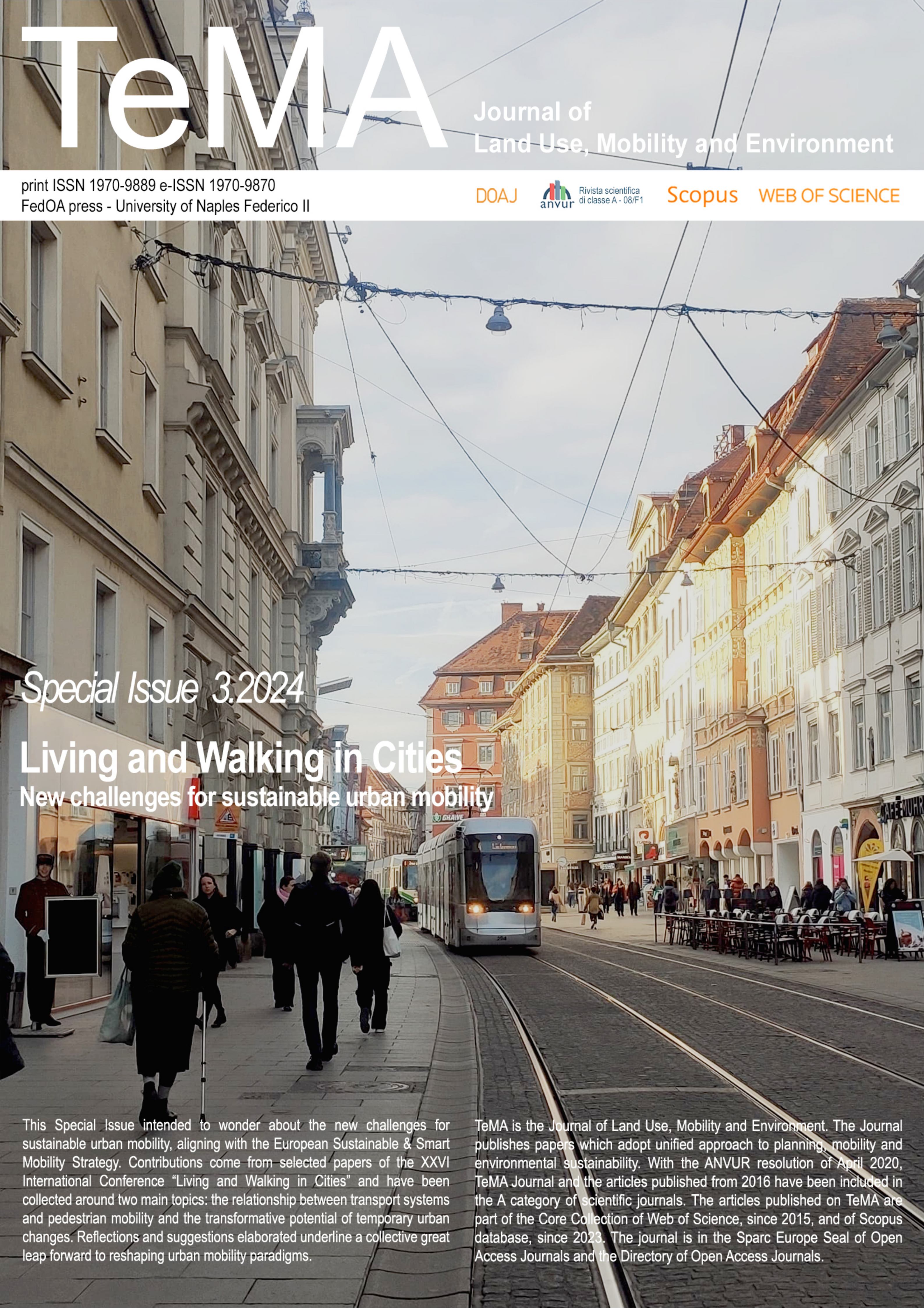

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New challenges for sustainable urban mobility

This Special Issue intended to wonder about the new challenges for sustainable urban mobility, aligning with the European Sustainable & Smart Mobility Strategy. Contributions come from selected papers of the XXVI International Conference "Living and Walking in Cities" and have been collected around two main topics: the relationship between transport systems and pedestrian mobility and the transformative potential of temporary urban changes. Reflections and suggestions elaborated underline a collective great leap forward to reshaping urban mobility paradigms.

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Cover photo: Herrengasse street in Graz (Austria), baroque pedestrian avenue and centre of public life, provided by Michela Tiboni (June, 2024)

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Towards more walkable streets. An assessment method applied to school areas in Parma

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Abstract

It is well known that urban areas near schools are often characterised by excessive motorised traffic, making access to school facilities difficult and dangerous on foot, especially for children. Increasing walkability of these areas can indeed lead to multiple benefits: safer streets, cleaner air, a more pleasant public space that encourages social uses and the adoption of healthier lifestyles. For these reasons, scientific literature has recently focused on school streets/squares, and their possible regeneration, also through tactical urbanism. Even Italian legislation have recently introduced the concept of "school zones".

Methods and tools are, therefore, needed to delimitate these zones and assess their walkability and quality to select appropriate interventions.

Within this framework, the paper applies a GIS-based methodology to calculate a School Walkability Index (SWI), providing a score for catchment areas around schools. The method is applied in the 3-, 10- and 15-minute pedestrian isochrones around primary schools in Parma. Data to perform the walkability assessment have been collected through in-field inspections. This evaluation enables the identification of low walkability levels and punctual criticalities. The outcomes of the research can be helpful to public administrations engaged in improving school accessibility and the social vocation of the surrounding public spaces.

Keywords

Walkability; Primary schools; GIS.

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1. Introduction

Already in 1975, traffic psychologist Stina Sandels concluded that 'even the best road safety education cannot adapt a child to modern traffic, so traffic has to be adapted to the child' (Sandels, 1975). And in 1996, the third edition of the Living and Walking in Cities Conference organised by the *Centro Studi Città Amica* (CeSCAm) at the University of Brescia already titled 'Going to School', addressing possible interventions to remodel the city looking at children safety to and around school areas (Busi & Ventura, 1996). Indeed, active mobility is a crucial strategy for encouraging children's physical activity and wellbeing, as well as for supporting decarbonisation actions, but it requires supportive environments that allow children to walk safely and comfortably. The role of schools siting and street design and their effects on the potential to walk to school is well established in the literature (Aynaz Lotfata et al., 2023; Giles-Corti et al., 2011; Rodriguez et al., 2009; Thomas et al., 2022), and nowadays schools are still among the best locations to start street transformations. As everybody could understand, children are the most important road users around schools and should be protected (Alam, 2022). It is well known that urban areas near schools are often characterised by car traffic congestion, especially at specific times of the day, causing inconvenience for children and their carers in terms of accessibility on foot, but also impacting the environment. This condition also prevents these urban spaces from being used for different purposes: social, educational, or recreational. Recent literature on the subject is increasingly focusing on *school streets* or *school squares* as ways to reinvent urban areas around school facilities, also considering tactical urban planning interventions, as those enhanced during the pandemic (City of Victoria, 2019; D'Amico, 2024; Lydon & Garcia, 2015; Hopkinson et al., 2021; Pileri et al., 2022; Sangalli & Pinzuti, 2021). Furthermore, as reminded by Bertolini (Bertolini, 2020), *play streets*, i.e., the temporarily closure of entire streets to motorised traffic to give children more space to play, are currently experiencing a revival in many parts of the world, usually as a result of citizen initiatives, with significant positive effects on physical activity, safety, social interaction, and social capital. Even in Italian legislation, particular emphasis has recently been placed on the issue. In fact, the "school zone" has been officially included within the Italian Street Code by the Legislative Decree n. 76/2020. This law recently defined "school zones" as urban areas close to school buildings, in which special protection for pedestrians and the environment is guaranteed, delimited along the access roads by appropriate start and end signs. Within this framework, this paper defines a School Walkability Index approach, that could be applied to priorities urban interventions on the road space around school areas. The index was applied to each road segment within pedestrian catchment areas around 21 primary schools in the city of Parma (Italy) to define a comprehensive pedestrian friendliness score of each analysed school catchment area.

The paper is structured as follows: section 2 presents the case study of Parma and the materials and methods applied to evaluate the School Walkability Index. Section 3 shows the results and provides a discussion in terms of quantitative and qualitative walkability assessment around the analysed schools, and finally section 4 concludes the work by presenting future research steps.

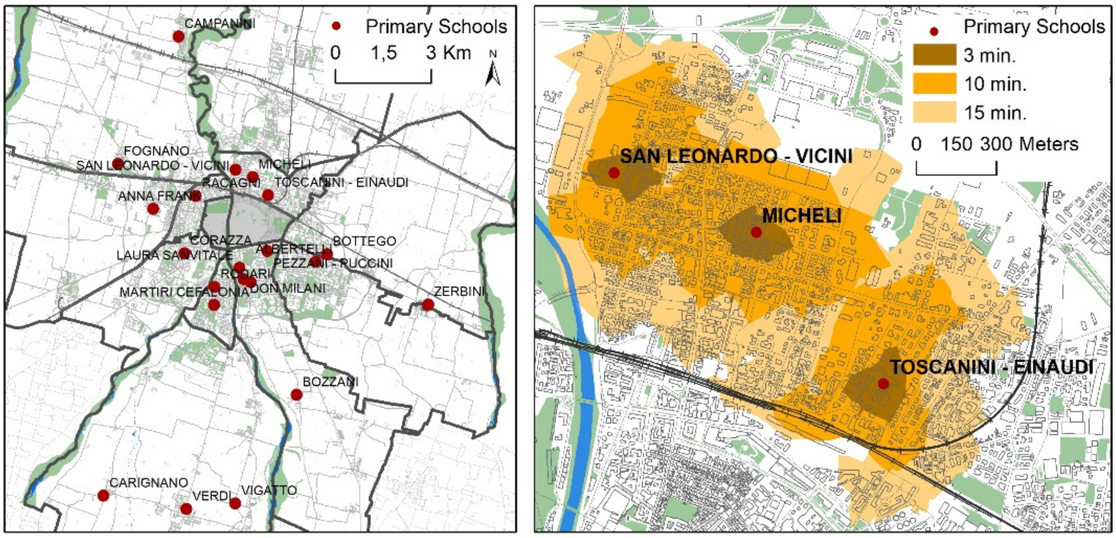
2. Materials and methods

2.1 The case study of primary schools in Parma

Parma is a medium-sized city located in the Emilia-Romagna Region, in the north of Italy. In 2023, the city[1] counts 198,431 inhabitants, 8,605 of which are children in the primary school age (6-10 years old), and it is divided in 13 neighborhoods. For this analysis, 21 elementary schools were selected (Fig.1a), including all the primary schools located within the city (both public and private ones), except for primary schools located in

1 Data referred to January 2023 taken from the Parma Open Data Portal (source: https://opendata.comune.parma.it/dataset/popolazione-residente-al-1-gennaio-2023 accessed in May 2023).

the historical center ('Oltretorrente' and 'Parma Centro' neighborhoods), since walkability issues within the historic city presents specific peculiarities that could be addressed through more detailed approaches (see, i.a., Caselli et al., 2021). For each of the analysed schools, specific isochrones were defined considering a child walking at 3 km/h and adopting a GIS-based network analysis methodology (Caselli et al., 2021; Rossetti et al., 2020). Considered isochrones reflects a 3 min. – to define the closest urban area around the schools - 10 min. and 15 min. walking time to and from schools (Fig.1b) - values considered in the literature as optimal catchment areas for primary schools (Mercandino, 2006; ORL-ETH Zürich).



(a) (b)

Fig.1 (a) Location of the 21 analysed primary schools within the neighbourhood of Parma; (b) example of the 3-, 10- and 15-minutes walking catchment areas for some of the schools (San Leonardo-Vicini, Micheli and Toscanini-Einaudi) (on the right)

Attribute	Qualitative evaluation	Quantitative evaluation
Pedestrian/Vehicle-allowed	Only pedestrians allowed/Vehicles allowed	P / V
L1-Sidewalk provision	No/Only one side/Both side	-1/1/2
L2-Sidewalk width	No/ Only one side >90cm <1.50m/ Only one side >1.50m/ Both side >90cm <1.50m/Both side >1,50m	-1/0.5/1/ 1.5/2
L3-Ramps provision	Absent/Present	-1/1
L4-Presence of obstacles	Present/Absent	-1/1
L5-Surface maintenance	Poor/Good	-1/1
L6-Continuity	Absent/Present	-1/1
L7-Presence of parking	Present/Absent	-1/1
C1-Crossing provision	Absent/Present	-1/1
C2-Access ramp provision	Absent/Present	-1/1
C3-Crossing maintenance	Poor/Good	-1/1
C4-Crossing length	Excessive/Regular	-1/1
C5-Visibility	Poor/Good	-1/1

Tab.1 Selected attributes and related evaluation for the walkability assessment in the catchment areas of each analysed school

Within those isochrones, roads inspections were carried out to gather specific data on the pedestrian paths available and on their walkability levels. Detailed field inspections gathered information on each road segment within each isochrone, considering several infrastructural elements (e.g. road type; carriageway width, sidewalk provision and widths, presence of crossings, ramps, lightings, possible presence of obstacles, maintenance and paving factors, continuity), as well as factors related to the urban environment (e.g. buildings types, land uses, presence of public services and facilities) (Campisi et al., 2021; Ignaccolo et al., 2020; Lee et al., 2020; Torrisi et al., 2022). Each of these attributes was evaluated qualitatively and quantitatively, attributing a numerical value according to the observed description of the considered attribute. The numerical value is lower if the condition of the attribute is negative, and vice versa. Tab.1 summarises the attributes used for the evaluation.

2.2 School Walkability Index (SWI)

To consider the characteristics detected along the pedestrian routes in an aggregate way, a global walkability index was calculated for both vehicular and pedestrian-restricted links. This index was defined as "School Walkability Index" (SWI), as it aims to assess walkability at the catchment areas of each analysed school. In fact, the numerical evaluation assigned to the considered attributes took this into account, i.e. the presence of parking is considered in a negative sense since it would be advisable to encourage soft mobility (i.e. walking and cycling) and discourage the use of private cars to take children to school, and moreover to stop in its immediate surroundings. The calculation of SWI for vehicular links was performed following Equation 1:

$$SWI_{vehic} = L_1 * \left(1 + \frac{\sum_{n=2}^{7} L_n}{9}\right) + C_1 * \left(1 + \frac{\sum_{n=2}^{5} C_n}{4}\right) \quad (1)$$

where the numbers 9 and 4 respectively correspond to the maximum values that links and crossings' attributes can assume. Then, the obtained SWIs were normalised between 0 to 1.

The SWI for pedestrian links was considered equal to the maximum normalised value of 1, increasing it by 0.5 in the case of good surface maintenance.

3. Results and Discussions

This session reports the main results obtained for the analysed case study, presented through the elaboration of thematic maps. Using a GIS software, a spatial analysis was conducted with georeferenced data, linking the database of attributes to the road network graph through a joint based on the IDJ parameter, associated with each link.

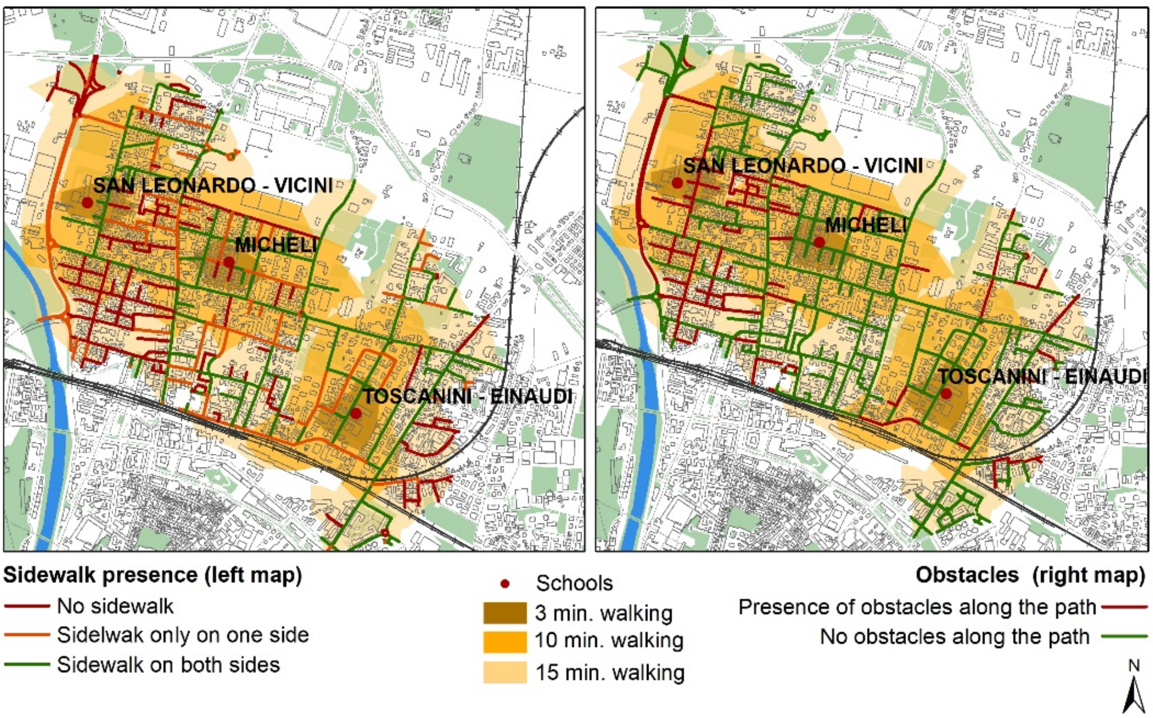


Fig.2 Examples of thematic maps for the inspected road segments within the 3-, 10- and 15-minute isochrone from some of the considered schools. Each road segment is coloured according to sidewalk presence (left) and obstacles (right)

Fig.2 shows just few of the possible thematic maps that could be developed with the collected data. The sidewalk provision is shown in Fig.2 on the left: there is a small number of green links with the sidewalk on both sides and this happens above all passed the immediate surroundings (3-minute isochrone) of the school. The presence of obstacles is graphically shown in the Fig.2 on the right: in the case of the San Leonardo - Vicini school, there is a greater presence of obstacles along the path. Then, the SWI was assessed for each road and pedestrian segments included in the 3-, 10- and 15-minutes catchment areas of the primary schools. Fig.3 shows the obtained SWIs for each segment around some of the analysed schools. It evidently emerges in the zoom (on the right) low SWI values associated with the links around the schools of Verdi and Vigatto. In fact, near these two schools, located in peripheral and rural areas of the city it is possible to highlight that the sidewalk is not always present. Afterwards, calculating the arithmetic mean of the SWIs associated with each road and pedestrian segment within the considered isochrones, it was possible to obtain an overall evaluation of the walkability for the 3-, 10- and 15-minutes walking catchment areas of analysed schools (Fig.4a and 4b).

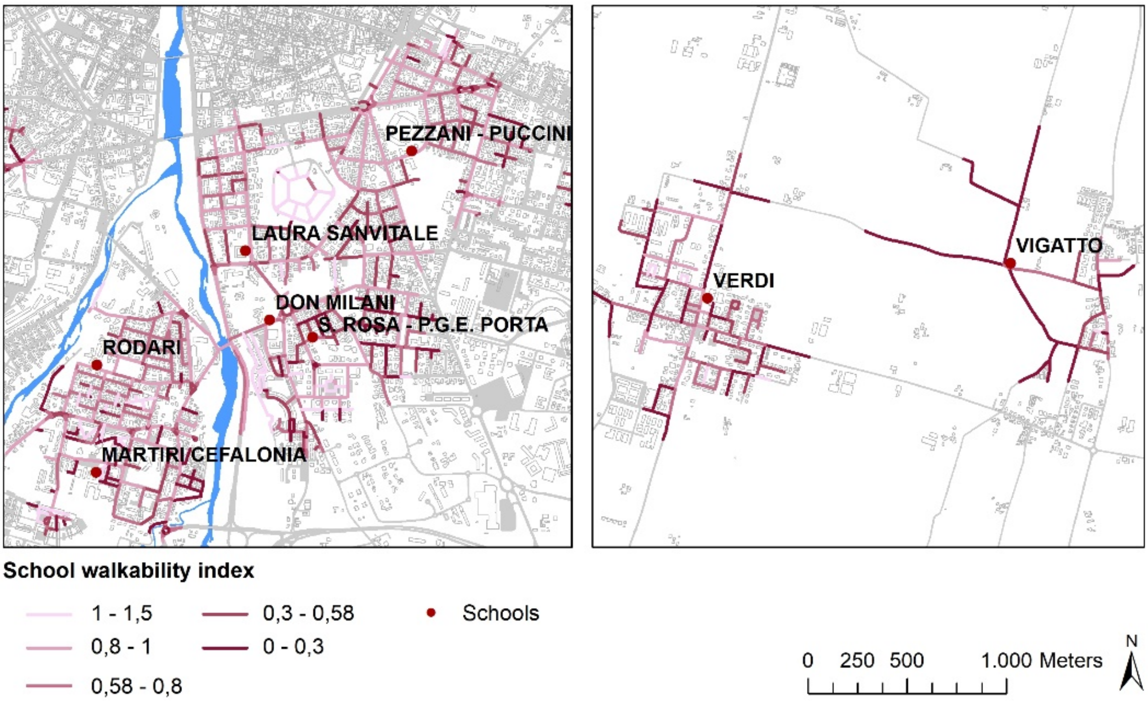


Fig.3 SWI applied to the road segments within 15 minutes walking from some of the analysed primary schools in Parma

A quantitative analysis of the obtained results was summarised in Tab.2, reporting the SWIs for all the analysed school sites, for each of the three isochrone levels considered. On average, the number of schools with a low average SWI value is equal to 38% for the 3- and 10-minute isochrones and it rises to 43% for the 15-minute isochrones. Carrying out a global assessment for the three levels of isochrones, there is an equal distribution between the schools with the worst and best average SWI, in both cases equal to 3 schools.

Then, punctually analysing some schools, it is possible to highlight that in some cases redevelopment interventions would be needed in the immediate vicinity (i.e. Laura SanVitale and Martiri Cefalonia schools); instead, in other cases within the 3-minute isochrone the walkability is good, but moving to 10 and 15 minutes of walking distance the value of the average SWI becomes critical, making walking to the school difficult both in terms of comfort and safety (Fig.5).

This happens, e.g., in the cases of the Anna Frank and Micheli schools, because the larger service areas (10- and 15-minute isochrone areas) either straddle a peri-urban zone or an obsolete residential area where pavements are not always present on streets, or these are not properly dimensioned.

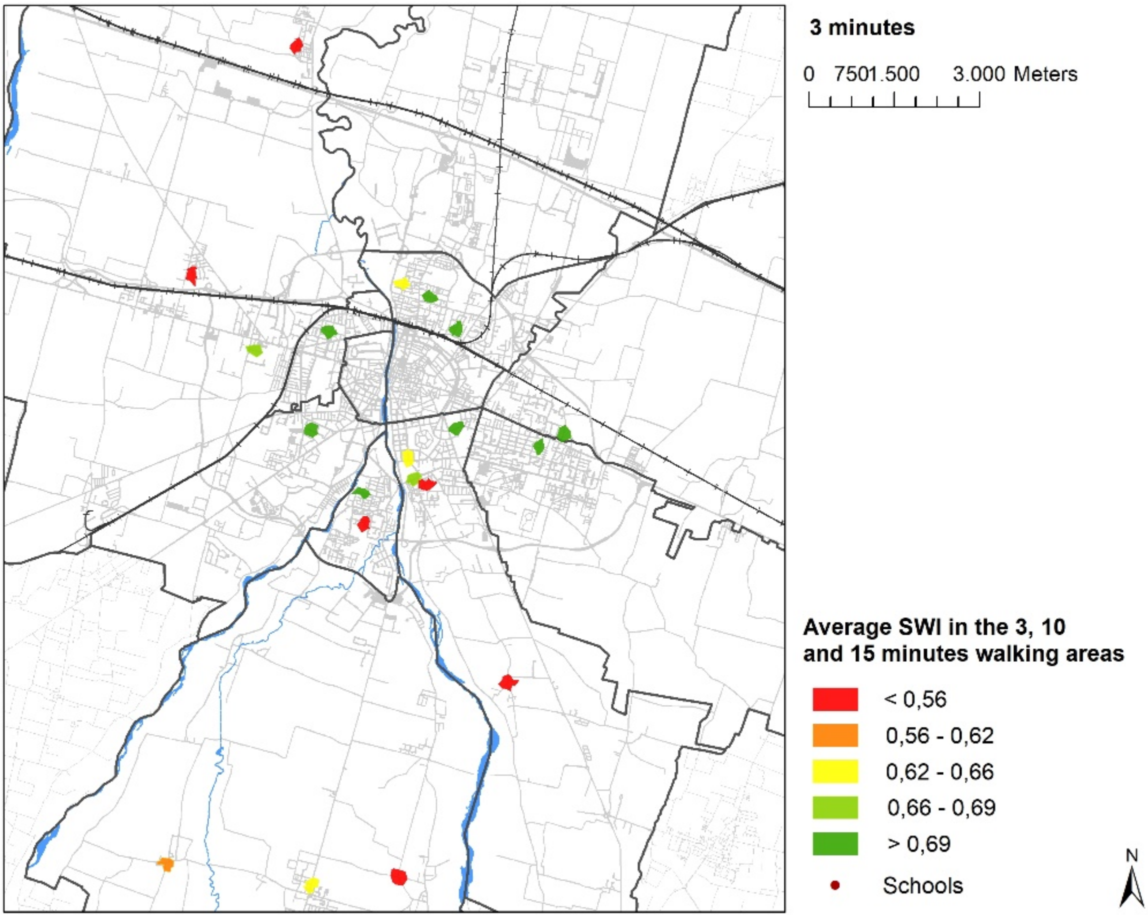


Fig.4a Average normalised SWI in the 3-minute walking catchment areas around the analysed primary schools

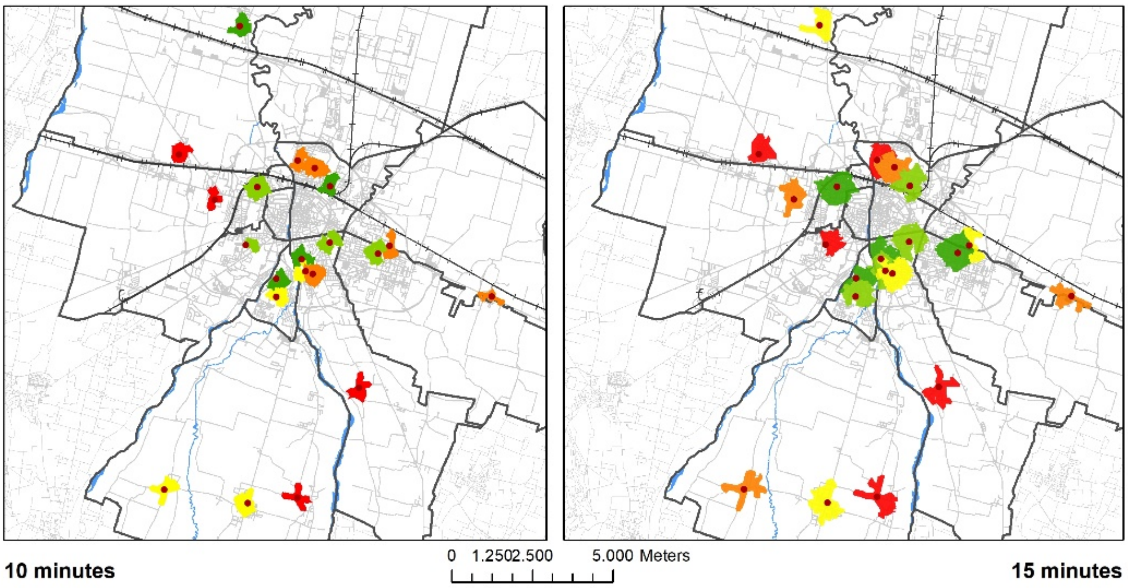


Fig.4b Average normalised SWI in the 10- (on the left) and 15- (on the right) minute walking catchment areas around the analysed primary schools

School name	Average SWI 3 minutes	Average SWI 10 minutes	Average SWI 15 minutes
ALBERTELLI	1.27	0.72	0.70
ANNA FRANK	0.69	0.54	0.59
BOTTEGO	0.72	0.60	0.64
BOZZANI	0.33	0.28	0.30
CAMPANINI	0.41	0.75	0.66
CARIGNANO	0.60	0.67	0.59
CORAZZA	0.74	0.73	0.56
DON MILANI	0.67	0.69	0.68
FOGNANO	0.49	0.42	0.44
LAURA SANVITALE	0.62	0.74	0.78
MARTIRI CEFALONIA	0.56	0.69	0.69
MICHELI	0.73	0.62	0.62
PEZZANI - PUCCINI	0.72	0.72	0.67
RACAGNI	0.78	0.72	0.70
RODARI	0.79	0.76	0.71
S. ROSA - P.G.E. PORTA	0.37	0.66	0.65
SAN LEONARDO - VICINI	0.62	0.58	0.52
TOSCANINI - EINAUDI	0.72	0.75	0.69
VERDI	0.65	0.68	0.63
VIGATTO	0.32	0.38	0.52
ZERBINI	0.27	0.60	0.60

Tab.2 Average SWI in the catchment areas of each analysed school

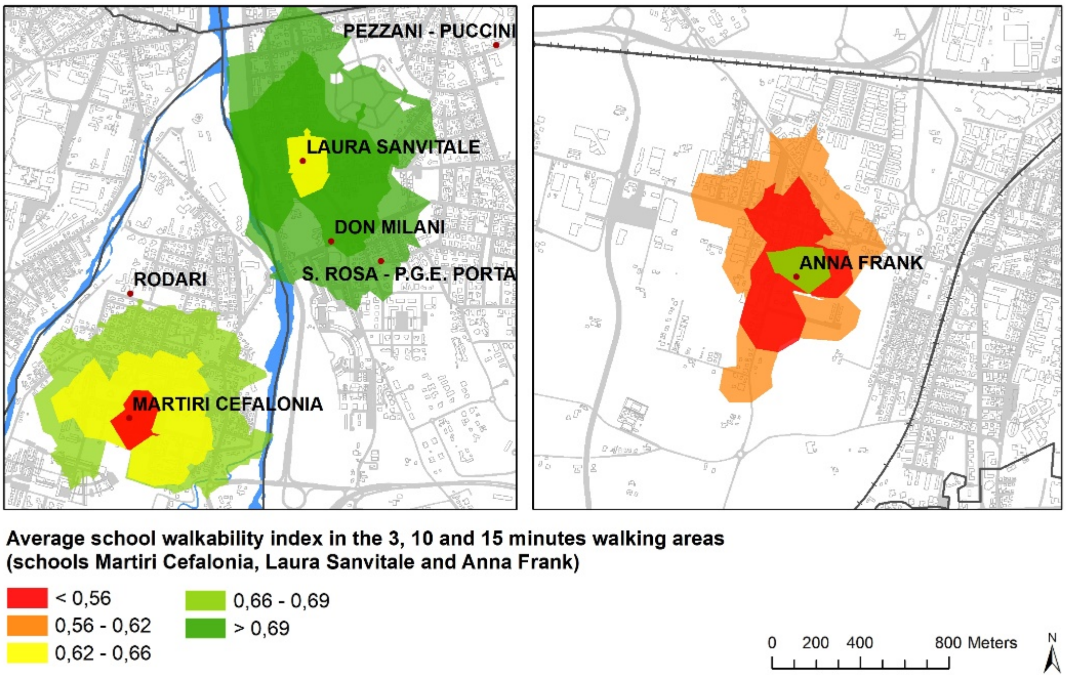


Fig.5 Average normalised SWI in the 3-, 10- and 15-minutes walking catchment areas around some of the analysed primary schools that presents different walkability levels in the different isochrones

4. Conclusions

As reported in the literature, school zones (often addressed as school streets or school squares) have positive impacts on children, families, and the environment in general. Their delimitation, in conjunction with road redesign (also through tactical urbanism) to solve walkability criticalities along the routes, could play a crucial role in boosting walking to schools. The proposed methodology provides an assessment of walking catchment areas around schools highlighting the most critical routes in terms of walkability index, where those kinds of interventions could be more successfully applied. Furthermore, the methodology could also allow the identification of punctual areas around schools where even smaller interventions can improve single walkability bottlenecks or obstacles (e.g. by removing single parking stalls and extending the sidewalk on the model of parklets (Campisi et al., 2022)). All these measures could boost the shift toward active mobility and respond to some of the challenges that contemporary cities are facing: i.a., environmental sustainability, energy transition, resilience, social inclusion and equity (Carpentieri et al., 2023; Carra et al., 2022; Costa & Delponte, 2024; Gargiulo et al., 2022; Papa et al., 2018; Spadaro et al., 2023; Tiboni et al., 2021; Tiboni & Rossetti, 2012; Tira et al., 2020).

The proposed methodology will be exploited, e.g. by considering how the length of each road segment could affect the overall walkability around the school. Further improvements could also involve some analysis of the perception of school pupils (e.g. through questionnaires or surveys), as also already partially done for some pilot primary schools in Parma (San Leonardo, Cocconi and Micheli schools) by the municipality, through the 'Gamification' experience developed in 2021 thanks to the URBACT project 'Thriving Streets'.

References

Alam, A. (2022). Investigating sustainable education and positive psychology interventions in schools towards achievement of sustainable happiness and wellbeing for 21st century pedagogy and curriculum. *ECS Transactions, 107* (1), 19481. https://doi.org/10.1149/10701.19481ecst

Bertolini, L. (2020). From "streets for traffic" to "streets for people": can street experiments transform urban mobility? *Transport Reviews*, *40* (6), 734–753. https://doi.org/10.1080/01441647.2020.1761907

Busi, R. & Ventura, V. (Eds.). (1996). *Proceedings of the III International Conference "Living and Walking in Cities" - Going to School*. Office for official publications of the European Communities, Luxembourg

Campisi, T., Caselli, B., Rossetti, S. & Torrisi, V. (2022). The Evolution of Sustainable Mobility and Urban Space Planning: Exploring the factors contributing to the Regeneration of Car Parking in Living Spaces. *Transportation Research Procedia*, *60*, 76-83. https://doi.org/10.1016/j.trpro.2021.12.011

Campisi, T., Ignaccolo, M., Inturri, G., Tesoriere, G., & Torrisi, V. (2021). Evaluation of walkability and mobility requirements of visually impaired people in urban spaces. *Research in Transportation Business & Management*, *40*, 100592. https://doi.org/10.1016/j.rtbm.2020.100592

Carpentieri, G., Guida, C., Gorrini, A., Messa, F., Abdelfattah, L. & Büttner, B. (2023). Digital data to support urban planning processes to develop women safety cities: an application to the city of Naples. *TeMA - Journal of Land Use, Mobility and Environment*, *16*(3), 595-608. https://doi.org/10.6093/1970-9870/10272

Carra, M., Rossetti, S., Tiboni, M. & Vetturi, D. (2022). Urban regeneration effects on walkability scenarios. *TeMA - Journal of Land Use, Mobility and Environment*, 101-114. https://doi.org/10.6093/1970-9870/8644

Caselli, B., Rossetti, S., Ignaccolo, M., Zazzi, M. & Torrisi, V. (2021). Towards the Definitions of a Comprehensive Walkability Index for Historical Centres. In *Computational Science and Its Applications – ICCSA 2021*, *Lecture Notes in Computer Science,* 12958. Cham: Springer. https://doi.org/10.1007/978-3-030-87016-4_36

Caselli, B., Carra, M., Rossetti, S. & Zazzi, M. (2021). From urban planning techniques to 15-minute neighbourhoods. A theoretical framework and GIS-based analysis of pedestrian accessibility to public services. *European Transport|Trasporti Europei, 85* (10). https://doi.org/10.48295/ET.2021.85.10

City of Victoria, CRD, 880 cities. (2019). *School Streets Guidebook*. Retrieved from: https://www.880cities.org/wp-content/uploads/2019/11/school-streets-guidebook-2019.pdf

Costa, V. & Delponte, I. (2024). User-centred mobility management and social inclusion. Urban insights from the University of Genoa. *TeMA - Journal of Land Use, Mobility and Environment, 2*, 33-45. https://doi.org/10.6093/1970-9870/10299

D'Amico, A. (2024). Examples of good experiences for child-friendly cities. Comparison of sustainable practices in Italy and around the world. *TeMA - Journal of Land Use, Mobility and Environment, 2*, 143- 155. https://doi.org/10.6093/1970-9870/10886

Gargiulo, C., Maternini, G., Tiboni, M. & Tira, M. (2022). New scenarios for safe mobility in urban areas. *TeMA - Journal of Land Use, Mobility and Environment*, 3-5. https://doi.org/10.6093/1970-9870/8916

Giles-Corti, B., Wood, G., Pikora, T., Learnihan, V., Bulsara, M., Van Niel, K., Timperio A., McCormack G. & Villanueva K. (2011). School site and the potential to walk to school: The impact of street connectivity and traffic exposure in school neighborhoods. *Health & Place*, *17* (2), 545-550. https://doi.org/10.1016/j.healthplace.2010.12.011

Hopkinson, L., Goodman, A., Thomas, A., Aldred, R. & Sloman, L. (2021). *School Streets: Reducing children's exposure to toxic air pollution and road danger*. Report by Transport for Quality of Life and Active Travel Academy for Possible and Mums for Lungs, January 2021. Retrieved from: https://transportforqualityoflife.com/wp-content/uploads/2023/11/school-streets-reducing-childrens-exposure-to-toxic-air-pollution-and-road-danger-2021.pdf

Ignaccolo, M., Inturri, G., Giuffrida, N., Le Pira, M., Torrisi, V. & Calabrò, G. (2020). A step towards walkable environments: spatial analysis of pedestrian compatibility in an urban context; *European Transport|Trasporti Europei*, *76* (6), 1-12

Lee, S., Lee, C., Nam, J. W., Abbey-Lambertz, M. & Mendoza, J. A. (2020). School walkability index: Application of environmental audit tool and GIS. *Journal of Transport & Health, 18*, 100880. https://doi.org/10.1016/j.jth.2020.100880

Lydon, M. & Garcia, A. (2015). *Tactical urbanism: Short-term action for long-term change*. Washington DC: Island Press

Lotfata, A., Tao, R. & Su, Y. (2023). Evaluating the walking accessibility of Cook County's public schools to use as open space. *International Journal of Urban Sciences*, *27* (1), 1-18. https://doi.org/10.1080/12265934.2022.2072940

Mercandino, A. (2006). *Urbanistica tecnica. Pianificazione Generale*. Milano: Il Sole 24 ore

ORL-ETH Zürich (various years). Provvisorische Richtlinien zur Orts-, Regional- und Landesplanung, Zurigo

Papa, E., Carpentieri, G. & Guida, C. (2018). Measuring walking accessibility to public transport for the elderly: the case of Naples. *TeMA - Journal of Land Use, Mobility and Environment, 105-116*. https://doi.org/10.6092/1970-9870/5766

Pileri, P., Renzoni, C. & Savoldi, P. (2022). *School Squares. Reinventing the dialogue between school and city*. Mantova: Corraini Edizioni

Rodriguez, A. & Christine A. Vogt. (2009). Demographic, environmental, access, and attitude factors that influence walking to school by elementary school-aged children. *Journal of School Health, 79* (6), 255-261. https://doi.org/10.1111/j.1746-1561.2009.00407.x

Rossetti, S., Tiboni, M., Vetturi, D., Zazzi, M. & Caselli, B. (2020). Measuring Pedestrian Accessibility to Public Transport in Urban Areas: a GIS-based Discretisation Approach, *European Transport|Trasporti Europei*, *76* (2)

Sandels, S. (1975). *Children in traffic*. Surrey: Elek Books Ltd

Sangalli, G. & Pinzuti, P. (2021). *Le strade scolastiche. Nuove piazze per le città*. Bikenonomist

Spadaro, I., Rotelli, C. & Adinolfi, P. (2023). Sustainable mobility for urban regeneration. *TeMA - Journal of Land Use, Mobility and Environment*, *16* (2), 255-277. https://doi.org/10.6093/1970-9870/9722

Thomas, A., Furlong, J. & Aldred, R. (2022). Equity in temporary street closures: The case of London's Covid-19 'School Streets' schemes. *Transportation Research Part D: Transport and Environment, 110,* 103402. https://doi.org/10.1016/j.trd.2022.103402

Tiboni, M. & Rossetti, S. (2012). Vulnerable users to assess urban quality. *TeMA - Journal of Land Use, Mobility and Environment, 5* (3), 91-102. https://doi.org/10.6092/1970-9870/1200

Tiboni, M., Rossetti, S., Vetturi, D., Torrisi, V., Botticini, F. & Schaefer, M. D. (2021). Urban policies and planning approaches for a safer and climate friendlier mobility in cities: Strategies, initiatives and some analysis. *Sustainability*, *13* (4), 1778. https://doi.org/10.3390/su13041778

Tira, M., Pezzagno, M. & Richiedei, A. (Eds.). (2020). *Pedestrians, Urban Spaces and Health: Proceedings of the XXIV International Conference on Living and Walking in Cities (LWC, September 12-13, 2019, Brescia, Italy)*. CRC Press. https://doi.org/10.1201/9781003027379

Torrisi, V., Garau, C., Barbagallo, A., Leonardi, P. & Ignaccolo, M. (2022). Modelling of Interactions Between Pedestrians and Vehicular Traffic to Promote Active Mobility: The Case of San Benedetto Neighbourhood in Cagliari (Italy). In *International Conference on Computational Science and Its Applications*, 453-468. Cham: Springer. https://doi.org/10.1007/978-3-031-10542-5_31

Image Sources

Fig.1; 2; 3; 4; 5: Elaboration of the authors.

Attributions

This paper is the result of the joint work of the authors. Conceptualisation: S.R., B.C., V.T.; Methodology: S.R, B.C., V.T.; formal analysis, S.R., B.C.; Data curation and elaboration: V.T., S.R., Writing – original draft preparation: S.R. V.T.; Writing – review and editing: B.C., V.T., S.R.; Funding acquisition: S.R., B.C.

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