

REFUGE CITY IN AN ARID CLIMATE: EVOLUTION OF GREEN COVER IN NEIGHBORHOODS INHABITED BY OLDER PEOPLE, MENDOZA, ARGENTINA¹

CIUDAD REFUGIO EN CLIMA ÁRIDO: EVOLUCIÓN DE LA COBERTURA VEGETAL EN BARRIOS HABITADOS POR PERSONAS MAYORES, MENDOZA, ARGENTINA

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Existen numerosas y variadas iniciativas urbanas para generar espacios públicos abiertos que permitan disminuir los efectos adversos de los fenómenos climáticos extremos de calor. Los refugios climáticos al aire libre son una de estas estrategias, ya que ofrecen condiciones ambientales de confort térmico para protegerse de contextos desfavorables. Este trabajo analiza y contrasta la evolución de la cobertura vegetal y la dinámica poblacional de personas mayores desde la década del 2000 en tres barrios tradicionales de una ciudad de clima árido con veranos cálidos. El objetivo es generar datos y aportes a los gobiernos locales y regionales ante la situación de vulnerabilidad al calor, lo que facilita la adaptación y aplicación de estrategias de refrescamiento urbano que brinden mejores condiciones microclimáticas. Además, estos datos contribuyen al aumento del confort térmico en el espacio público para promover el envejecimiento activo y la resiliencia climática de la población.

Palabras clave: clima árido, sobrecalentamiento urbano, ciudad forestada, personas mayores

A multitude of urban initiatives have been implemented to create open public spaces to mitigate the adverse effects of extreme heat events. Outdoor climate shelters are one of the strategies used to provide comfortable thermal conditions and protect against inclement weather. This study analyzes and compares the evolution of green cover and the population dynamics of older adults since the 2000s in three traditional neighborhoods of a city with an arid climate and hot summers. This study aims to generate data and provide input to local and regional governments on the extent of heat vulnerability. This will facilitate the adaptation and implementation of urban cooling strategies that improve microclimatic conditions. Furthermore, these data contribute to increased thermal comfort in public spaces, promoting active aging and climate resilience among the population.

Keywords: arid climate, urban overheating, forested city, older adults

I. INTRODUCTION

The 21st century has witnessed the convergence of urban demographic aging and climate change. By 2045, for the first time in human history, there will be more older people than children, while the current life expectancy is 77 years old (United Nations, Department of Economic and Social Affairs, Population Division, 2019; Oliveri, 2020).

In the international context of an unprecedented demographic transition, Argentina is among the top four Latin American countries with the highest aging rates. This process, which was first glimpsed in the last quarter of the 20th century, is now accelerating. In fact, the proportion of people aged 60 and over is expected to continue increasing, reaching 22% in 2050. Within the older population, the oldest age group (70+) is the fastest-growing segment (United Nations, Department of Economic and Social Affairs, Population Division, 2019). It should also be noted that women have a greater relative weight in the total population as ages rise, a phenomenon known as the feminization of old age (Oliveri, 2020). However, a longer life expectancy does not necessarily mean a better quality of life, as older people need environments that accommodate the physical changes associated with aging.

In turn, global warming is worsening living conditions in cities. In cities with high temperatures, adding extreme weather events - such as heat waves - generates unhealthy and hostile environments, where people not only feel uncomfortable, but can suffer cardiovascular and respiratory diseases that deteriorate their health. Older adults and children are the most vulnerable age groups to these temperature increases, and in the warmest cities, the consequences could be catastrophic.

In the reality of a constantly warming planet and with an aging population, the question arises: What tools do cities have to adapt to the climate changes they face? City planning today challenges us to rethink new ways of life and interaction for resilience and adaptation to climate change, while also helping correct social, urban, and territorial inequities. Making cities more age-friendly is a necessary and logical way to promote the well-being of urban residents and keep cities prosperous.

Despite the abundance of projections and diagnoses that separately address both population aging and the impacts of climate change in urban environments, the empirical evidence that combines both aspects remains scarce. In particular, there is a lack of studies that comprehensively analyze how the dynamics of urban vegetation cover — especially tree-lined streets

and green areas — influence the thermal habitability of neighborhoods with a high proportion of older people. This gap becomes especially relevant in cities with an arid climate, such as the Mendoza Metropolitan Area (MMA), where the lack of vegetation cover and the shortage of water resources for its upkeep intensify climatic vulnerability. Specifically, the knowledge gap addressed by this first phase of the study seeks to provide data and original empirical evidence on the interrelation between demographic aging and the transformation of urban vegetation cover in arid contexts, to generate scientific inputs about the impact of this transformation on the climate vulnerability of the older population, an aspect that will become increasingly noticeable.

The objective of this first phase is to quantify, analyze, and contrast the evolution of vegetation cover (tree-lined streets and green areas) between 2000 and 2020 in three traditional neighborhoods of a city with an arid climate, focusing on its relationship with population aging. This study lays the foundation for evaluating urban green infrastructure as a climate refuge for the older population. Methodologically, the multi-temporal comparative analysis of spectral coverage is used as an indicator of vegetation provision and resilience at a neighborhood scale, a fundamental contribution given the scarcity of spatially specific metrics in arid contexts. This initial exploratory analysis is the starting point for a broader investigation that, in future phases, will seek to determine the adaptation potential of neighborhoods' open spaces to improve outdoor thermal comfort during periods of extreme heat, thus facilitating interaction and active aging among the older population.

II. THEORETICAL FRAMEWORK

Active aging and climate vulnerability

The current global scenario is characterized by the convergence of two phenomena: rising extreme temperatures (Copernicus, 2024) and the progressive aging of the population (González Blanco, 2024). This synergy poses urgent social and health problems, given the greater vulnerability of older people to thermal stress.

In this context, the Pan American Health Organization (PAHO) promotes the concept of active aging, defined as the process of optimizing health, participation, and safety opportunities to improve people's quality of life (Pan American Health Organization [PAHO], 2023). This comprehensive approach integrates psychological, social, and environmental aspects to promote dignified and inclusive models of aging.



Figure 1. Environmental adaptation strategies for older adults. Source: Prepared by the authors. Adapted from García-Valdez et al. (2019).

The neighborhood as an adaptation scale

Environmental adaptation strategies for the older population, such as resilience and environmental proactivity (Figure 1), are most effective at the neighborhood scale, given the reduction in daily journeys for this age group (García-Valdez et al., 2019; Power & Williams, 2019). The neighborhood is consolidated as the main space for socialization and aging in place.

Within this scale, outdoor spaces are crucial for thermal, physical, and social reasons (Fiallos Flores, 2025; Ma et al., 2021). Thermal adaptation is a key factor in the use of these spaces, influenced by physiological factors and psychological adaptation to the environment (Baquero Larriva & Higuera García, 2019). To mitigate the thermal sensitivity of this population, the design must be planned to provide a variety of subspaces (shaded, sunny, protected against the wind), allowing users to choose their preferred comfort levels. In addition, social motives significantly influence the duration and patterns of use. Therefore, providing recreational spaces can increase communication and lengthen stays, thereby contributing to active aging and thermal adaptation (Santamaría Aguirre & Núñez Torres, 2023).

Climate shelters and vegetation cover

The growing shortage of meeting places and the high proportion of older people living alone or in single-generation homes in Argentina (INDEC, 2022) emphasize the importance of universal urban design in public spaces to promote active aging in place. Aging-friendly cities and caring cities encourage the development of adaptation strategies and planning of population-

sensitive urban spaces for active aging, through the introduction of new designs, the incorporation of equipment, and the promotion of proximity services and home help (PAHO, 2023; Chinchilla Moreno, 2020).

To mitigate the adverse effects of heat waves, climate shelters are emerging as a key initiative that provides thermal comfort in unfavorable conditions. These spaces are essential to protect the most vulnerable population (Florian, 2022). Recent studies confirm a strong preference for those shelters that are integrated or have access to nature (Amorim-Maia et al., 2023). Therefore, cities have begun to recognize the urgent need to design an effective network of accessible, appropriate shelters, with expanding vegetation cover and improved access to urban parks and gardens as the primary adaptation strategies.

III. CITY OF STUDY

Mendoza, a city planned as a climate refuge

The study focuses on the Mendoza Metropolitan Area (MMA), an intermediate city in Argentina located in the foothills of the Andes. The region is classified as having a desert climate (BWk) (Kottek et al., 2006), with annual average temperatures between 14°C and 18°C, marked thermal amplitudes, and low rainfall (~200 mm per year) (Argentine National Meteorological Service [SMN], 2025).

Despite these conditions, urban development is concentrated in the plains and foothills, where habitability is possible thanks to the channeling of water resources from mountain streams. The city of



Figure 2. (a) Location of the Province of Mendoza in South America (b) Urban stain of the MMA (c) Aerial image of the central area (e) Irrigation ditches and trees (d) Urban model (f) Typical tree-lined street. Source: Prepared by the Authors based on Bórmida (1986) and the Municipality of Mendoza, Adobe Stock.

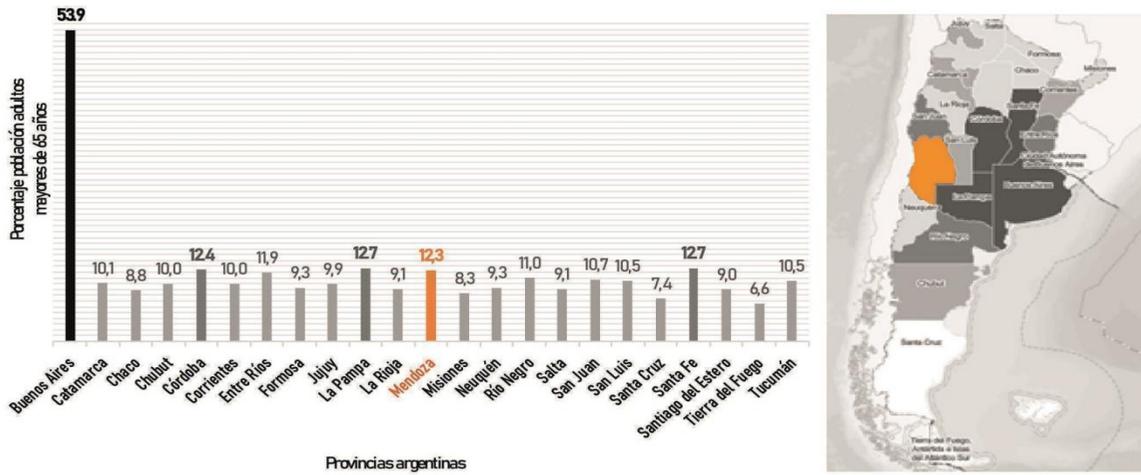


Figure 3. Percentage of people over 65 years of age, differentiated by province. Source: INDEC (2022).

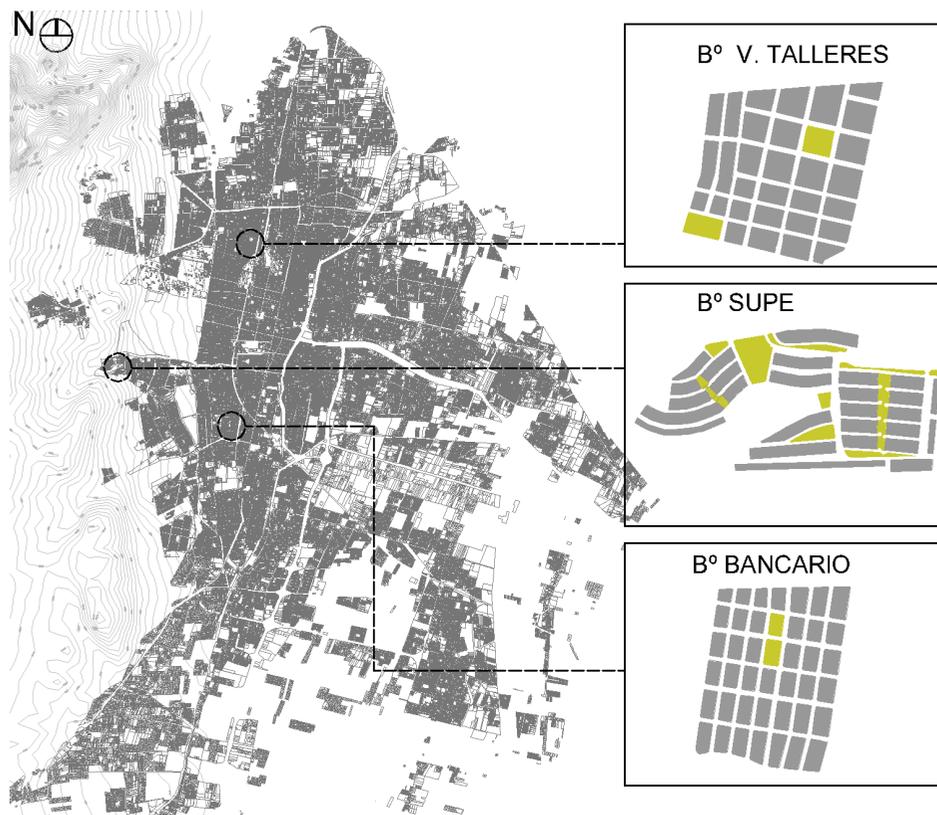


Figure 4. Planimetry of the case studies “Villa Talleres”, “Bancario”, and “SUPE”. Source: Prepared by the authors.

Mendoza is distinguished by its planning as a “refuge city”, characterized by wide tree-lined streets, irrigated by a traditional system of irrigation ditches (Ponte, 2006). This green profile generates an artificial microclimate, making Mendoza an iconic case of urbanism in arid areas (Figure 2).

Older people in the MMA

Mendoza has the fifth-highest percentage of people aged 65 or older in Argentina (Figure 3). The distribution of this age group is heterogeneous, with the departments of Capital and Godoy Cruz showing the highest proportions at 15.9% and 15.2%, respectively (INDEC, 2022).

Currently, the refuge city model is undergoing a transformation driven by the expansive growth of urban areas, the reconversion of productive regions, and urban densification, phenomena associated with forest loss. The core challenge lies in upholding the guiding principles of design and its own urban model to maintain its identity amid these dynamic changes.

IV. METHODOLOGY

Selection and characterization of cases

The study focuses on the observation of three representative neighborhoods of the Mendoza Metropolitan Area (MMA), located in the departments of Capital and Godoy Cruz, selected for their high concentration of older adults. The choice was based on essential criteria for the research: belonging to jurisdictions with a sustained increase in the proportion of older people; state management, which guarantees an initial homogeneity in urban and constructive planning; geomorphological representativeness by including cases of both the plain and the foothills; and the availability of high-resolution satellite images for spectral analysis.

The selection process resulted in the following cases: Villa Talleres (Capital), a low-density residential neighborhood with a rectangular grid structure, built in 1947; and in Godoy Cruz, the Bancario neighborhood with a homologous development, and the SUPE neighborhood, built in 1966, which is distinguished by being the first urbanization in the foothills sector (Figure 4). The latter sits on hillsides at 800

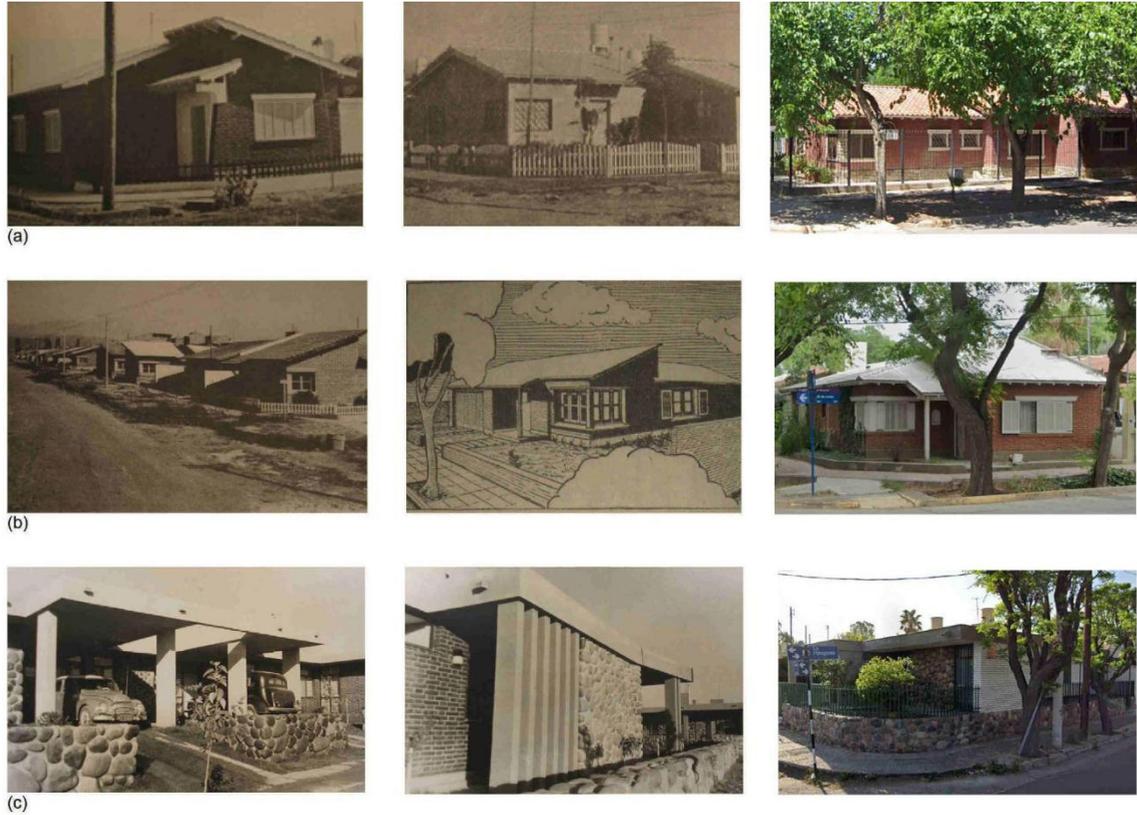


Figure 5. Original and current illustrations and photographs (2025) of the dwellings of: (a) “Villa Talleres”, (b) “Bancario”, and (c) “SUPE”. Sources: Diario Los Andes (2021). Prepared by the authors.

meters above sea level, offering an organic sector that adapts to the natural slope.

The three complexes were conceived under the concept of “garden neighborhood”, characterized by an integrated planning that prioritized tree-lined streets and the provision of green spaces (Figure 5). The single-family homes were designed so that approximately 50% of the plot (200 m²) had free surface areas, generating important central green lungs. This urban conception has led to the original owners staying, resulting in significant population aging. According to census data (INDEC, 2022), the proportion of people aged 70 or older is 14% in Villa Talleres and 15% in both Bancario and SUPE.

Spectral quantification

To evaluate the state and evolution of the urban forest and vegetation spaces in each neighborhood — considered a valuable heritage as a climate refuge — a spectral survey was conducted using a supervised classification of satellite images (Figure 6). Images provided by Google Earth and processed with MultiSpec© software were used. Three time periods

spanning 18 years were analyzed: September 2002, October 2010, and January 2020. These dates were selected to capture optimal organic development in line with forestry phenology.

The classification process identified three classes per image: green, land, and covered. The Minimum Euclidean Distance (MED) method was applied. This criterion assigns pixels to the category whose spectral centroid is closest. The MultiSpec© software calculates elementary statistics for each category (mean, standard deviation, etc.) from the Digital Numbers (DN), then assigns the remaining pixels to the closest class in the spectral space (Chuvienco, 1996).

The statistical parameters generated by MultiSpec©, which assess the classification strength, are summarized in Table 1. The validation results indicate that the classification is highly accurate and reliable. The Global Accuracy measures the total proportion of correctly classified pixels, while the Kappa Coefficient (κ) evaluates the degree of agreement between the map and the reference data, excluding chance. All values obtained consistently exceed 84% for κ and 89% for Overall Accuracy, validating the robustness of the surface coverage

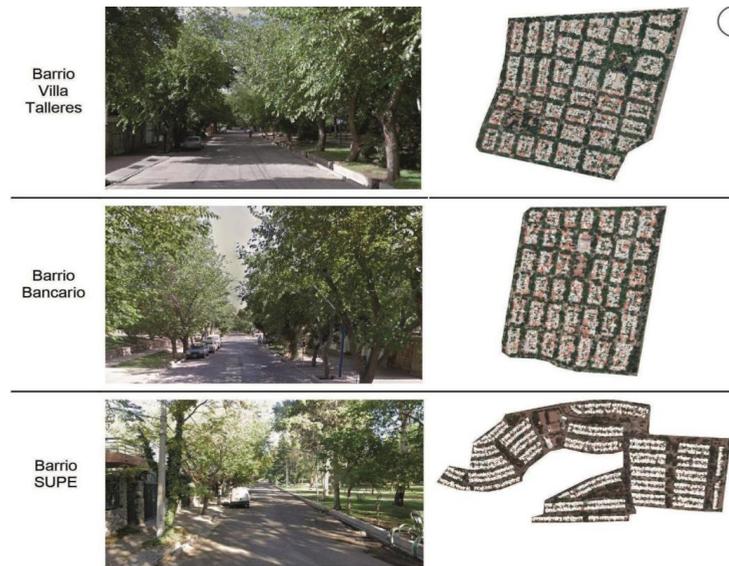


Figure 6. Typical tree-lined streets and planimetry of the case studies: "Villa Talleres", "Bancario", and "SUPE". Source: Google (n.d.).

Neighborhood	Decade	Overall accuracy (%)	Kappa κ coefficient (%)	Kappa Variance $\text{Var}(\kappa)$
Villa Talleres	2000	91.9	87.2	0.000002
	2010	94.0	90.6	0.000002
	2020	89.6	84.0	0.000002
Bancario	2000	97.9	95.9	0.000000
	2010	97.5	96.1	0.000000
	2020	96.1	94.1	0.000000
SUPE	2000	96.5	92.2	0.000000
	2010	98.7	97.8	0.000000
	2020	99.0	97.2	0.000000

Table 1. Statistical parameters on the analysis performed by Multispec©. Source: Prepared by the authors.

data across all analyzed periods. The Kappa Variance ($\text{Var}(\kappa)$), which measures the accuracy of the κ estimate, presents insignificant values, reinforcing the reliability of the results.

V. RESULTS

Figure 7 presents the findings from satellite image processing and analysis of the population age structure (older and younger than 70) for the three neighborhoods in the 2000s, 2010s, and 2020s. The analysis focused on the proportion of vegetation cover, covered surfaces, and land.

Dynamics of surface coverage and intervening factors

The comparative analysis reveals that the proportion of covered surfaces was the variable that showed the most significant variation, reflecting an intense dynamic of urban transformation. In Villa Talleres, the percentage increased dramatically from 42.6% to 56.1%. This growth is related to internal modifications in housing and to a singular real estate and regulatory factor: the construction of high-density towers, a development that, although it increases population density, did not include urban green spaces proportional to that increase. In Bancario and SUPE, the increase is mainly

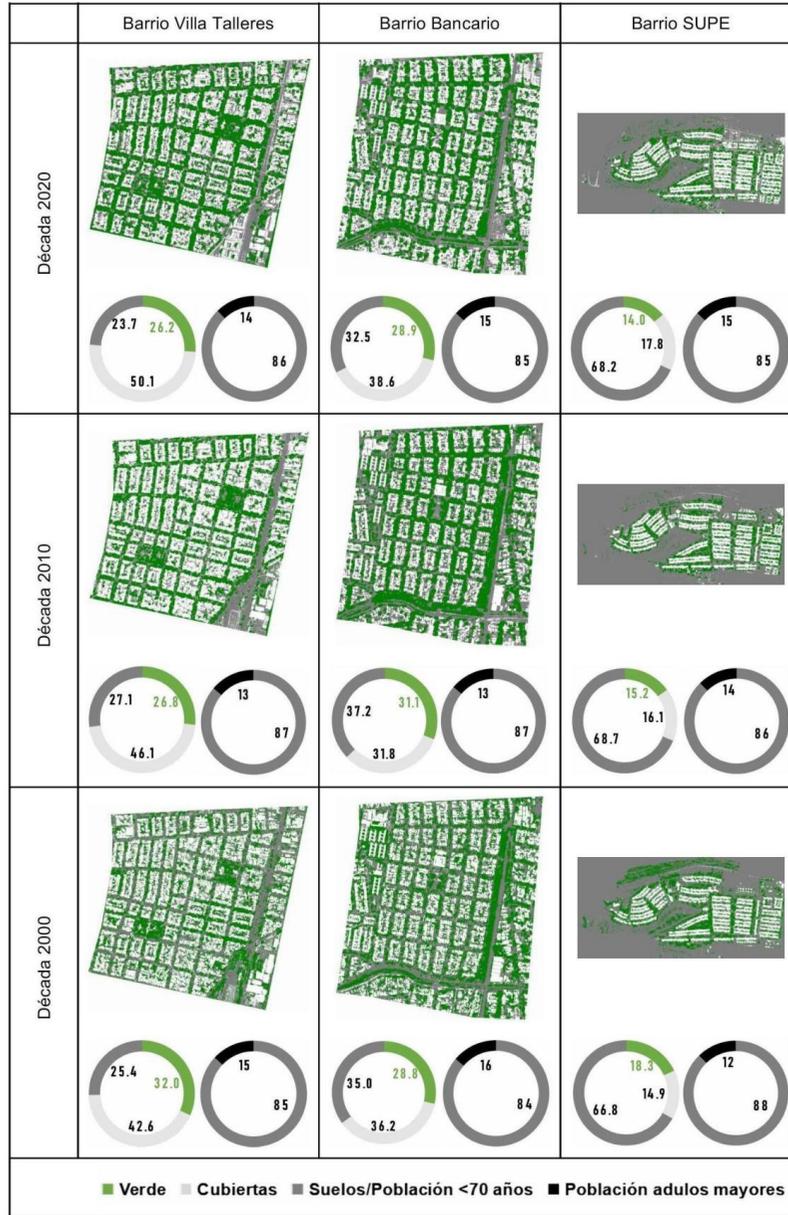


Figure 7. Satellite images processed with MultiSpec®, percentage graphs according to type of coverage, and evolution of the percentage of the population density of people over 70 for the three decades analyzed. Source: Prepared by the authors

attributed to internal extensions made by inhabitants, which entail a reduction in the permeable surface. In SUPE, this growth occurred at the expense of the natural terrain, given its lower initial vegetation cover.

The evolution of vegetation showed heterogeneous trends. Villa Talleres and SUPE registered considerable decreases: from 32% to 26.2% and from 18.3% to 14%, respectively. In SUPE, this loss exacerbates its shortage, as it is the neighborhood with the lowest coverage in 2020 (14%). By

contrast, Bancario showed greater resilience, with a slight increase in 2010 (31.1%) linked to a municipal intervention to incorporate a linear, tree-lined bike path. Despite this initial improvement, field observations in 2020 indicate that the associated forest has deteriorated, with no recent planting, resulting in a slight drop by 2020 (28.2%).

Neighborhood	Δ Green (2000-2020)	Δ 70+ (2000-2020)	Behavior	Possible intervening factors
SUPE	18.3→14.0% (Reduction)	12→15% (Increase)	Apparent inverse relationship: the decrease in vegetation coincides with the constant increase in the older population.	This could indicate a cumulative effect of densification and environmental deterioration in a neighborhood already with shortcomings, without investment in green spaces for an increasingly vulnerable population.
Villa Talleres	32.0→26.2% (Reduction)	13→14% (Oscillation and Increase)	Reduction in vegetation despite mixed densification: The older population rise in 2020 coexists with a global decline in vegetation.	The construction of towers (a real estate factor) can alter the age structure (a temporary decrease in older people in 2010 due to the entry of a younger population). However, the negative impact on vegetation is dominant and persistent.
Bancario	30.0→28.2% (Stability / Reduction)	13→14% (Oscillation and Increase)	Greater plant resilience: vegetation remains stable or partially improves, while the older population increases.	The municipal intervention (a tree-lined bike path) mitigated vegetation loss, suggesting that active planning can reverse the negative trend and indirectly benefit the older population.

Table 2. Analysis of vegetation cover variations and older people, along with possible intervening factors. Source: Prepared by the authors.

Relationship with population aging

The analysis of the evolution of the percentage of people aged 70+ relative to vegetation cover revealed an association. Table 2 summarizes the observed dynamics. It shows that, although the population over 70 has generally increased in the last decade, vegetation cover evolution is heterogeneous and influenced by external factors.

This trend is consistent with generalized population aging in urban contexts, with little planning for the provision of quality green spaces adapted to the needs of older people. The deterioration of the forest in Bancario and the lack of projection of green spaces in Villa Talleres are evidence of this deficit.

Methodological considerations

It is crucial to frame these findings in their scope of validity. Since the study sample is limited to three neighborhoods, the results are descriptive and exploratory in nature, so although they do not allow statistical inference to a broader population, a trend in the transformation of these neighborhoods is observed. Methodologically, the multi-temporal comparative analysis of spectral coverage at the neighborhood scale enables the interpretation of observed trends as indicators of contextual patterns typical of these cases. In future works, the study sample will be expanded to apply inferential statistical methods and validate the identified relationships. On the other hand, examining the underlying mechanisms in greater depth will require integrating qualitative methodologies, such as resident perception surveys, to assess the adaptation potential of

open spaces to improve outdoor thermal comfort during extreme heat, thereby facilitating interaction and active aging among the older population.

VI. DISCUSSION

Yung et al. (2019) offer a series of recommendations to address the special needs of older people during summer heat in open spaces, including a variety of green areas with different functions and types, areas for social interaction, and an acceptable thermal environment. Aghamolaei and Lak (2023) and Huang et al. (2016) suggest that improvements and incorporation of different equipment — furniture, shading elements, provision of drinking water, information, and warning systems — increase the level of permanence in summer of older people by 80%, while less thermal stress and greater social interaction were recorded. Finally, Herrmann-Lunecke et al. (2024) highlight the need to update regulatory instruments to incorporate older people's preferences in the design of open spaces.

Another relevant contemporary aspect is the incorporation of the caring cities approach. Understanding care as the very interweaving of urban life, which is generated through moments in which life is maintained, continues, and repairs. Williams, (2020) defines three aspects of care: (i) as ethical, it has the potential to maintain, continue, repair and transform our worlds, (ii) as a practice, it has a fundamental role to guarantee the survival in our worlds, both for human and non-human beings, and finally (iii) as a performative act in tune with physical expressions in the city.

In turn, Chinchilla Moreno (2020) states that, after decades of industrialization, our cities, in their physical and legislative dimensions, are places oriented to productivity. In them, you can distribute goods, advertise a commercial product, or drive to work. However, they are also a more hostile environment for activities not related to the productive: being able to choose where to sit and rest, use a public restroom, drink clean water without paying, breathe unpolluted air, and have fun without consuming, among other everyday activities. The author concludes that paying careful attention can help us understand the role of upkeep and repair in creating more caring and just cities; emphasize our collective interdependence and mutual responsibility; and reveal silences, injustices, and neglect in ways that provoke action.

In this sense, outdoor climate shelters are conceived as a fundamental part of networks, systems, and everyday spaces that provide essential services for protection, safety, and comfort in cities. These infrastructures have distributive effects on environmental conditions, public health, and the vulnerability of the local community, which affect the reality of the inhabitants, particularly of those who spend much of their time in the same place, such as older people, as well as care workers, primarily women (Hendricks, 2022). These groups depend on the availability and suitability of spaces in urban infrastructure that provide thermal comfort while also offering opportunities for the care and regeneration of physical and emotional well-being (Binet et al., 2022).

Given the close relationship between perception and behavior, the analysis of environmental perception is outlined as a valuable tool for studying adaptation strategies (Torró Segura et al., 2020). Environmental adaptation and demographic aging require multidisciplinary studies, as they are crucial for developing urban policies that improve the quality of life of older people. In this sense, it is important to continue exploring identity and attachment to place in aging, as well as to analyze further the attributes and functions that define the complex person-environment relationship. For this, it is essential to incorporate spatiotemporal scales of analysis and to develop new research methods and tools that account for the psychosocial and cultural aspects of older people.

VII. CONCLUSIONS

The convergence of demographic aging and climate change in Latin American urban regions poses a critical challenge for urban planners. This situation demands that cities create friendly, safe, and stimulating environments, especially for the older population, which is highly vulnerable to adverse climatic events. The choice of physical adaptation strategies in the MMA is complex, as it involves trade-offs among cost, implementation time, and the effectiveness of the action.

The qualitative and quantitative analysis of three traditional neighborhoods in the MMA showed that although some spaces have been adapted to improve the quality of life, urban and real estate development have negatively impacted the available vegetation cover. Through this demographic analysis and satellite images, it was sought to lay the foundations for a subsequent study on the thermal comfort of older people in outdoor spaces. Likewise, the aim is to determine the potential of these environments to improve outdoor thermal comfort during hot periods and, consequently, facilitate interaction and permanence among this age group.

Quantitatively, the initial results indicate that the original concept of "refuge city" is progressively diluted in the MMA. It is imperative that urban planners prioritize the development of spaces that ensure thermal comfort, accessibility, and social interaction. This will ensure that cities are not only livable but also become inclusive and healthy environments for all ages.

As upcoming challenges, it is proposed to analyze the adaptive capacity of older people through surveys and estimates of outdoor thermal comfort; diagnose environmental conditions using in situ microclimatic measurements; and propose plausible physical improvements to the outdoor spaces in the three neighborhoods studied. Ultimately, the challenge is twofold: to build cities that respond to the immediate needs of older people and, at the same time, are resilient in the face of future climate challenges, promoting dignified and active aging.

VIII. CONTRIBUTION OF AUTHORS CRedit:

Conceptualization, M.B.S., M.A.R., A.L.C.; Data Curation, M.A.R., A.L.C.; Formal analysis, M.B.S., M.A.R.; Acquisition of financing, M.B.S., M.A.R.; Research, M.B.S., M.A.R., A.L.C.; Methodology, M.B.S., A.L.C.; Project management, M.A. R.; Resources, M.B.S., M.A.R., A.L.C.; Software, M.B.S.; Supervision, M.B.S., M.A.R., A.L.C.; Validation, M.B.S., M.A.R., A.L.C.; Visualization, M.A.R., A.L.C.; Writing – original draft, M.B.S., M.A.R., A.L.C.; Writing – revision and editing, M.B.S., M.A.R., A.L.C.

IX. BIBLIOGRAPHIC REFERENCES

- Aghamolaei, R., Lak, A. (2023). Outdoor Thermal Comfort for Active Ageing in Urban Open Spaces: Reviewing the Concepts and Parameters. *Ageing International*, 48, 438-451. <https://doi.org/10.1007/s12126-022-09482-w>
- Amorim-Maia, A. T., Anguelovski, I., Connolly, J., y Chu, E. (2023). Seeking refuge? The potential of urban climate shelters to address intersecting vulnerabilities. *Landscape and Urban Planning*, 238, 104836. <https://doi.org/10.1016/j.landurbplan.2023.104836>

- Baquero Larriva, M. T., e Higuera García, E. (2019). Confort térmico de adultos mayores: una revisión sistemática de la literatura científica. *Revista Española de Geriatría y Gerontología*, 54(5), 280-295. <https://doi.org/10.1016/j.regg.2019.01.006>
- Binet, A., Houston-Read, R., Gavin, V., Baty, C., Abreu, D., Genty, J., Tulloch, A., Raid, A., y Arcaya, M. (2022). The Urban Infrastructure of Care: Planning for Equitable Social Reproduction. *Journal of the American Planning Association*, 89(3), 282-294. <https://doi.org/10.1080/01944363.2022.2099955>
- Bórmida, E. (1986). Mendoza: Modelo de Ciudad Oasis. *Revista Summa*, 226, 68-72. https://um.edu.ar/wp-content/uploads/1986_-_Summa_226.pdf
- Chinchilla Moreno, I. (2020). *La ciudad de los cuidados*. Los Libros De La Catarata.
- Chuvieco, E. (1996). *Fundamentos de Teledetección espacial*. Ediciones RIALP S.A.
- Copernicus (2024). *The 2024 Annual Climate Summary. Global Climate Highlights 2024*. <https://climate.copernicus.eu/global-climate-highlights-2024>
- Diario Los Andes (7 de marzo de 2021). El Barrio Bancario de Godoy Cruz: historia que se habita. <https://www.losandes.com.ar/arquitectura/el-barrio-bancario-de-godoy-cruz-historia-que-se-habita>
- Fiallos Flores, J. I. (2025). La actividad física recreativa y su relación con el bienestar en adultos mayores. *MENTOR Revista de investigación Educativa y Deportiva*, 4(10), 715-734. <https://doi.org/10.56200/mried.v4i10.9190>
- Florian, M. C. (26 de Julio de 2022). Barcelona prepara refugios climáticos para mantener frescos a los residentes durante los meses de verano. ArchDaily <https://www.archdaily.cl/cl/985847/barcelona-prepara-refugios-climaticos-para-mantener-frescos-a-los-residentes-durante-los-meses-de-verano>
- García-Valdez, M. T., Sánchez-González, D., y Román-Pérez, R. (2019). Envejecimiento y estrategias de adaptación a los entornos urbanos desde la gerontología ambiental. *Estudios demográficos y urbanos*, 34(1), 101-128. <https://doi.org/10.24201/edu.v34i1.1810>
- González Blanco, M. (2024). Aproximación al envejecimiento activo y a la educación permanente. Una experiencia de intervención educativa musical con personas mayores. *European Public & Social Innovation Review*, 10, 1-19. <https://doi.org/10.31637/epsir-2025-1428>
- GOOGLE. (s.f.). [Fotos de Street View e imágenes de satélite]. <https://www.google.com.ar/maps>
- Hendricks, J. M. (2022). *Evaluating Climate Risk, Land Use Change, and Urbanization to Address Food Security Through Climate Smart Agriculture Applications in Kenya* [Tesis de Maestría, Villanova University]. ProQuest. <https://www.proquest.com/openview/ed2fe3ac783e7ff9a510cff05b131e16/1?pq-origsite=gscholar&cbl=18750&diss=y>
- Herrmann-Lunecke, M. G., Figueroa-Martínez, C., Ríos-Peters, R., y Zumelzu-Scheel, A. (2024). Personas mayores y espacios comunes de vivienda colectiva en Chile: Desafíos para los instrumentos normativos e indicativos. *Urbano*, 27(50), 48-59. <https://doi.org/10.22320/07183607.2024.27.50.04>
- Huang, J., Zhou, C., Zhuo, Y., Xu, L., y Jiang, Y. (2016). Outdoor thermal environments and activities in open space: An experiment study in humid subtropical climates. *Building and Environment*, 103, 238-249. <http://dx.doi.org/10.1016/j.buildenv.2016.03.029>
- INDEC (2022). *Resultados del Censo 2022. Censo Nacional de Población, Hogares y Viviendas 2022.. Censo 2022*. República Argentina. https://censo.gob.ar/index.php/datos_definitivos_mendoza/
- Kottek, M., Grieser, J., Beck, C., Rudolf, B., y Rubel, F. (2006). World Map of the Köppen-Geiger climate classification updated. *Meteorologische Zeitschrift*, 15(3), 259-263. <https://doi.org/10.1127/0941-2948/2006/0130>
- Ma, X., Tian, Y., Du, M., Hong, B., y Lin, B. (2021). How to design comfortable open spaces for the elderly? Implications of their thermal perceptions in an urban park. *Science of The Total Environment*, 768, 144985. <https://doi.org/10.1016/j.scitotenv.2021.144985>
- United Nations, Department of Economic and Social Affairs, Population Division. (2019). *World Population Prospects 2019: Highlights*. United Nations. https://population.un.org/wpp/assets/Files/WPP2019_Highlights.pdf
- Oliveri, M. L. (2020). *Envejecimiento y atención a la dependencia en Argentina. Scripta Nova Revista electrónica de geografía y ciencias sociales*, 10(218). <http://dx.doi.org/10.18235/0002891>
- Organización Panamericana de la Salud [OPS]. (2023). *Programas nacionales de ciudades y comunidades amigables con las personas mayores Una guía*. <https://doi.org/10.37774/9789275327975>
- Ponte, J. R. (2006). Historia del regadío: Las acequias de Mendoza, Argentina. *Scripta Nova Revista electrónica de geografía y ciencias sociales*, 10(218). <http://www.ub.es/geocrit/sn/sn-218-07.htm>
- Power, E. R., y Williams, M. J. (2019). Cities of care: A platform for urban geographical care research. *Geography Compass*, 14(1), e12474. <https://doi.org/10.1111/gec3.12474>
- Santamaría Aguirre, J. H., y Núñez Torres, S. H. (2023). Usos y desusos del espacio público: Consecuencias de una estética civilizatoria. *Módulo Arquitectura CUC*, 30, 257-280. <https://doi.org/10.17981/mod.arq.cuc.30.1.2023.10>
- Servicio Meteorológico Nacional Argentina [SMN]. (20 de agosto de 2025). *Clima de Argentina. Características: Estadísticas de largo plazo*. <https://www.smn.gob.ar/estadisticas>
- Torró Segura, M. T., Camarasa Belmonte, A. M., y Pitarch Garrido, M. D. (2020). Percepción del riesgo de inundación en el municipio de Ontinyent (Comunitat Valenciana). *Cuadernos de geografía de la Univeridad de València*, 10(3), 117-140. <http://dx.doi.org/10.7203/CGUV.103.16227>
- Williams, M. J. (2020). The possibility of care-full cities. *Cities*, 98, 102591. <https://doi.org/10.1016/j.cities.2019.102591>
- Yung, E. H. K., Wang, S., y Chau, C.-K. (2019). Thermal perceptions of the elderly, use patterns and satisfaction with open space. *Landscape and Urban Planning*, 185, 44-60. <https://doi.org/10.1016/j.landurbplan.2019.01.003>