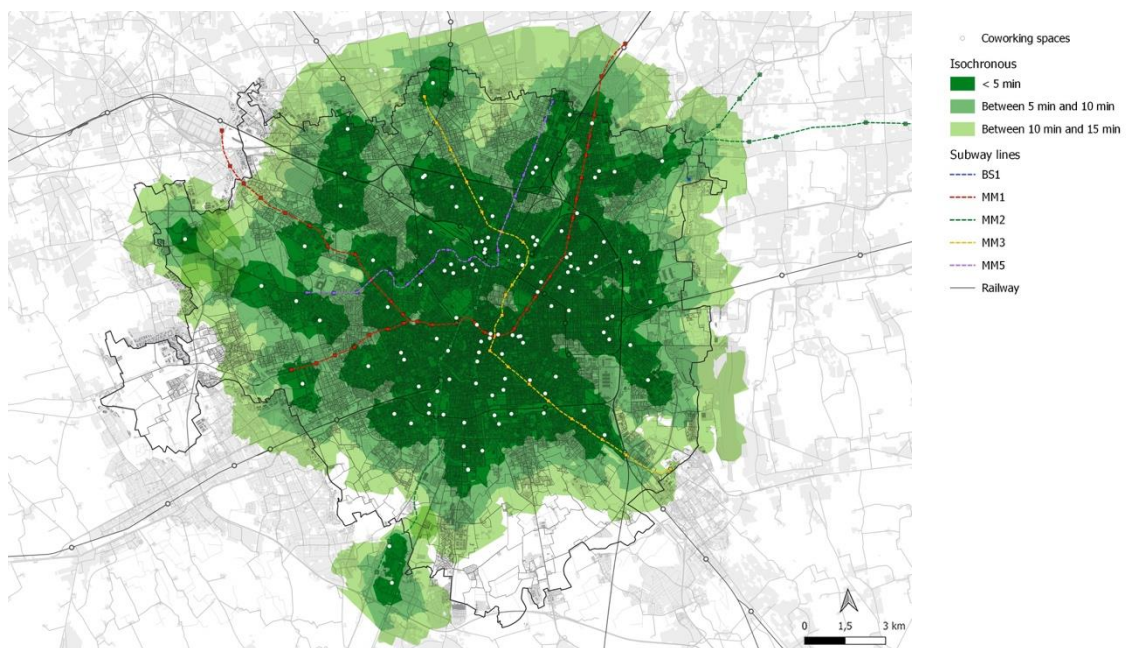


Fig.5 Access to coworking spaces by bike within 15 minutes in Milan

⁵ Average walking speed of an adult in good health: 1 m/second equal to about 4 km/hour.

Accessibility by bike was calculated analogously, using a speed of about 3.3 m/second equal to 12 km/hour. In this case, the overall level of access to CSs is higher: it is possible to reach one CS in less than 15 minutes from almost all the city areas (Fig.5). However, CSs agglomeration phenomena in some neighbourhoods should be reconsidered as some areas are served by only one space, while others, especially around the city centre, host a significant variety of spaces, even close to each other. In conclusion, this analysis provides a complex and integrated framework of services and mobility and can guide policymakers towards relevant actions or projects.

5. A focus on three Milanese neighbourhoods: Niguarda-Parco Nord, Gallarate, and Baggio

This section focuses on three peripheral neighbourhoods in Milan: Niguarda- Parco Nord, Gallarate, and Baggio, which have been chosen because during the pandemic: (i) have lost the lowest number of city users; (ii) are peripheral neighbourhoods with different levels of essential services and access to subway stations (Tab.1, Fig.6); (iii) do not host CSs. Specifically, Gallarate has high accessibility to subway stations, Niguarda-Parco Nord has medium accessibility, and Baggio has low accessibility.

For each neighbourhood, TIM mobile phone data are analysed to map the outflows between 9:00 a.m. and 10:00 a.m. in three working days: one before Covid-19 spread (April 3, 2019), one in the first lockdown (April 1, 2020) and one in the period of coexistence with the virus (October 14, 2020). Mobile data show that during the Covid 19 pandemic, the number of human presences has been steady, probably because people live and work in these areas.

	1. Niguarda-Parco Nord	2.Gallarate	3.Baggio
Population (31/12/2020)	13,579	17,478	18,687
School Educational Services	11	10	13
Crèche	4	2	0
Nursery school	3	4	4
Primary	2	3	2
Secondary I level	2	1	1
Secondary II level	0	0	1
Family time-space	0	0	1
Sport and leisure	11	17	12
Playground	10	14	8
Oratory	1	3	4
Culture and training	7	2	5
Associations	4	0	3
Italian schools for foreigners	0	1	1
Library	0	0	1
BikeMI	2	1	0
Show	1	0	0

Tab.1 Essential services by neighbourhood

The aim is to identify specific areas where new neighbourhood CSs can settle to satisfy the local demand for remote workers. The approach can be replicated to study other neighbourhoods and help identify the mobility flows. Some of these flows could be intercepted by the neighbourhood CSs, as alternative workplaces to the traditional work premises and private homes. Niguarda-Parco Nord hosts all school levels up to the first-grade secondary school, associations, a theatre, and playgrounds. There is also a Milano sports structure, and the neighbourhood services are spread all over the area. Gallarate supplies all schools to the secondary level

and has no associations. The neighbourhood shops are clustered along an axis to the north and from the centre to the south. Finally, in Baggio, all school orders are up to grade II (vocational school). There are a family time space and a library; however, the territorial distribution of services is very concentrated in the centre. The analysis of the supply of the services shows that the three areas are somewhat similar but with the following exceptions (Tab.1, Fig.s 7,9,11). Niguarda-Parco Nord services are more distributed, while in Baggio and Gallarate, they are mainly located along the main arteries. Gallarate does not host any association except for an Italian school for foreigners, and there are only two crèches compared to 4 in the other two neighbourhoods. Baggio hosts all school types, including family time space and a vocational school. Therefore, Gallarate has a lower level of accessibility to services than the other two having high endowments only in playgrounds. Baggio, instead, is the one with a higher school coverage.

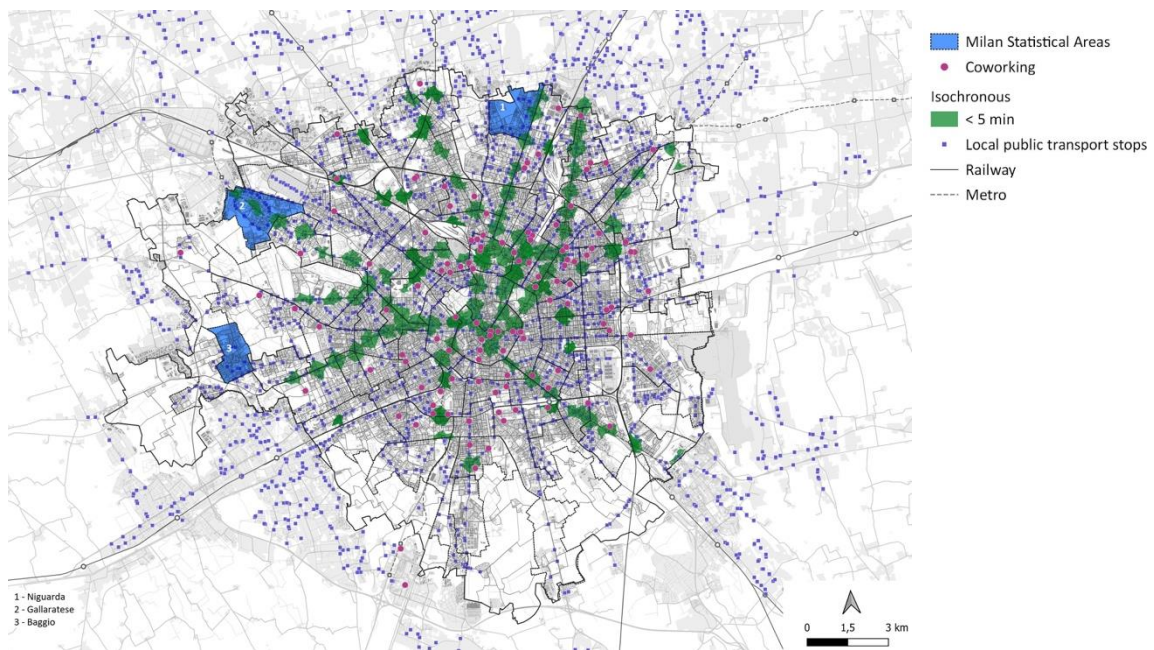


Fig.6 Access to subway stations

Niguarda- Parco Nord

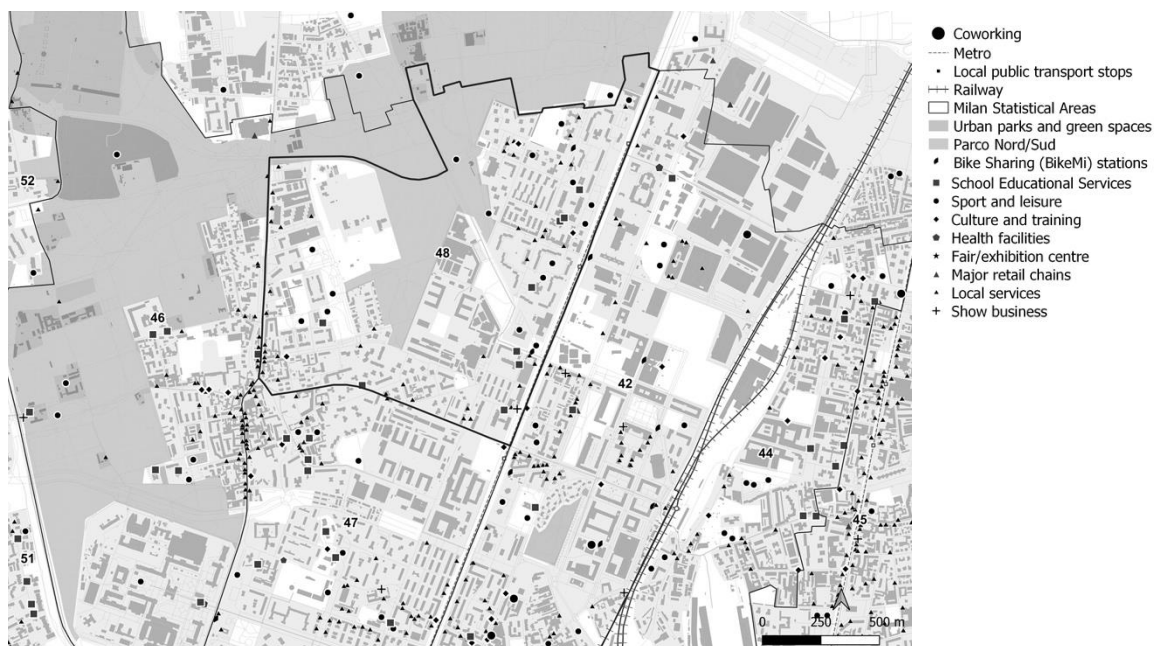


Fig.7 Essential services in Niguarda- Parco Nord neighbourhood (48)

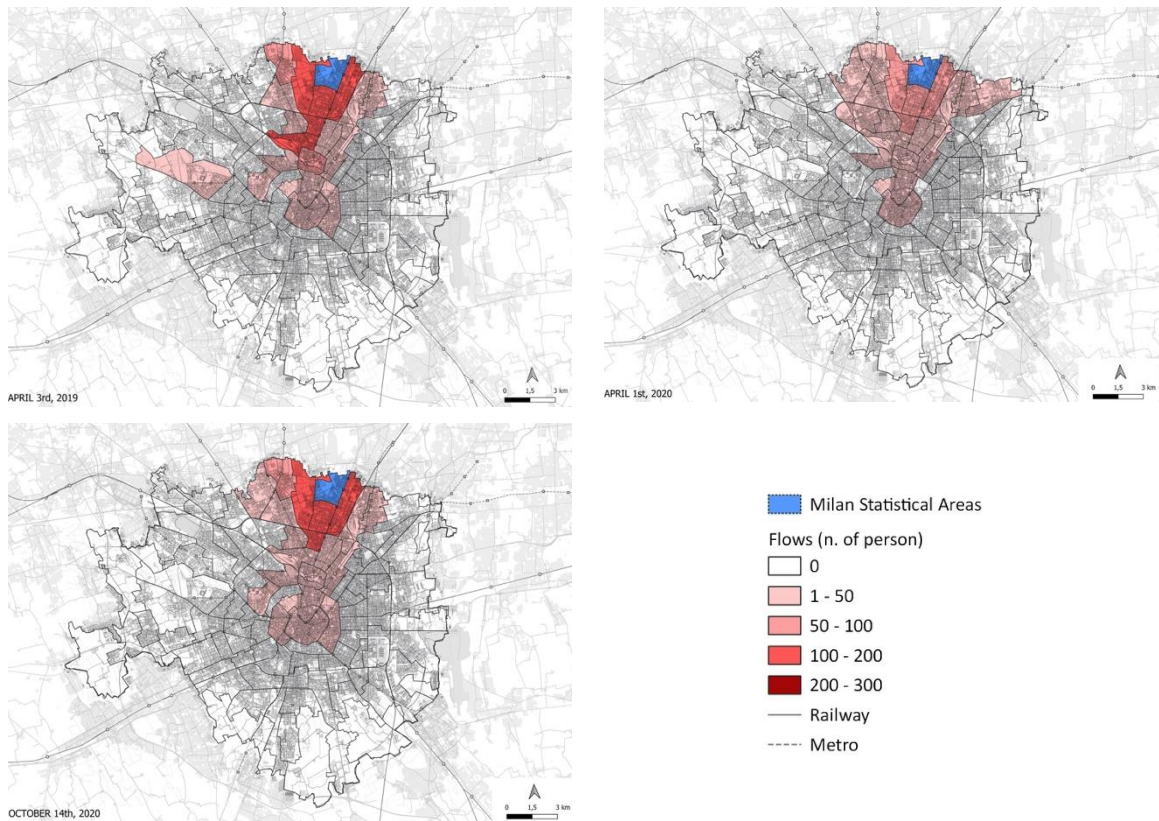


Fig.8 People outflows from Niguarda-Parco Nord between 9 am, and 10 am on three working days before and during the Covid-19 pandemic

The neighbourhood Niguarda-Parco Nord is located in Milan's northern area, at the border with the municipalities of Bresso and Sesto San Giovanni. It has a medium accessibility level, taking advantage of metro line 5, whose stops are located in the eastern portion of the area. Figure 9 shows that, in this case, the flows are mainly concentrated in the northern part. Data also highlights some mobility patterns in the morning, indicating a potential user pool for a CS.

Gallaratese



Fig.9 Essential services in Gallaratese neighbourhood (72)

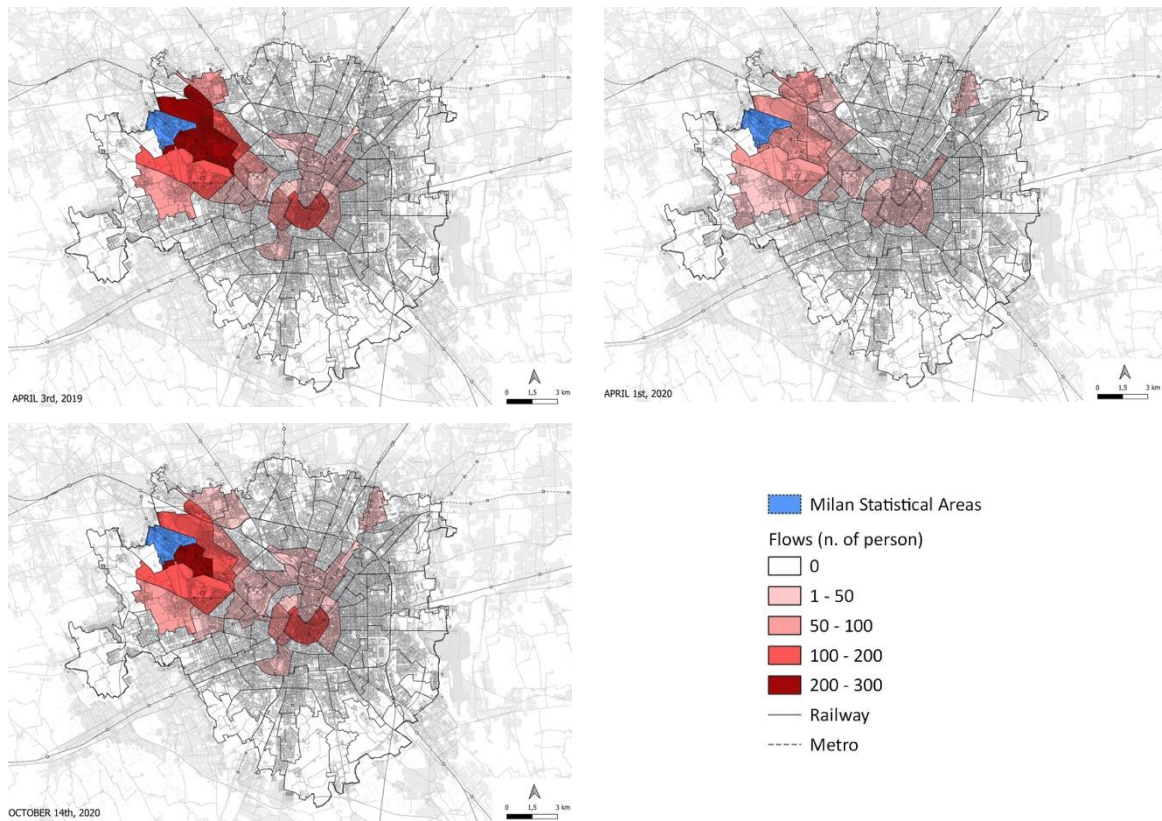


Fig.10 People outflows from Gallarate between 9 a.m., and 10 a.m. on three working days before and during the Covid-19 pandemic

Gallaratese has a high level of accessibility, with two subway stops. As shown in Fig.7, a strong connection between the city centre and the north-western quadrant emerges, also maintained during the lockdown period. The good accessibility level to the subway stops and the proximity to park and ride facilities make this area appealing for a CS. During the pandemic, there has been an increasing demand for peripheral working spaces with good accessibility to the city centre.

Baggio

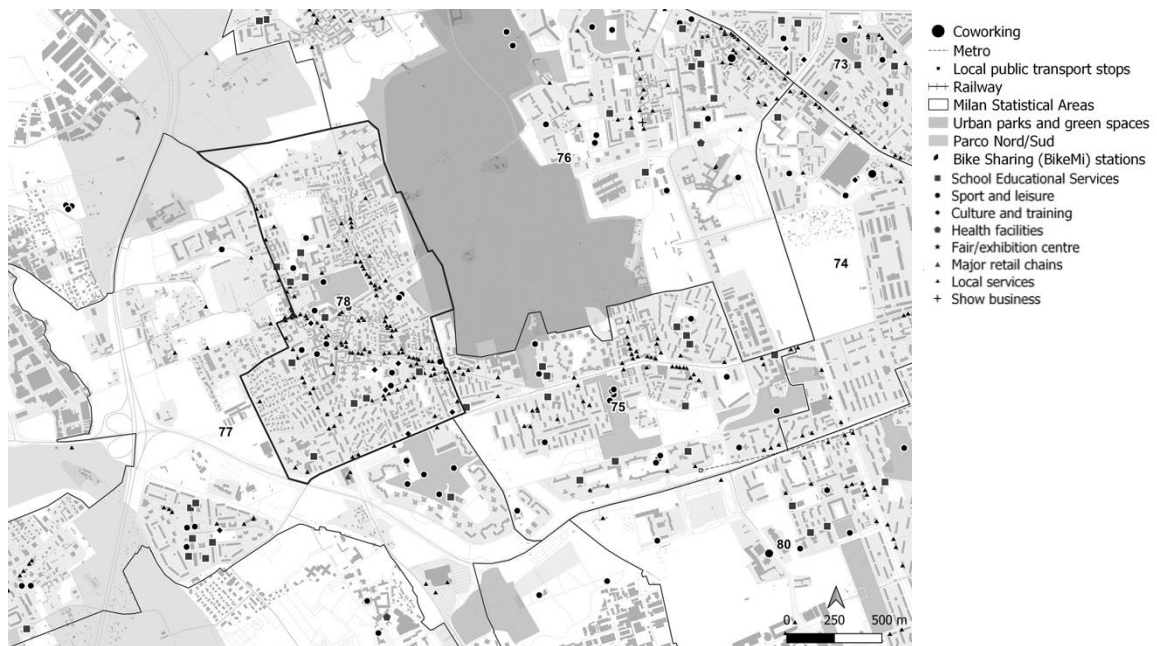


Fig.11 Essential services in Baggio (78)



Fig.12 People outflows from Baggio between 9 am and 10 am on three working days before and during the Covid-19 pandemic

Baggio had less intense flows than the other two neighbourhoods (Fig.11), probably due to its limited accessibility to the subway stops. Before the Covid-19 spread, outflows were directed towards adjacent areas, the city centre, and some transport hubs. However, these flows substantially disappeared during the pandemic, highlighting a significant presence of remote workers in this neighbourhood, which are potential users of a CS.

6. Discussion, conclusions and further research

The analysis of TIM mobile phone data highlighted a decrease during the Covid-19 pandemic in the people’s presence within central areas of the city. This phenomenon implies the existence of a pool of remote workers and other users of the city centre, which might be searching for solutions closer to their homes to work and entertain. CSs could intercept part of this demand since they are alternative workplaces.

The exploration of the three peripheral neighbourhoods of Niguarda- Parco Nord, Gallaratese, and Baggio, which do not host a CS, underlined that they present a potential demand for a coworking space. Before the pandemic, Niguarda-Parco Nord and Baggio experienced an outflow of people – although with different intensity – which substantially disappeared during the pandemic. This trend highlights the presence of remote workers in these neighbourhoods, which might work in neighbourhood CSs.

The case of Gallaratese is different because it has a good accessibility level to the subway stops and offers park-and-ride facilities, thus attracting users from outside the neighbourhood and the neighbouring municipalities. During the pandemic and beyond, there has been an increasing demand for geographically dispersed hubs like CSs with good accessibility to the centre of large cities. For remote workers living outside Milan, choosing to work in a CS in the peripheral neighbourhood of Gallaratese allow them to reach the workplace by car, park it in the parking nearby, and reach the city center by underground when needed.

The structural adoption of a decentralised working model requires a comprehensive rethinking of service distribution within the city. The "Milano 2020 Strategia di Adattamento" (Milan 2020 Adaptation Strategies)

has promoted this, and the Municipality of Milan has offered their employees to work in a third-place close to their homes (i.e. decentralised branches owned by the Municipality, disused offices of large local companies, and private coworking spaces). The near working strategy produces positive externalities such as vehicle traffic reduction, transports' congestion, better work-life balance, and stimulates knowledge exchange. The neighbourhood CS should offer several social services (e.g., babysitting services, training, workshops) to improve the users' work-life-balance (Mariotti et al., 2021b; Mainieri et al., 2021).

The matching between supply (of CS) and demand (of users) can be supported by offering vouchers for working in a CS, thus covering the CS's fees to rent a desk and use its facilities. These vouchers can be provided by either the employer (justified by space and cost reduction for traditional offices) or by public institutions (compensation for lower environmental costs linked to the decrease in mobility or public policies aiming to support peripheral areas).

Future research could focus on implementing a synthetic index of available public and private services in the neighbourhoods, differentiating by the relevance of each type of service. The analysis for all Milan neighbourhoods will be able to measure the "15-minute city" goal, offering a valuable tool to policy makers and official planners to promote new local services – including new working spaces such as neighbourhood coworking spaces (Mainieri et al., 2021; Mariotti et al., 2021b), and hybrid spaces –, thus contributing to the revitalisation of peripheral areas, and reducing existing inequalities.

Acknowledgements



The paper is supported by the Progetto D'Eccellenza-DAStU Politecnico di Milano; Milano Collabora project funded by the Municipality of Milan; the COST Action CA18214 'The geography of New Working Spaces and the impact on the periphery', which is funded by the European Union (<http://www.new-working-spaces.eu>/<https://www.cost.eu/actions/CA18214>).

References

- Abdelfattah, L., Deponte, D. & Fossa, G. (2021). The 15-minute city as a hybrid model for Milan. *Tema. Journal of Land Use, Mobility and Environment*, 71-86. <http://dx.doi.org/10.6092/1970-9870/8653>
- AGCOM (2022). Communication Markets Monitoring System, www.agcom.it.
- Akhavan, M., & Mariotti, I. (2018). The effects of coworking spaces on local communities in the Italian context. *Territorio*, (87), 85–92. <https://doi.org/10.3280/TR2018-087014>
- Balducci, A., Fedeli, V., & Curci, F. (2017). Milan beyond the metropolis. In A. Balducci, V. Fedeli, & F. Curci (Eds.), *Post-metropolitan territories: Looking for a new urbanity* (pp. 27–52). New York: Routledge.
- Barbieri T., Basso G., & Scicchitano S. (2021). Italian Workers at Risk During the COVID-19 Epidemic. *Italian Economic Journal*.
- Batty, M. (2021). Science and Design in the age of COVID-19. *Environment and Planning B: Urban Analytics and City Science* 48 (1), 3–8. <https://doi:10.1177/2399808321989131>.
- Batty, M., E. Besussi, K. Maat, & J. J. Harts (2004). Representing Multifunctional Cities: Density and Diversity in Space and Time. *Built Environment* 30 (4), 324–337. <https://doi:10.2148/benv.30.4.324.57156>.
- Bocca, A. (2021). Public space and 15-minutes city. A conceptual exploration for the functional reconfiguration of the proximity city. *Tema. Journal of Land Use, Mobility and Environment*, 14 (3), 395-410. <http://dx.doi.org/10.6092/1970-9870/8062>
- Capasso Da Silva, D.; King, D.A.; & Lemar, S. (2020). Accessibility in practice: 20-minute city as a sustainability planning goal. *Sustainability*, 12, 129.
- Cirianni, F.M.M., Comi, A. & Luongo, A.S. (2022). A sustainable approach for planning of urban pedestrian routes and footpaths in a pandemic scenario. Evidence from Italian cities. *Tema. Journal of Land Use, Mobility and Environment*, 15 (1), 125-140. <http://dx.doi.org/10.6092/1970-9870/8629>
- Deponte, D., Fossa, G. & Gorrini, A. (2020) Shaping space for ever-changing mobility. *Tema. Journal of Land Use, Mobility and Environment*, 133-149. <http://dx.doi.org/10.6092/1970-9870/6857>

- Di Marino M, Tomaz E., Henriques C. & Chavoshi S.H. (2022). The 15-minute city concept and new working spaces: a planning perspective from Oslo and Lisbon, *European Planning Studies*, <http://dx.doi.org/10.1080/09654313.2022.2082837>
- Farr, D. (2007). *Sustainable Urbanism: Urban Design with Nature*, John Wiley & Sons Inc, Hoboken, New Jersey.
- Fenu, N. (2021). Bicycle and urban design. A lesson from Covid-19. *Tema. Journal of Land Use, Mobility and Environment*, 14 (1), 69-92. <http://dx.doi.org/10.6092/1970-9870/7716>
- Florida R., Rodríguez-Pose A., & Storper M. (2021). Cities in a post-COVID world. *Urban Studies*, 1-23.
- Gorrini, A., Messa, F., Ceccarelli, G. & Choubassi, R. (2021). Covid-19 pandemic and activity patterns in Milan. Wi-Fi sensors and location-based data. *Tema. Journal of Land Use, Mobility and Environment*, 14 (2), 211-226. <https://doi.org/10.6093/1970-9870/7886>
- Italiancoworking (2021). Italian coworking survey 2021, I numeri del coworking in Italia, 30 gennaio 2021, <https://www.italiancoworking.it/i-numeri-del-coworking-in-italia>
- Lo Russo M., & Mariotti I. (2022). L'impatto della pandemia Covid-19 sulla sostenibilità e resilienza degli spazi di coworking, in Montanari F., a cura di, *Spazi collaborativi in azione. Creatività, innovazione e impatto sociale*, Franco Angeli, Milano, in corso di pubblicazione.
- Mainieri M., Saturno E., Selloni D. (2021). Coworking di prossimità: nuovi modelli per una città dei 15 minuti. Un percorso di co-design con i coworking milanesi, Milano Collabora, Comune di Milano, https://collaboriamo.org/media/2021/07/Coworking_a_Milano.pdf
- Manfredini, F. & Di Rosa, C. (2018). Measuring Spatial Accessibility for Elderly. An Application to Subway Station in Milan. *Tema. Journal of Land Use, Mobility and Environment*, 85-94. doi: <http://dx.doi.org/10.6092/1970-9870/5800>
- Manzini Ceinar, I., & Mariotti, I. (2021). Teleworking in post-pandemic times: may local coworking spaces be the future trend? *Romanian Journal of Regional Science*, 15 (1), 52-76.
- Mariotti I., Di Vita S., & Akhavan M. (2021a), eds., *New workplaces: Location patterns, urban effects and development trajectories. A worldwide investigation*, Springer.
- Mariotti, I., Di Marino, M., & Akhavan, M. (2021b). The emergence of coworking models in the face of pandemic. In J.R. Bryson, A. Lauren, L. Reardon, A. Ersoy, eds., *Living with Pandemics: People, Place and Policy*, Edward Elgar, 129-139.
- Mariotti I., Manfredini F., & Giavarini V. (2021c). La geografia degli spazi di coworking a Milano. Una analisi territoriale, Milano Collabora, Comune di Milano, https://collaboriamo.org/media/2021/07/Coworking_a_Milano.pdf
- Mariotti I., Di Marino M., & Bednar P. (2022a). *The COVID-19 pandemic and Future of Working Spaces*. Routledge, <https://doi.org/10.4324/9781003181163>
- Mariotti I., Di Matteo D., & Rossi F. (2022b). Who were the losers and winners during the COVID-19 pandemic? The rise of remote working in suburban areas. *Regional Studies, Regional Science*, forthcoming.
- Mariotti I. (2021). Il lavoro a distanza svuota le città? In Bellandi M., Mariotti I., Nisticò R., eds, *Città e periferie alla prova del Covid-19: dinamiche territoriali, nuovi bisogni, politiche*, Donzelli Editore, Roma, pp.25-35.
- Mariotti I., Pacchi C., & Di Vita S. (2017). Coworking Spaces in Milan: Location Patterns and Urban Effects, *Journal of Urban Technology*, 24 (3), 1-21.
- Moreno, C.; Allam, Z.; Chabaud, D.; Gall, C.; & Pratlong, F. (2021). Introducing the "15-Minute City": Sustainability, Resilience and Place Identity in Future Post-Pandemic Cities. *Smart Cities*, 4, 93-111. <https://doi.org/10.3390/smartcities4010006>
- Mouratidis, K. (2018). Is Compact City Livable? The Impact of Compact Versus Sprawled Neighbourhoods on Neighbourhood Satisfaction. *Urban Studies* 55 (11), 2408-2430 <https://doi:10.1177/0042098017729109>
- Newman, P. Beatley, T., & Boyer, H. (2017). *Resilient Cities: Overcoming Fossil Fuel Dependence*, 2nd ed.; Island Press: Washington, DC, USA.
- Osservatorio Smart Working (2021). Politecnico di Milano: <https://www.osservatori.net/it/ricerche/osservatori-attivi/smart-working>
- Pais, I., Manzo, C., & Gerosa, A. (2021). La trasformazione dei coworking di Milano nell'emergenza pandemica. Le interviste ai coworking manager. Report, Comune di Milano, Milano Collabora, https://collaboriamo.org/media/2021/07/Coworking_a_Milano_cattolica.pdf
- Perry, C.A. (1929) "The Neighborhood Unit", "Regional Plan of New York and its Environs", vol. VII, New York.
- Reid, C. (2020). Anne Hidalgo Re-elected as Mayor of Paris Vowing to Remove Cars and Boost Bicycling and Walking. Available online: <https://www.forbes.com/sites/carltonreid/2020/06/28/anne-hidalgo-re-elected-as-mayor-of-paris-vowing-to-remove-cars-and-boost-bicycling-and-walking/?sh=7aa9e961c852>

Pinto, F., & Akhavan, M. (2022). Scenarios for a Post-Pandemic City: urban planning strategies and challenges of making "Milan 15-minutes city." *Transportation Research Procedia*, 60 (2021), 370–377. <https://doi.org/10.1016/j.trpro.2021.12.048>

Smith, Mark K. (2011). 'Neighborhoods and regeneration. Theory, practice, issues', *The encyclopedia of pedagogy and informal education*. [www.infed.org/community/neighborhoods_and_regeneration.htm].

Sostero, M., Milasi, S., Hurley, J., Fernandez-Marcias, E., & Bisello, M. (2020), Teleworkability and the COVID-19 crisis: a new digital divide? Seville, European Commission JRC and Eurofound.

Spinuzzi, C. (2012). Working Alone, Together: Coworking as Emergent Collaborative Activity. *Journal of Business and Technical Communication*, 26 (4), 399–441. <https://doi.org/10.1177/1050651912444070>

Tajani C. (2021), *Città prossime. Dal quartiere al mondo: Milano e le metropoli globali*, Guerini e Associati editore.

Zecca, C., Gaglione F., Laing, R., & Gargiulo C., (2020) Pedestrian routes and accessibility to urban services. rhythmic analysis on people's behaviour before and during the Covid-19. *Tema. Journal of Land Use, Mobility and Environment* 13 (2), 241-256. <http://dx.doi.org/10.6092/1970-9870/7051>

Weng, M.; Ding, N.; Li, J.; Jin, X.; Xiao, H.; He, Z.; & Su, S. (2019). The 15-minute walkable neighbourhoods: Measurement, social inequalities and implications for building healthy communities in urban China. *Journal of Transport & Health*, 13, 259–273.

Image Sources

Fig.1: Mariotti et al. (2021c, p.33);

Fig.2: Mariotti et al. (2021c, p.34);

Fig.3: Mariotti et al. (2021c, p.24);

Fig.4: Mariotti et al. (2021c, p.29);

Fig.5: Mariotti et al. (2021c, p.30);

Fig.6: authors' elaboration on Piano dei Servizi di Milano (PGT);

Fig.7: authors' elaboration on Piano dei Servizi di Milano (PGT);

Fig.8: Mariotti et al. (2021c, p.39);

Fig.9: authors' elaboration on Piano dei Servizi di Milano (PGT);

Fig.10: Mariotti et al. (2021c, p.38);

Fig.11: authors' elaboration on Piano dei Servizi di Milano (PGT);

Fig.12: Mariotti et al. (2021c, p.40).

Table Sources

Tab.1: authors' elaboration on Piano dei Servizi di Milano (PGT).

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