Future Scenarios and Equity Implications in Pedestrian Accessibility in Athens, Greece

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Abstract. The purpose of this study is to evaluate pedestrian accessibility in a suburban area in Athens Metropolitan Area (AMA) and to explore future scenarios for road space allocation schemes. To assess the existing conditions, the study followed a geospatial analysis approach that incorporated various criteria such as pavement width, quality of pavement, the existence of crosswalks, tactile paving, and the number of curb ramps. Afterwards, five further scenarios were developed through considering socioeconomic characteristics and the preliminary assessment of the current conditions. The new scenarios are the following: a) the active mode corridors in the approved Sustainable Urban Mobility Plan (SUMP) of the municipality, b) conventional interventions (ramps and crosswalks), c) land use-oriented based interventions (improvements around transit stations and basic amenities), d) social-oriented interventions in areas with high share of disadvantaged groups and e) enhanced social-equity strategy focusing on areas with low accessibility and high share of disadvantaged groups. Equity implications were examined through the lens of both the horizontal (Gini index) and the vertical approach (Bivariate Moran's I index). Applied to the municipality of Egaleo, a suburban area in the western part of the AMA, the Gini index demonstrated that the SUMP delivers the most equitable conditions. On the other hand, the Bivariate Moran's I index indicated that the enhanced social equity strategy is the most effective in promoting vertical equity. These intriguing outcomes, particularly helpful for policymakers, strongly note that if communities strive for social equity in pedestrian accessibility, they should emphasise socio-economic data in planning.

Keywords: accessibility · pedestrians · spatial analysis · equity · scenario planning

1 Introduction

Cities in Greece suffer from a serious lack of pedestrian accessibility. At the same time, proposed planning and design solutions, do not intrinsically consider the social characteristics of urban and suburban neighbourhoods. Poor walkability conditions can lead to social exclusion, limited access to essential services, and reduced quality of life [1]. This strongly highlights the need to assess pedestrian accessibility and to explore potential future takeaways for inclusive street spaces [2].

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O. Gervasi et al. (Eds.): ICCSA 2025 Workshops, LNCS 15899, pp. 3–19, 2026.
https://doi.org/10.1007/978-3-031-97663-6_1

Notably, the main characteristics of a just city in terms of transport planning, are equity and accessibility [3, 4]. More specifically, social exclusion refers to the inability to participate in a community's economic and social activities at a basic level, despite a willingness to do so, due to limited access to opportunities [5, 6]. In the same direction, Martens [7] defined "transport equity" as ensuring a minimum level of access for everyone. This notion reflects a sufficientarian perspective of equity. Conversely, the egalitarian perspective underscores the need for an equal distribution of resources and opportunities among all members of society [8]. Overall, transport equity includes policies, infrastructure, and services that play a crucial role in making transport systems more inclusive and tailored made to the needs of the users [9]. Delving more into that notion, we should that it can be further divided into two categories: horizontal equity and vertical equity related to socio-economic status and needs According to the utilitarian approach, horizontal equity refers to the greatest benefit for most individuals from policies. Vertical equity, according to the intuitionist approach, proposes a pluralistic perception of justice to address moral issues in real-world situations [10, 11].

Previous research has shown that active modes accessibility is significantly influenced by the type of infrastructure and policy solutions, brought forward by central or local stakeholders. Barmpas et al. [12] demonstrated that small Greek cities experience serious problems related to pedestrian accessibility. Remaining in Greece, Tsigdinos [13] explored the impact of future active corridors scenarios (based on different street classification schemes) on equity in a suburban municipality of Athens and found that radical solutions (well-integrated network) tend to provide more horizontal equity conditions. This portrays the ability of road space allocation to define the accessibility levels of active travellers. Likewise, Arellana et al. [14] who studied the case of two Colombians cities, underscore that the lack of prioritisation for pedestrian infrastructure creates barriers that discourage walking, potentially exacerbating social inequities, particularly in low-income areas. It is indeed very promising, while challenging, that countries in the Global South, e.g., Chile, experience high shares of walking as the predominant transport mode (especially for lower-middle-income groups), despite the ongoing investment in car infrastructure [15]. This discrepancy between persistence of walking, but low pedestrian accessibility conditions, calls for tailored made solutions which enhance pedestrian infrastructure and support more equitable, active transportation options. Looking also into other contexts, we may find that walking facilities and their impact on a fair level of pedestrian accessibility is often ignored, thus resulting in inequitable transport systems with severe spatial disparities [16, 17].

Therefore, it is demonstrated that pedestrian accessibility problems that might lead to social exclusion phenomena, are still present in urban areas, highlighting the urgent need for more human-centric and inclusive spatial planning schemes. In this demanding "landscape", this study aims to assess pedestrian accessibility in a suburban area of the Athens Metropolitan Area (AMA) and explore potential future road space allocation strategies. To evaluate the current conditions, a geospatial analysis was conducted, considering factors such as pavement width, pavement quality, the presence of crosswalks, tactile paving, and the number of curb ramps. Subsequently, five additional scenarios were developed, taking into account socioeconomic characteristics and an initial assessment of existing conditions. The novelty of this research lies in the development of a

cohesive methodology for evaluating pedestrian accessibility through a complete equity lens (both horizontal and vertical aspect) that could be beneficial for policymakers. The structure of the paper is as follows. The second section presents the methods used in detail, the third section illustrates the results obtained, while the last section discusses the result with relevant literature as well as draws the conclusions of this study.

2 Methodology

This study was carried out in four main stages: First, the analysis of existing situation, then the scenario formulation, third, we calculated the accessibility index and finally we evaluated equity through different indices. Spatial data were used, and the analysis was done with Geographic Information System (GIS) software (QGIS and GeoDa) and statistical models (MS excel and R). The flowchart in Fig. 1 shows the process followed.

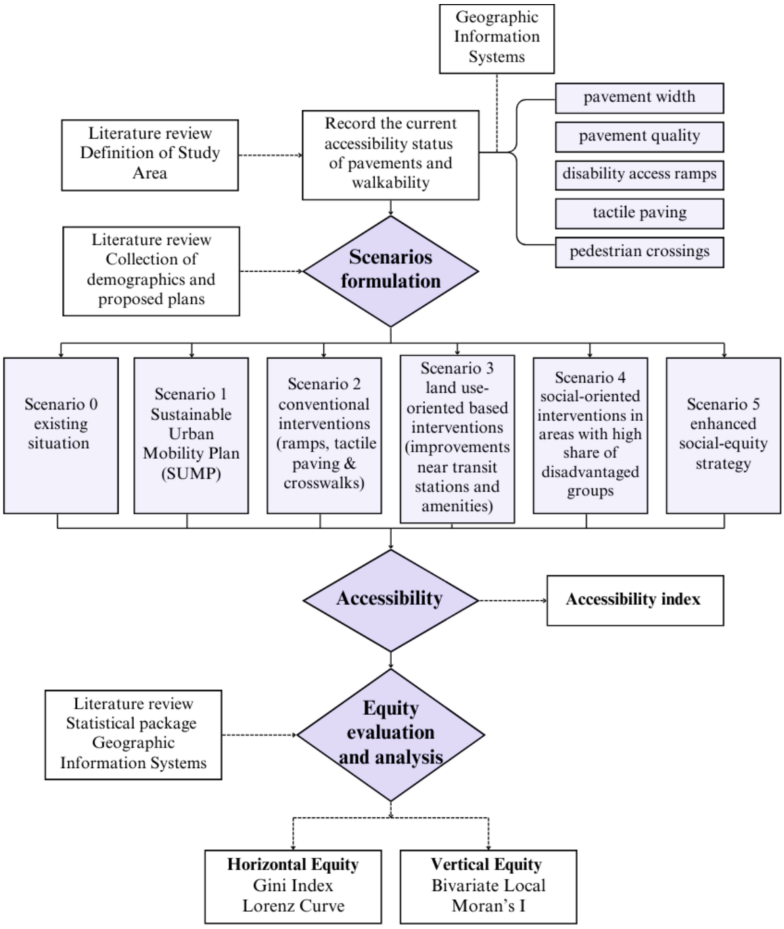

Fig. 1. Methodological framework (source: own elaboration).

2.1 Study Setting and Dataset

First and foremost, acknowledging pedestrian accessibility problems requires a challenging study area that shows context-based interest and will act as a proper study setting. Bearing this in mind, this research used the municipality of Egaleo as a study case.

This municipality is located within the AMA and it belongs to the western sector of the Athens' Regional Unit. Figure 2 shows the location of the study area within the AMA and the Attica Region. It's a rather sizable municipality (5.65 km^2), with diverse land uses like several commercial centres, metropolitan parks, two university campuses and three metro stations. Furthermore, the municipality has a great role to play for metropolitan Athens as well, as per the Regional of Attica, it is one of the most significant intermunicipal centre in the entire area. The municipality was selected because of its diverse land uses that embrace walking and due to its relatively fair connectivity with fixed route public transport (metro) compared to the rest of Athens. Afterall, pedestrians should have adequate access to public transport stations and stops [18]. Moreover, the municipality of Egaleo functions as a suitable case study, since it has an approved Sustainable Urban Mobility Plan (SUMP), thus making room for comparison with formal planning initiatives.

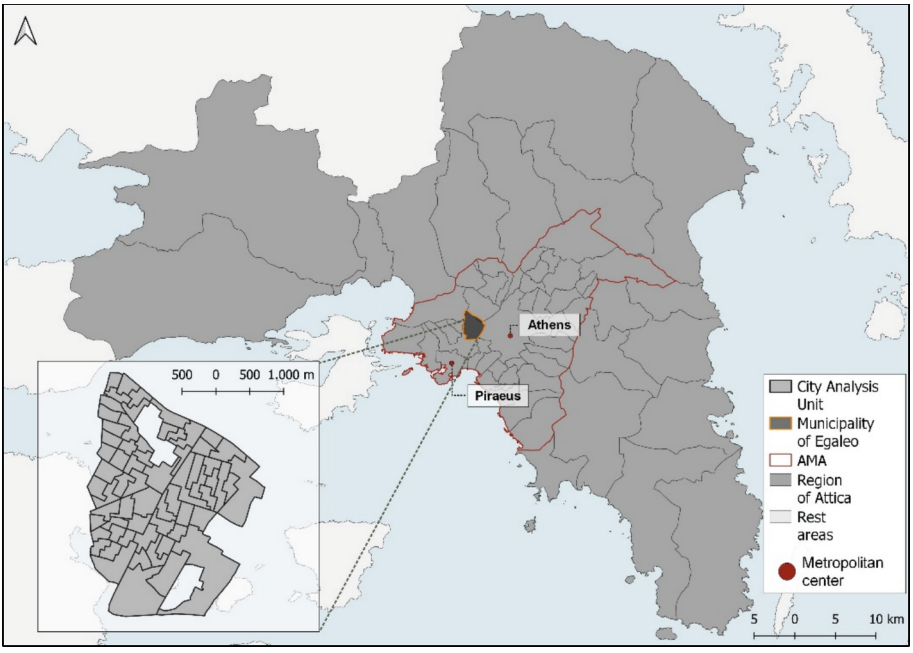

Fig. 2. Municipality of Egaleo in Athens Metropolitan Area (source: geodata.gov.gr, Panorama Greek census data and own elaboration).

Looking into the data, the Hellenic Statistical Authority (ELSTAT) provides socio-economic data, at a city analysis unit level (CAUs) [19]. These CAUs are groups of building blocks with a population of approximately 900–1,000 individuals. Therefore,

the research was conducted at the CAU level for the incorporation of this data. Notably, Egaleo consists of 63 CAUs. The obtained data referred to the socioeconomic characteristics of the residents. To facilitate the measurement of vertical equity, this study used the unemployment rate, the percentage of no-car households, and the percentage of citizens aged from 0 to 15 and over 65 according to the census of 2011 (recent data are not available yet). Figure 3 illustrates the distribution of these characteristics.

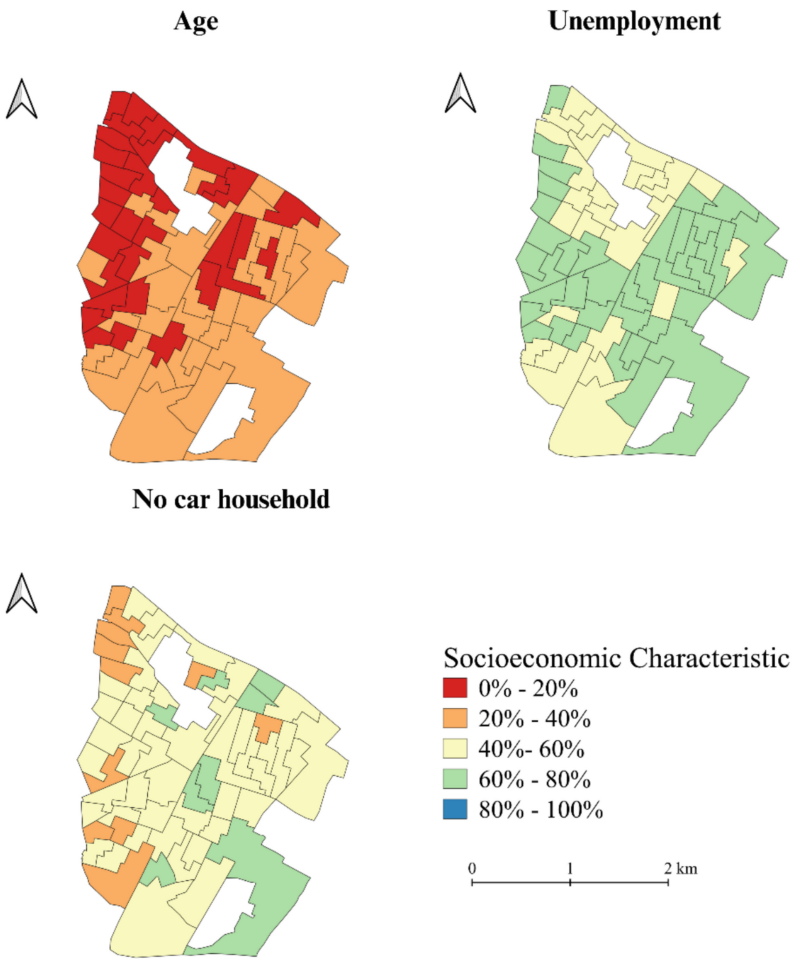

Fig. 3. Distribution of the socioeconomic characteristics in the municipality (source: own elaboration).

In particular, we observe that regarding the age factor, there are 30 CAUs where residents aged under 15 or over 65 make up to 10% of the population. Additionally, 33 CAUs exhibit a higher concentration of these age groups, reaching up to 20% of the population. Regarding the unemployment, 26 CAUs fall within the 20–30% category, while 37 CAUs belong to the 30–40% category. Lastly, in terms of households without

personal car, 11 CAUs fall within the 10–20% range, 44 CAUs within 20–30%, and 8 CAUs within 30–40%.

2.2 Current Accessibility Status

An on-site survey was conducted regarding the pavement's factors, to assess the current accessibility status in the municipality. This was incorporated through the concept of "walkability index"[20] with the selection of specific subcategories, forming a checklist. The key elements included a) pavement width and b) quality, c) the presence and d) condition of tactile paving for the visually impaired, and e) the number of ramps and f) crossings. The following table (Table 1) marks the attributes and the thresholds.

Table 1. Pavement Attributes and Accessibility Thresholds

Attributes	Values (Threshold)
Pavement width	0.10 m–1.00 m
	1.10 m–1.50 m
	1.60 m–2.00 m
	>2.00 m
Pavement quality	Very low, without tiles, without cement, with numerous barriers, without curb
	Low, broken tiles, some barriers, no homogeneity of tiles or materials
	Moderate, acceptable condition of materials, not so many barriers
	Good, homogeneity of tiles, acceptable condition of materials, not so many barriers
	Very good, homogeneous material, without barriers and broken tiles
Number of curb ramps	Number of curb ramps **(over 2)**
Tactile paving	Absent
	Existent but with some differences from the requirement
	Existent and consistent with requirements
Number of crosswalks	Number of crosswalks **(over 2)**

Thresholds Justification

Regarding the pavement width, since the free pedestrian zone was recorded approximately, the threshold value was set at 1.50m, conforming to the Greek legislation standards [21]. When it comes to the pavement quality category, the chosen minimum threshold is 'moderate', as it corresponds to areas with acceptable conditions of materials, and only a few barriers. Concerning the rest of the attributes, at least two ramps and tactile paving that comply with the relevant regulations, are required to ensure accessibility

for people with disabilities. Additionally, crossings at both ends of the pavement are necessary to establish continuous pedestrian routes.

The need and ability for mobility, within the vertical equity approach, is addressed through specific threshold elements, such as ramps and tactile paving. These features are designed to safeguard accessibility for individuals with varying mobility needs. Pavements are then evaluated based on how well these thresholds support the principles of vertical equity, ensuring that all individuals can access and navigate public spaces effectively. In this way, the design of pavements and urban infrastructure becomes a key factor in promoting equitable pedestrian mobility.

2.3 Socioeconomic Factors

As previously mentioned, vertical equity was examined for the unemployed, the households without a car, and citizens under 15 or over 65 years old. Lack of accessibility can cause the exclusion of the unemployed and equity in transport can be a crucial factor in attracting job opportunities [22]. Similarly, accessibility is an important factor for children under 15 years of age as pedestrian infrastructure can affect their independence and access to school, recreation, and social opportunities [23]. Regarding citizens over 65, pedestrian accessibility is considered as an important factor for their health status [24]. Last, households without cars are dependent on public transport and walking as without these modes, they have limited access to work, health, and services [25].

2.4 Accessibility Rate

Subsequently, the Accessibility Index (A) was developed as the primary means of measurement. This index is defined as follows (Eq. 1):

$$\mathrm{A} = \frac{length\ of\ fair\ pavements}{total\ length\ of\ pavements}\% \tag{1}$$

This simple indicator incorporates the evaluation of pavements relying on the aforementioned threshold levels. It represents an index focusing on accessibility for individuals with different mobility needs and abilities. Specifically, it evaluates pavements in an essence of a checklist where all thresholds simultaneously apply. This index is based on a similar index found in [13] that measured sufficiency through the ratio of active travel-oriented streets to the total length of streets in each neighbourhood.

2.5 Gini Index and Lorenz Curves

After measuring the accessibility index for each CAU in the study area, we used the Gini Index and the Lorenz Curves to address horizontal equity. A high value of Gini Index indicates that accessibility is unevenly distributed, with some areas receiving significantly better services than others. In contrast, low values of the index indicate a more balanced distribution of urban resources. In the present study, the application of the index was used to examine the distribution of fair pavements across the population of each CAU.

The analysis of the Gini Index in street space development contributes to the formulation of policies aimed at reducing inequalities, ensuring that accessibility is fair and more inclusive for the entire population. Therefore, as previously mentioned, it serves as a simple tool for evaluating horizontal equity of accessibility in the study area. The Gini index can be calculated using Eq. 2 [26]:

$$G = 1 - \sum_{k=1}^{n} (X_k - X_{k-1}) * (Y_k + Y_{k-1}) \tag{2}$$

X_k: is the cumulative proportion of the population in CAU k.
Y_k: is the cumulated proportion of the accessibility of CAU k.

2.6 Bivariate Local Moran's I

The Bivariate Local Moran's I is a very powerful statistical tool that explores the spatial patterns between two variables [27]. It serves as an assessment of vertical equity regarding the socioeconomic status and an evaluation of scenarios in the most burdensome CAUs. This is calculated through Eq. 3.

$$I_i = \frac{(x_i - \overline{x})}{\sum_{j=1}^{n} (y_i - \overline{y})^2 / n} \times \sum_{j=1}^{n} W_{ij}(y_i - \overline{y}) \tag{3}$$

I_i is the Bivariate Local Moran's I statistic for CAU i.

x_i and y_i are the values of the two variables, e.g., accessibility and unemployment at CAU i.

x_i and y _i are the means of the two variables across all CAUs.

W_ij represents the spatial weights between CAU i and neighbours j (queen contiguity weights in this case).

n is the total number of CAUs.

This equation evaluates the relation between the values of two variables at a specific location i and their corresponding values in neighbouring locations, taking into account spatial weights (e.g., based on geographical boundaries). It determines whether there is a clustering of similar values (High-High or Low-Low), contrasting values (High-Low or Low-High), or no spatial association, with a 5% confidence level [28]. In this study, the Bivariate Moran's I is used to analyse the connection between proportional accessibility differences and key socioeconomic factors such as unemployment, age and no-car households.

2.7 Scenarios Formulation

The research progressed with the development of scenarios to analyse the problem, with the existing situation defined as Scenario 0 (S0). This scenario forms the basis for building the subsequent scenarios. Scenario 1 (S1) incorporated the green routes from the SUMP of the municipality. In these areas, pavement conditions were improved by assigning them their best possible values. The next scenario (S2) focused on conventional interventions, common measures that municipalities typically implement to enhance pavement accessibility. These included the installation of tactile paving for visually

impaired pedestrians, the construction of ramps for people with disabilities, and the marking of pedestrian crossings. As conventional interventions we considered those that slightly improve the pedestrian accessibility index, while not claiming additional urban space like curb ramps and tactile paving [29].

For the following scenario 3 (S3), an assessment was conducted based on the social characteristics of the CAUs. The analysis identified the 90th quantile (i.e., the worst 10%) for each characteristic to pinpoint the most vulnerable areas, where pavement conditions were subsequently improved. Scenario 4 (S4) was designed to drastically improve pedestrian mobility around metro stations and key municipal services. A three-minute walking radius was defined, within which pavement conditions were substantially upgraded. Finally, the last scenario (S5) was developed based on the outcomes from S0. The CAUs identified as the most vulnerable, characterised by a high socio-economic burden and low accessibility, according to bivariate Local Moran's I analysis, underwent significant improvements.

The structure of the scenarios is designed to enhance a specific aspect of equity in each case. Scenarios that involve the universal implementation of measures (1, 2, and 4) without incorporating socio-economic factors into their policies focus on horizontal equity, as well as vertical equity in terms of mobility needs and capabilities. On the other hand, scenarios that introduce targeted interventions in CAUs with disadvantaged socio-economic indicators (3 and 5) aim to improve vertical equity in both its dimensions: mobility needs and capabilities, as well as socio-economic status.

3 Results

In this section, we present the results as derived from the implementation of the checklist method. Firstly, we demonstrate the existing pavement conditions (fair or poor) per segment. Next, the final outcomes of the accessibility rate will be presented. Afterwards, the evaluation of horizontal equity through the Gini index and the Lorenz curves will take place and finally, the vertical equity will be revealed by the Bivariate local Moran's I analysis via a detailed illustration of bivariate clusters (accessibility and socio-economic factor) as found in similar studies [27].

Initially, the above map (Fig. 4) illustrates the outcome of the pavement assessment based on their characteristics and the defined thresholds. Pavements that meet the thresholds are shown in blue, while those with the lowest performance are highlighted in red. Among the total pavements, only 8% successfully met the established thresholds. Subsequently, the Accessibility Index A was calculated per CAU across all scenarios. The figure below (Fig. 5) portrays the results for each scenario, categorised according to the index percentages.

It is clearly demonstrated that none of the scenarios can overcome completely today's troublesome condition. However, some scenarios achieve moderate to high values of pedestrian accessibility, signifying that solutions tailored to pedestrians and people with disabilities could promote change to spatial allocation practices. Focusing on each scenario separately, we may find that the existing situation (S0) is characterised by relatively low percentages of accessibility, with only CAUS out of 63 exceeding 20%. When it comes to S1, i.e., the SUMP proposals scenario, accessibility conditions are substantially better compared to S0 with 2 CAUs exceeding 60%, 7 CAUs found in the 40–60%

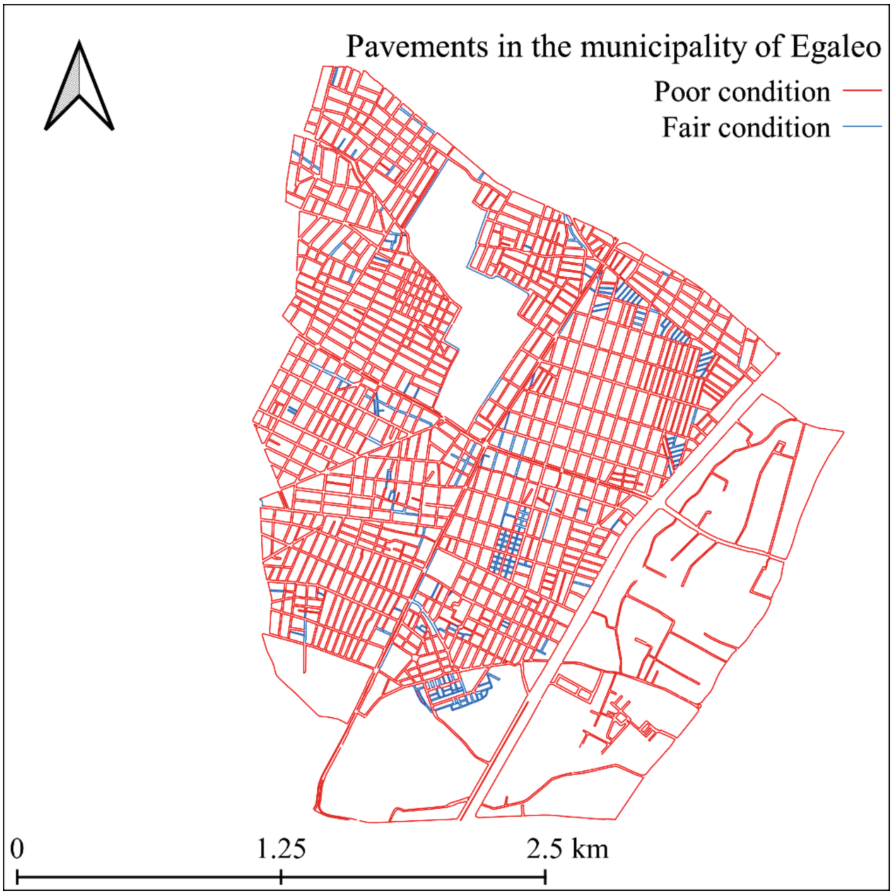

Fig. 4. Current pavement conditions in the municipality of Egaleo (source: own elaboration).

and 13 in 20–40% category. Moving on, the conventional interventions scenario (S2) did not manage to bring about sincere changes in pedestrian accessibility distribution. Only some minor changes are found and specifically, 4 CAUs fall now into the 40–60% category and 12 into the 20–40% category. At the next scenario (S3), conditions related to accessibility are clearly better than S0; nevertheless, values do not reach a high standard. In contrast, S4 articulating radical solutions around key land uses achieves high values of pedestrian accessibility, with even some CAUs (4) exceeding 80%. Finally, the social equity-based scenario leads to very meaningful changes towards better pedestrian accessibility with several CAUs falling into the 60–80% category.

Apart from pedestrian accessibility which is one key factor pinpointing the conditions in which people move around the study area, we shed light on the way this accessibility scores are distributed throughout the entire area. The initial assessment of equity, related with the horizontal aspect, was conducted using the Gini Index. The index examined the distribution of pedestrian accessibility based on the population of

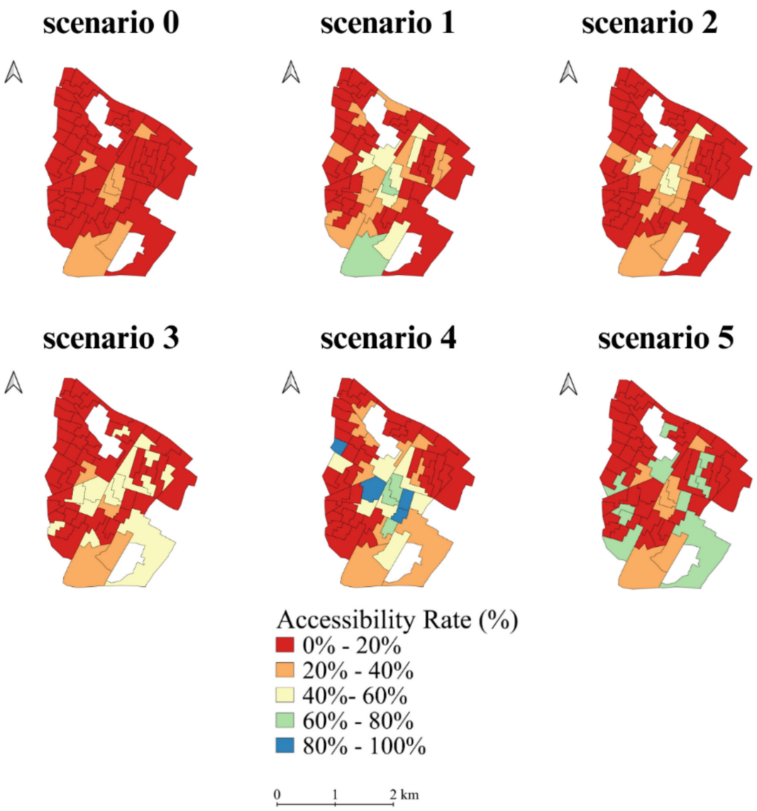

Fig. 5. Accessibility index CAUs. (source: own elaboration).

each CAU, unveiling that S1 achieves the most equitable conditions, whereas S5 leads to the most unbalanced distribution. These outcomes are distinctly displayed in the next Figure (Fig. 6), accompanied by the Lorenz curve of each scenario.

Next, the analysis of the vertical aspect of equity is conducted using the Bivariate Local Moran's I (Fig. 7). The results of the analysis are presented as separate visualisations with colour gradients, illustrating the correlation between the two variables-accessibility and socio-economic factors:

- High Accessibility-High Socioeconomic factor (HH) – Areas where both variables have high values, shown in red (desired).
- Low Accessibility -Low Socioeconomic factor (LL) – Areas where both variables have low values, shown in blue.
- High Accessibility -Low Socioeconomic factor (HL) – Areas with high accessibility and low social burden, shown in pink.
- Low Accessibility -High Socioeconomic factor (LH) – The opposite of HL, shown in light blue (troublesome).

The observation of the multiple separate visualisations unveils major differences between the socio-economic factors, but similarities within them. Desired clusters (HH)

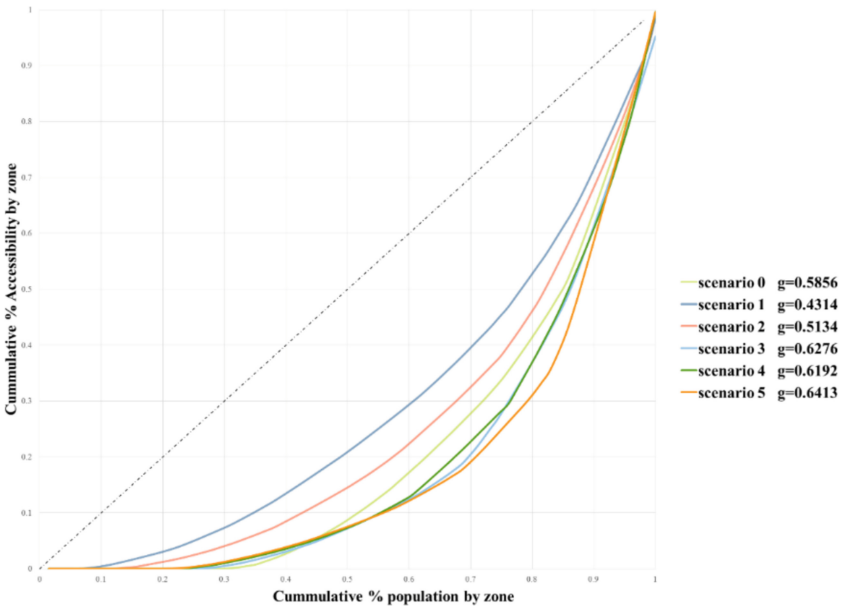

Fig. 6. Gini index and Lorenz curves per scenario (source: own elaboration).

are mainly found in the centre of Egaleo in case of cars and age, while in the southern part when referring to unemployment. On the other hand, troublesome clusters (HL) are encountered in the peripheral parts of the municipality in all scenarios. Notably, among the scenarios, we should stress that S5 leads to fairly different outcomes compared to the rest by achieving the lowest number of troublesome clusters.

4 Discussion

This paper explored one of the most important attributes in urban street space, pedestrian accessibility [20]. It not only examined the current situation, but also developed five new future pathways that might improve pedestrian accessibility levels in the study area. In other words, it comprises a study with contribution both for today and for tomorrow.

Looking into the findings, it should be noted that the existing condition of the study area is found to be inadequate for pedestrians and people with disabilities, regardless of their socio-economic characteristics. Tellingly, accessibility of Egaleo exhibits significant problems. As noted above, the multicriteria assessment of pavements through a comprehensive checklist, revealed their poor condition, with notable shortcomings in ramps, tactile paving for the visually impaired, and pedestrian crossings. Indicatively, 18 CAUs have zero accessible pavement length, while only 8% of the overall pavements are considered accessible in the study area. Through Fig. 4 we may understand more comprehensively the spatial distribution of this issue. Segments with fair pavements are mainly located within the central area of Egaleo or around metro stations and universities. These results are also encountered in other similar studies addressing pedestrian accessibility in urban areas [16, 17].

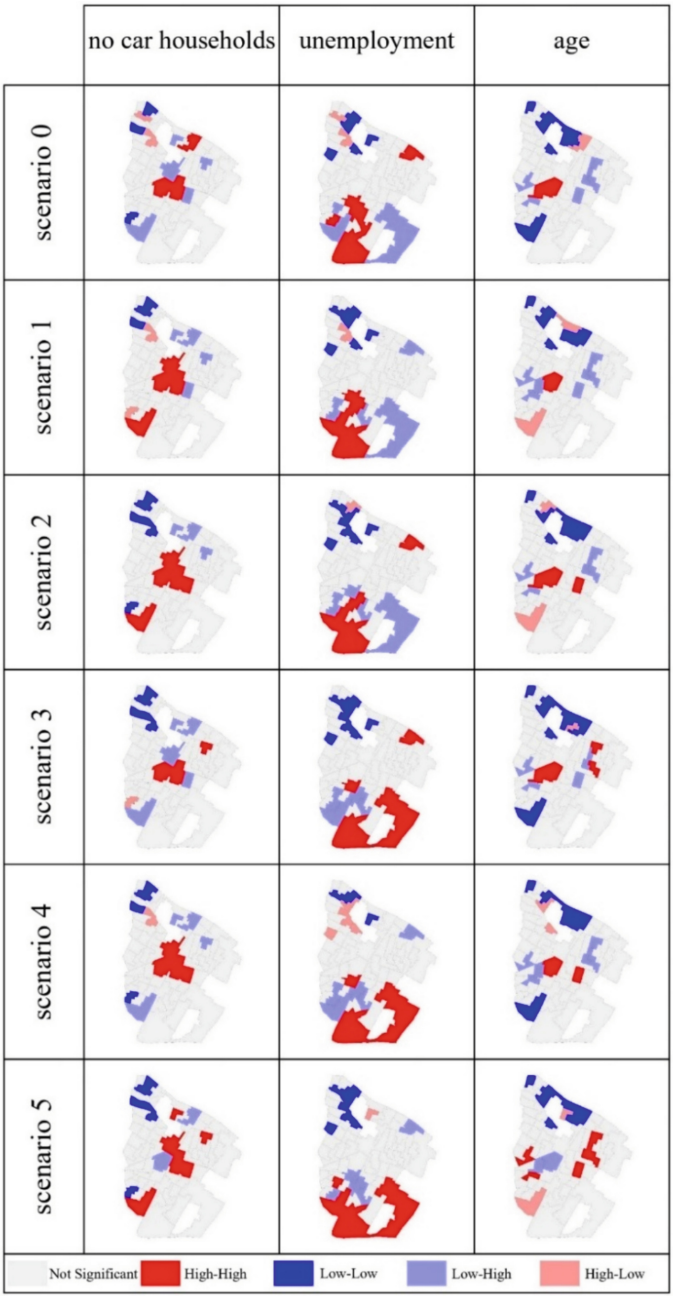

Fig. 7. Bivariate Local Moran's I results (source: own elaboration).

Continuing with equity, the analysis of the Gini index demonstrates that S1 (SUMP scenario) is the strategy that ensures the greatest horizontal equity in pedestrian accessibility. Radical strategies are also favourable to horizontal equity in other cases as well [13]. This outcome is quite expected, as the green corridors proposed by SUMP are evenly distributed across the municipality's territory. Delving more into the results of this index, we should mention that Scenarios 3 (90% quantile) and 5 (equity-based), which aim to improve CAUs with high socio-economic burdens (these two scenarios are very similar), exhibit the highest levels of horizontal inequity (though lower than other contexts like [17]).

Regarding the Bivariate Local Moran's I index that depicts the vertical aspect, the focus is on the category Low (accessibility) – High (socioeconomic factor), which is represented in light blue. Scenarios 0–4 exhibit an average of 14 CAUs with high vertical inequity, whereas Scenario 5, which includes targeted interventions based on the existing conditions (Scenario 0), reduces inequalities to 9 CAUs. This outcome is confirmed by relevant literature. Though not directly related with walking, but with cycling, Mora et al. [30] and Pritchard et al. [31] highlighted the potential negative effects of future scenarios appraising cycling on equity.

Focusing more explicitly on the vertical equity outcomes, it is identified that the interventions proposed by S1 have minimal impact on vertical equity, regardless of social characteristics, despite being the most equitable scenario in terms of the horizontal aspect. S2 involving conventional interventions, shows an increase in CAUs with vertical equity and a lower Gini index than the current state. This suggests that, despite their simplicity, such interventions positively contribute to equitable accessibility within the study area.

Following, targeted interventions in the most burdened areas based on socio-economic factors (S3), do not bring substantial improvements to the study area's overall condition, as revealed by the Bivariate Local Moran's I index. This indicates that "untargeted" interventions in disadvantaged areas does not constitute a solution at either a horizontal or vertical level. In S4, where improvements were suggested around points of interest within Egaleo (e.g., metro stations, universities, public services), vertical inequity increases compared to the current state, without distinct improvements. This outcome was expected, as points of interest are not evenly distributed throughout the area, failing to cover the entire population adequately. Finally, S5 which proposes targeted interventions relying on the data from the existing situation (S0), exhibits significant improvements in vertical equity, significantly reducing CAUs classified as LH. However, this outcome intriguingly contradicts the Gini index results (highest value among all scenarios) indicating that such interventions do not simultaneously ensure horizontal equity.

To define a pedestrian-friendly strategy for similar areas, this research proposes a combined solution for enhancing pedestrian accessibility incorporating:

- S1 (SUMP), which includes routes distributed across the study area to ensure accessibility for the entire population (horizontal equity)
- S5 (Equity-based), which includes targeted interventions in areas identified as troublesome in the analysis of the existing situation (vertical equity)

Neither of the two scenarios are sufficient on their own. Hence, a multidimensional approach to planning is essential, integrating both spatial and socio-economic dimensions to achieve "complete" equity, both horizontal and vertical, in urban transportation accessibility within the study area. This cohesive strategy might be very helpful, especially for areas with poor pedestrian infrastructure.

5 Conclusions

The present research shed light on pedestrian accessibility in a rather challenging context, unveiling insights for policy recommendations that could be beneficial to policymakers and planners. Exploring future pathways is surely critical for making cities and towns accessible and equitable. A key outcome of this study is that future solutions should be combinatorial and that equity cannot be achieved, without addressing socio-demographic characteristics properly. Apart from the insights delivered, this research contributes to the development of evaluation methods and tools related to the horizontal and vertical aspect of pedestrian accessibility, as reflected by pavements. It is very important that it looks both into today and into the future. Employing scenarios is also an asset of this study.

Notwithstanding, despite its useful contribution, this research has certainly several limitations. First and foremost, as recent data are not available yet, we utilised sociodemographic data referring to 2011 (as these were the only available); today's socio-economic realm might be very different. Moreover, another limitation is the absence of valid data related to people with disabilities in Athens. Obtaining such data would be very meaningful in calculating vertical equity. Additionally, the index developed in this study, was a rather simple (though understandable) index, mostly resembling a checklist exceeding some thresholds. Last, recording all these detailed data of pavements is truly a labour-intensive work; therefore, we believe that advanced techniques for mapping streets via image recognition, undoubtedly have a role to play.

As future steps, we recommend that new papers could implement this method into diverse areas and carry out comparative analysis to obtain more generalisable results. Apparently, the simplicity of our method facilitates its application to varying urban contexts (metropolitan areas, large or small cities and towns). The essential data for reproducing the pedestrian accessibility analysis are the (detailed) pavements' attributes, while regarding the equity evaluation one needs to know the sociodemographic characteristics of the study area. What is more, for going beyond the existing situation, new studies should place particular emphasis on well-structured and clear planning scenarios. Tellingly, more scenarios could be tested and more sociodemographic characteristics (minorities, gender, people with disabilities, etc.) could be integrated in the future. Finally, new research attempts could try to enrich the present index by integrating models and weights. For instance, methods like Analytical Hierarchy Process or Multicriteria decision analysis (REGIME, DELPHI, etc.) could be very useful towards that direction. Adding weights to the index is expected to advance the method demonstrated in this paper and enhance the reliability of the outcomes. Plus, this index could include more characteristics of infrastructure (streetscape design) and land uses.

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