

## Elderly and Disabled People in the Urban Environment: Does the 15-minute City Paradigm Protect Them?

By Letizia Cremonini\*, Teodoro Georgiadis<sup>±</sup>, Marianna Nardino<sup>○</sup>,  
Federico Carotenuto<sup>•</sup>, Edoardo Fiorillo<sup>○</sup>, Daniela Famulari<sup>♦</sup>,  
Sheliza Thobani<sup>•</sup> & Duccio Caccioni<sup>▲</sup>

*The 15-minute city is now considered paradigmatic in representations or models of cities. This city should allow all citizens access to all services, with each service located within a distance that takes no more than fifteen minutes to reach from any point in the city. However, would such a city be truly equitable encompassing the diversity of a population, or would it only represent the center of the Gaussian bell curve, with a reasonable deviation from the maximum of the Gaussian? Let us consider a person who is elderly, chronically ill or has limited mobility. This paradigm does not make him/her safe concerning the exposure to a climate risk within the current urban structure. The risk is directly related to climate exposure and thus to the time it takes to perform an “everyday life” task (e.g. going shopping). Studies show that an older adult with limited mobility also has limited ability to remain in a state of physiological well-being when exposed to a heat wave, so the 15 minute-city does not produce as much benefit for those living towards the tail end of the Gaussian. This example of an elderly person with limited mobility can, moreover, be aggravated by the presence of any disabilities. The first results of Horizon Europe Project CARMINE and of the interaction with a group of stakeholders who were asked how they would work to introduce Nature Based Solutions (NBS) in the Metropolitan area of Bologna are presented in the findings. The objective of the CARMINE Project is to create a decision support system, scalable to European cities, for implementing urban climate policies in the Climate Adapt Platform.*

**Keywords:** elderly, disables, equity, exposure, policies.

### Introduction

Today, urban planning in European cities is an ongoing collaboration process between various sectors, including planning, climate, environment, cultural heritage,

---

\*Researcher, Institute for the BioEconomy, CNR, Italy.

<sup>±</sup>Sr. Research Assistant, Institute for the BioEconomy, CNR, Italy; Deputy Head, Environment Unit, Athens Institute, Greece.

<sup>○</sup>Researcher, Institute for the BioEconomy, CNR, Italy.

<sup>•</sup>Researcher, Institute for the BioEconomy, CNR, Italy.

<sup>○</sup>Researcher, Institute for the BioEconomy, CNR, Italy.

<sup>♦</sup>Researcher, Institute for the BioEconomy, CNR, Italy.

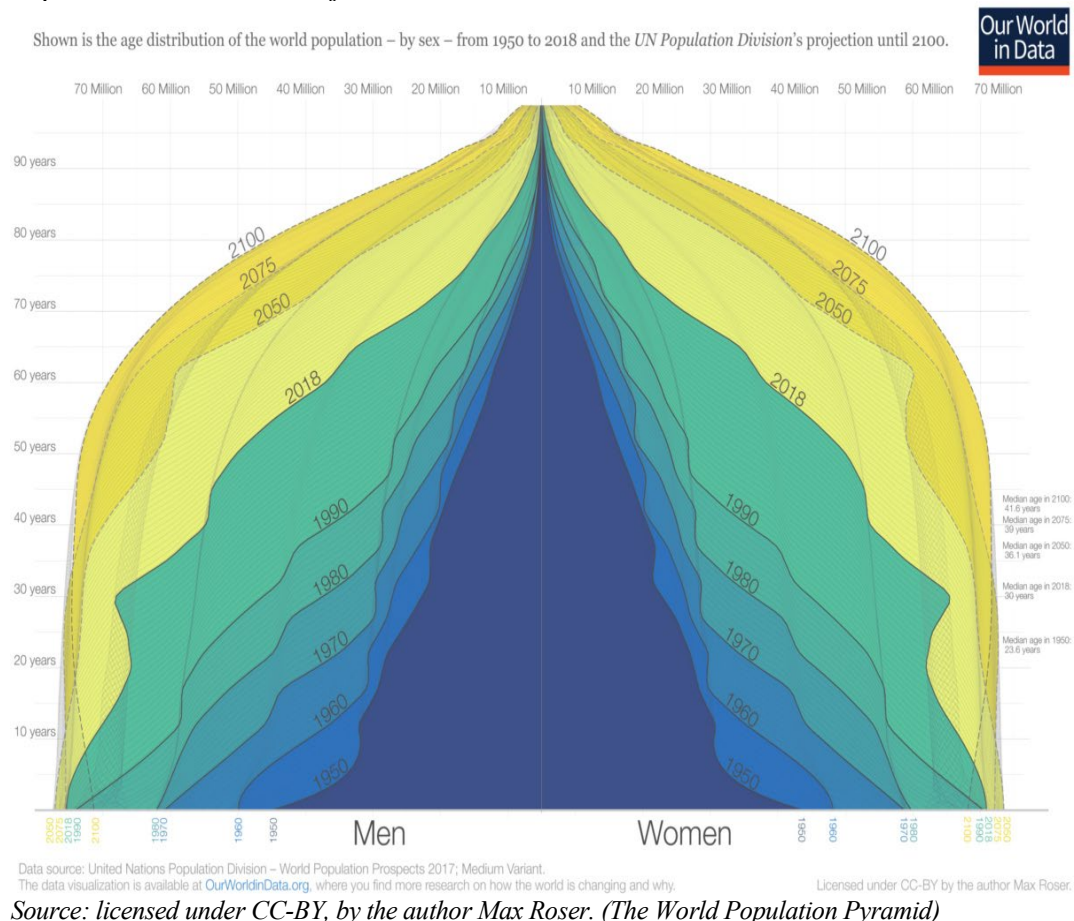
<sup>•</sup>European Projects Manager, Sustainability & Innovation · Caab Spa - Centro Agroalimentare di Bologna, Italy.

<sup>▲</sup>Marketing & Quality Director at Caab Spa - Centro Agroalimentare di Bologna, Italy.

economy, and social policies. Talking about urban planning today is very different from the urban planning that marked the explosive phases of urban development that characterized previous decades. Today, we face new challenges that are immeasurably greater than those of the past. Among the phenomena linked to climate change, the Urban Heat Island (UHI) combined with heat waves has the most significant impact in urban areas; therefore, it is essential to determine strategies to enable the population to counteract its effects.

If we imagine the cities of the near future, it seems likely that, over the next few decades, human beings will increasingly be drawn to urbanized centers. Furthermore, statistics show that these cities will be predominantly composed of the elderly, which are considered the least productive category and, at the same time, the one that falls ill the most (see Figure 1). Therefore, this category may have the most significant impact on our social system. As life expectancy continues to increase, it is important to consider the potential impact on social costs, which may rise exponentially.

**Figure 1.** Distribution of the Population by Sex from 1950 to 2018, and the UN Population Division's Projection until 2100



Suppose our scientific and technological advances remain at their current level. In that case, there is a risk that the social costs associated with the increase in the number of elderly people could increase significantly. It would be interesting to assess

whether urban and European governance are prepared to tackle this societal challenge. Moreover, with what tools might this challenge be achieved?

In the international debate on climate change, specific terminologies such as "resilience," "equity," and "renewability" are often used, but these phrases risk becoming 'empty' if not properly defined. For example, a relatively recent urban planning model is known as the "15-minute city". At first glance, it seems like a very advanced concept, being able to access all urban services within fifteen minutes, but on closer inspection, the question arises: "Who is it aimed at"? Perhaps a "standard" citizen of average age and average physical condition.

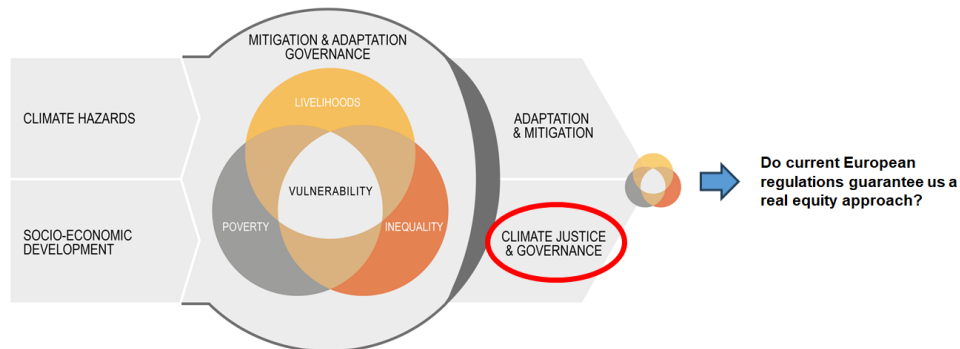
Moreover, here, the concept of "equitable" already begins to falter. How equitable can a city be if it is built around the average person, as opposed to the elderly person with health or mobility problems? From a quick Internet search, it would be easy to determine that a citizen with mobility problems may only have range of autonomy of a few hundred meters.

Starting from the United Nations 2030 Agenda for Sustainable Development, which sets out 17 interconnected challenges, we can focus precisely on the two primary targets for the urban environment, which will serve as our guide, referring to other European support policies where appropriate. The two sustainable development goals most relevant to the urban system are number 11, "sustainable cities and communities," and number 13, "climate action." Of course, the others are also important, but the urban agenda sees these two targets as essential for solving cities' challenges.

However, let us return briefly to the concept of equity. Consider, for example, an elderly person with a disability, low income, and no family support — a figure that, though statistically rare in our demographic-economic pyramid, represents one of the most vulnerable segments of society. While such individuals may lack in visibility or representation, this does not diminish their inherent value as individuals, and the wealth of experiences and knowledge they possess. Those living in our cities may be more exposed to climate phenomena than other categories, and our cities may not always respond equitably to their needs. What is an equitable approach that could be adopted at the European level? The European level is concerned about these issues, but does it also consider whether these citizens can be treated like others? It is important to recognize that these citizens require a different, and more inclusive approach. It is precisely their fragility that requires us to treat them differently, precisely in order to fully apply the concept of climate justice (see Figure 2). It is, therefore, necessary to analyze their needs in greater depth.

**Figure 2.** *The Human Dimension of Climate Change is at the Nexus of Climate Change, Climate Hazards, and Socio-economic Development*

Human dimension of climate change at the nexus of climate change, climate hazards and socio-economic development



Source: Birkmann, J., et al. (Birkmann, J. et al., 2022)

This study proposes a methodology within the Horizon Europe CARMINE Project (Carmine Project website, 2024), which is currently being tested for validity and operability. This Methodology seeks to establish an integrated strategy that aligns existing regulations (European, national, regional, and local) with scientific tools to understand the needs of vulnerable people and identify potential solutions, both operational and regulatory, for incorporation into urban planning instruments. In the short term, the intention is to integrate these solutions into the regulatory and operational/implementation framework, from local to regional and national levels.

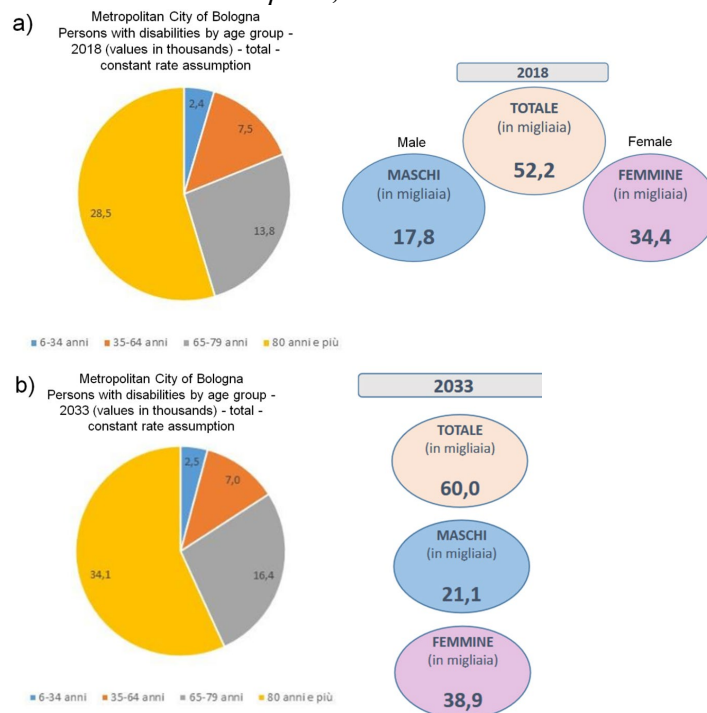
## Methodology

Bologna is the capital of the Emilia-Romagna region. The municipality has approximately 400,000 inhabitants, and its metropolitan area has over one million inhabitants.

The CARMINE Project is working with partners to develop a knowledge-based framework to address adaptation and mitigation in eight European metropolitan regions. The project is designed to bridge the gap between science and practice, to create actionable tools, products, and services that will improve the climate resilience of local communities and support decision-making at the European level. It is understood that the eight case studies defined include one from the Metropolitan City of Bologna. This study aims to explore the complexity of vulnerable populations in achieving equity during climate-related risks and access to essential services, such as quality, fresh food. In other words, the study will seek to establish the extent to which the city can respond equitably to the needs of complex, vulnerable groups of the population during the summer months. This is a critical consideration given the city's experience of heat waves coupled with UHI. However, in such a city, pollution also appears to be strongly correlated with the effect of the local microclimate due to recirculation processes (secondary circulation). To adapt to climate change means also to deliver under proper atmospheric conditions and move toward electric

delivery. In Figure 3 demographic data for 2018 show that the Metropolitan area of Bologna has a total of 52,000 people with disabilities, two-thirds of whom are female. The same figure projected for 2033 appears to confirm an increase in the number of people with disabilities. It will inherently raise questions about the potential economic impact on the region's social and healthcare systems in due course.

**Figure 3.** a) Metropolitan City of Bologna, Total of Persons with Disabilities by Age Group, (value in thousands), Constant Rate Assumption, Year 2018; b) Metropolitan City of Bologna, Total of Persons with Disabilities by Age Group, (value in thousands), Constant Rate Assumption, Year 2033



Source: Statistical Area, Municipality of Bologna

How might urban policy be organized so that those facing disadvantages have their own "life plan" (Progetto di vita policy, 2024; The United Nations Convention on the Rights of Persons with Disabilities, 2017), a degree of autonomy, and "true" dignity in their daily lives? Legislative Decree 62 of 3 May 2024 seeks to define and detail the importance of placing the individual's wishes at the center of all reasoning, respecting personal expectations and desires. This decree could be seen as a step forward in our understanding of disabilities and the support needed to enable disabled people to live their lives fully. It is possible to identify this threshold of autonomy through a multidimensional assessment carried out specifically for the individual. This individual assessment considers several factors, including the disability, other medical conditions, and the wishes and expectations of the individual concerned. It also looks at the possible margins of autonomous management that the person can achieve daily. Based on this assessment, the social/health service reasonably adapts to the

environment surrounding the disabled person to guarantee their right to life as independent and integrated as possible in the Community around them.

It is, therefore, not just a matter of welfare policies but also urban planning policies: it is a matter of "sustainable delivery," i.e. the possibility of finding quality food at affordable prices within a distance that can be reached within a time that does not expose the vulnerable individual to the physical risks posed by heat waves. In an inclusive and equitable city, the very concept of a "food desert" should be eliminated. The concept of food desert describes the poor access to nutritious food experienced by residents in urban or rural areas, and if high quality foods are available, they often are unaffordable for vulnerable groups. In the Food Desert EU Policy it would be ideal for there to be no neighborhoods where people living in poverty will have limited access to fresh and healthy products. It is important to acknowledge that these food deserts, and lower-income neighbourhoods, may be particularly vulnerable to specific health challenges, such as obesity, diabetes, and cardiovascular disease (Smets et al., 2022; Food desert, 2022; Rogers, 2024; Mylona et al., 2016).

A polycentric city based on a well-connected infrastructure network (railway station, integrated public transport, safe cycle, and pedestrian paths) that allow citizens to move around independently and at their own pace, without having to rely exclusively on private vehicles to access the entire metropolitan system, could be a winning formula.

The concept of the polycentric city emerged in the 1970s, when, in response to the urban sprawl that had characterized European cities in the previous decade, urban planners and researchers began to recognize new urban challenges, such as traffic congestion caused by people commuting to work in city centers. The gradual and increasingly coherent organization of public transport and the infrastructure system, in general, has encouraged the creation of autonomous secondary centers, which were intended to counteract the phenomenon of sprawl (Lemoy, 2024). This city model continues to respond coherently to the needs of new citizens as it adapts to any strategic evolution. A polycentric city model is probably possible because of its fractal-like characteristic, which responds adequately to the ever-increasing need to manage a multitude of citizens and city users of European metropolitan systems. The model appears to be adaptable in responding to new urban challenges, such as the risks posed by the impacts of extreme weather events.

What, then, can be meant by the term 'risk'? It is the product of danger multiplied by vulnerability multiplied by exposure. Therefore, there is no such thing as a standard citizen; there are differences that entail different risks, even if they are present at the same point  $x, y, z$  at time  $t$ . Is the concept of the food desert included within inclusive food policies? Yes, it is, but there may be other factors to consider. These factors are included in health policies about food quality for vulnerable groups, with the local application of the "Farm to Fork" policy, which aims to promote local products and their supply chains while guaranteeing their quality at affordable prices (European Commission, 2020).

The Food Desert Policy is also closely linked to economic policies for vulnerable populations with low ISEE ("PNRR" - National Recovery and Resilience Plan) income, part of which, not surprisingly, often includes a significant percentage of elderly

people living alone. It falls within the scope of equitable accessibility in an urban fabric that is shaped by the needs of vulnerable people (disability policies, "Life Project"). The food desert policy is linked to the Small Business Act commercial policy, which focuses on local SMEs operating in a well-defined area (European Union, 2008) and promotes the creation of "natural shopping centers" and "natural markets" (Regional Council of Piedmont, 1999; Confcommercio, 2013) as a model of cooperation at a neighborhood level.

A natural shopping center is an organized group of shops, restaurants, accommodation facilities, market areas, and craft activities. Public-private partnerships are considered one of the most suitable legal forms for representing the interests of all stakeholders, particularly in implementing actions and programs aimed at the redevelopment and promotion of local areas. These public-private partnerships hold significant potential as a tool for supporting many social and local activities to increase the inclusion of vulnerable groups.

The Food Desert policy also aims to foster enhanced "walkability," i.e. the possibility of reaching places safely, favoring travel on foot, by bicycle, or by public transport (Salat et al., 2017).

Finally, this approach also includes the creation of small pocket parks, which provide places of rest and recreation for vulnerable people, as well as places for relaxation and socializing. These parks serve the dual purpose of providing cooling areas and creating new places of social interaction to combat isolation. It is possible that, if they are designed well, pocket parks might be able to eliminate some car parking areas at little cost, enabling urban areas to be more inclusive.

It is important to consider that vegetation in Nature-Based Solutions (NBS) is used as an adaptation element, and in its physical content, it contributes to mitigation by reducing the heat island effect. Firstly, through the shading of the tree canopy on a given building; simultaneously the plants act as an adiabatic cooler for nearby buildings, acting as a cold screen, thanks to the second law of thermodynamics. This characteristic allows surrounding buildings to lose heat to the plants selected, distributed, and numerically appropriate for the project. It reduces the cooling requirements of the buildings facing them and, therefore, the CO<sub>2</sub> emissions necessary for operating the thermal machines for air conditioning. When selecting the species to be planted in each project, it may be beneficial to consider the WWH rule:

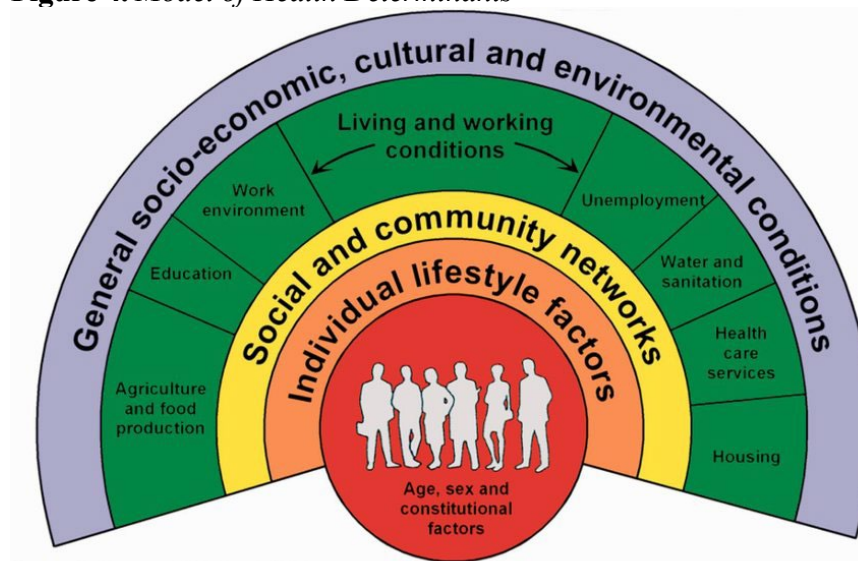
- Which plants should be selected for planting?
- Where should they be positioned?
- How many should be planted?

In the context of building and urban development projects in dense urban areas, it would be beneficial to consider this rule as a guiding principle, with its validity verified on a case-by-case basis using microclimate modeling. In terms of inclusion and safety, it would be beneficial to consider a further assessment of the social protection of the area, which could be achieved through a policy of opening shops and ensuring socially beneficial services are available 24 hours a day (through public-private agreements and partnerships).

It could be important to include another aspect in the complex reasoning. In a polycentric city, introducing means of transport (cars, buses, trains, etc.) is a critical factor, as it has led to planning taking on new forms. The possibility of moving easily and quickly, even within the same city, has made it possible to create purely commercial areas rather than mixed-use areas, such as historical centers or inner suburbs, where homes and shops are easily accessible by foot. This is one of the key points in the debate on redeveloping urban areas suitable for low-income people. The important aspect is not the 15 minute-city, but rather the creation of a livable environment that is easily accessible to all. Consider revising this approach to social cities, particularly in densely populated urban centers, where low-impact transportation options could be prioritized for deliveries and general movement. Additionally, it would be valuable to explore ways to incorporate green spaces into our urban planning, recognizing their potential not only as a route for physiological revitalization but also as a place for social interaction and enhancing overall well-being.

It is suggested that European cities' responses should ensure a level of complexity at all governance levels and in all the disciplines that build the city (see Figure 4). It is vital to ensure that a social and service dimension is in place for vulnerable individuals to meet their basic needs and recognize the relational and social systems that contribute to personal identity, within a social context, and that values their contributions. In understanding vulnerable community members and fostering equity, it is of the utmost importance to preserve the dignity of the individual.

**Figure 4.** *Model of Health Determinants*



Source: Dahlgren and Whitehead, 1991

Dahlgren, G. and Whitehead, M. (1991). *Policies and Strategies to Promote Social Equity in Health*. Stockholm: Institute for Futures Studies.

Source: Dahlgren et al. (Dahlgren et al., 1991)

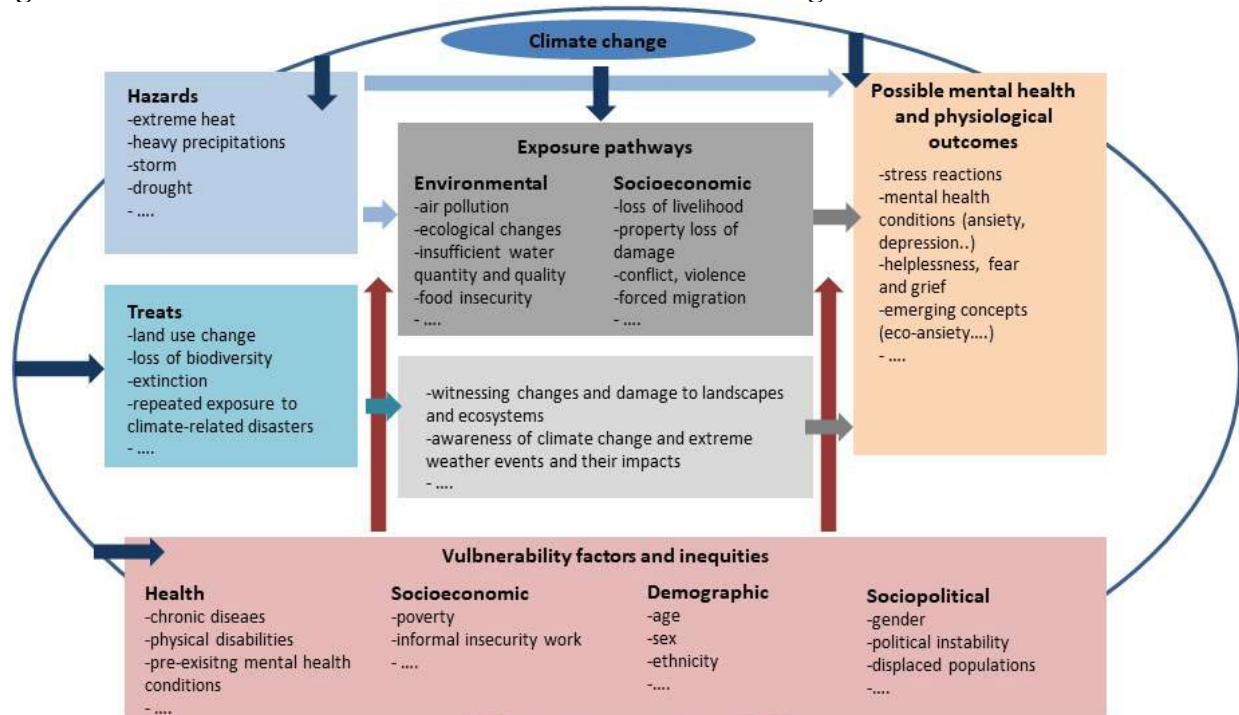
Fortunately, there are now a variety of tools at our disposal that can assist us in evaluating this across various scales and operational levels. The growth of European projects in recent years has been a valuable source of insight, helping us to identify approaches and methodologies that provide a framework for the various disciplines

involved and their interactions. For instance, we have been able to draw on the Blue Green Solutions project (Blue Green Solution project, 2015) and the Eklipse project (Eklipse Project, 2017) to develop software and tools that facilitate climate assessments at the micro and mesoscale. This knowledge enables us to represent the city's current and future responses.

We have outlined how to address this future challenge from a technological and scientific point of view. We have also understood what policies need to be taken into consideration in order to elicit the responses needed from the cities of the future. However, it is also worth considering a systemic approach that could help us to synthesize the complexity we face and must manage. Figure 5 shows a framework representing all the components at play. This framework includes the identification of a problem, which is climate change, and all the phenomena that impact the territory, and its direct and indirect impacts (hazards and threats). Ensuring that living beings are represented in the system is vital, and this study focuses on human beings.

Furthermore, individuals are exposed to environmental and social risks, with possible outcomes that climate change generates for them from both a physical and mental point of view. The lowest level represents the mechanisms and sectors that trigger the various impacts on humans, as shown in the exposure box. This framework was used to systematize the policies and sectors involved in the CARMINE Project Bologna case study to achieve the following results.

**Figure 5.** Policies and Sector Framework related to Climate Change



Source: The Authors

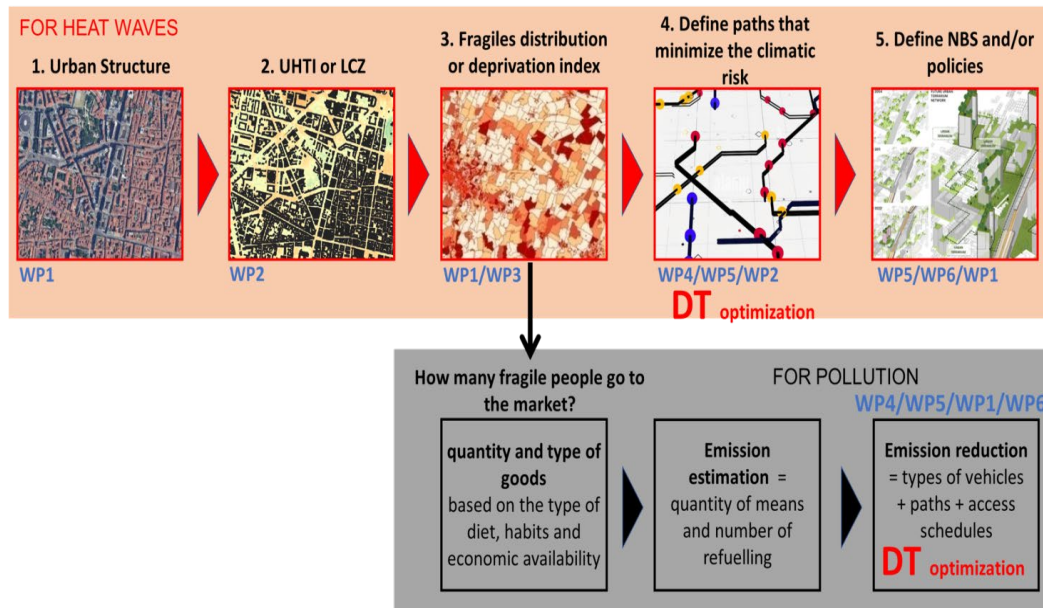
## Results

Applying the system framework described in the introduction to CARMINE's Bologna case study and taking into account the policies involved (Life Project, Smart Business Act, Farm to Fork, Transit Oriented Development, Food Desert), the focus is on the vulnerable individual. Likely, an elderly person who is chronically ill (i.e., diabetic or suffering from heart disease), lives alone on average, has a low-income and has difficulty moving around independently. This person likely does not have access to a private vehicle, or is unable to drive, but needs to go shopping, as part of their daily activities. They are likely more exposed to the risk of heat waves than those of average age and good health, simply because it may take them longer to travel to their destination (e.g. fresh food markets). This exposure can lead to psychological and physical challenges in the short to medium term, which may hurt their quality of life (Gamble et al., 2016). The CARMINE project has sought to involve local stakeholders in a Living Lab (<https://schub.carmine-project.eu/llm/#/llm/living-lab/10?tabNo=0#tabs>), which is collecting and analyzing the real needs of the project's target audience and their respective supply chains.

During the first workshop held in November 2024, stakeholders most directly involved with vulnerable and disabled people expressed the need for autonomy among the various categories of disabled people.

If we consider the methodological framework (see Figure 6), two approaches for analysis have been identified that may be worth pursuing. The first of these is the analysis of the urban fabric during heat waves. Given the structure of the city and its behavior in terms of microclimate, the distribution of vulnerable people is analyzed, taking into account all their characteristics, and the most likely routes they take to pursue their daily activities are hypothesized, including with the aid of digital twins. Based on these results, possible adaptation and mitigation actions can be defined. The second approach is linked to the well-being of vulnerable people. It considers aspects such as food quality, distribution, cost, and air quality, i.e. pollution linked to food-delivery transport.

**Figure 6.** Bologna's Methodology for Urban Frails, Risk and Exposure to Heatwaves and Pollution



Source: The authors

In developing this Methodology, based on the number and type of vehicles that deliver products to the various markets, the presence of vulnerable population groups, and the deprivation index, four markets will be selected as the most representative of the communities within the Metropolitan City of Bologna. In order to describe all the urban and social situations that represent the structure of the municipalities in the metropolitan city, it would be advisable to select at least one market in the largest urban center (Municipality of Bologna), one in a medium-sized urban center, and another in a smaller urban center. This cross-section will allow all the critical issues and potentials to emerge based on each degree of urban density. Once the markets have been identified, we will move on to the next stage, which will involve analyzing the long-term trend concerning the UHI risk coupled with heat waves. In the next phase, consider the demographic distribution to analyze the “most likely” routes from a given point X to the market for each of the four markets. This would allow us to obtain the most likely potential routes to reach that market (GIS analysis). In the final phase, it is envisaged that the routes to be verified through microclimate simulations (using ENVI-met software) will be identified from the route map to highlight vulnerabilities along these routes. Then other simulations could be carried out – this time during the design stage – which would allow the possibility to pre-determine new solutions.

The digital twin could potentially assist in classifying routes based on variables or elements that may contribute to discomfort, particularly in relation to microclimate comfort and pollution levels. It will also be possible to suggest regenerative urban solutions (NBS), advice for the population of Bologna, and guidance for local and regional policymakers.

It is important to note that data relating to vulnerable and disabled people is sensitive, so it will be necessary to consult the relevant authorities (the Local Health

Authority of Bologna and associations representing these categories), which are included in the list of stakeholders already actively involved in the project.

## Discussions

Why are adaptation issues prioritized over mitigation issues when analyzing the contents of the 2030 Sustainability Agenda? It is important to note that this criticism is not entirely without foundation, even when considering the findings of the 6th IPCC Report, which indicates that even if we achieve net-zero CO<sub>2</sub> emissions for several decades, the Earth's system will likely remain largely unaltered. It is not entirely fair to say that it is unjustified because applying urban planning techniques such as NBS are indeed adaptation measures, but they are also mitigation measures. Transit-Oriented Development and sustainable delivery are adaptation techniques. However, they have a high mitigation content by reducing CO<sub>2</sub> and pollutant emissions, and we can consider them to be urban planning techniques.

The example of vegetation as an element of NBS is paradigmatic for many "rigid" cities, i.e., those containing monumental heritage sites that rightly represent a common identity for the resident population and are protected by the European Landscape Convention itself. Understanding that this vegetation performs the fundamental task of reducing sensible heat is vital. For this reason, its characteristics and purposes must be defined within the urban regeneration process. In order to do this, the ex-ante and ex-post aspects of the intervention must be studied in depth. It is important to avoid an ideological approach and to adopt an exclusively scientific approach. This vegetation also has characteristics that can negatively impact health, if not correctly identified in new plantings or replacement works. We see in complexities and urgencies of lung and allergen diseases in young children that revoke these NBS interventions, especially with the presence of extended pollen periods due to climate change. These extended pollen periods can cause negative impact on this vulnerable section of the population.

Due to these complexities in urban planning, an interdisciplinary approach to design is essential to achieve a response consistent with the objectives to be achieved. The WWH method, when combined with tools for microclimatic validation of the proposed solutions, could offer valuable support to policymakers in carefully selecting tree and shrub species to be planted in urban contexts. This could prevent any intervention from becoming unjustified, revoked or evident in greenwashing.

This is the current state of affairs about regeneration. From the analysis carried out thus far, another aspect has come to light, one closely linked to the number of elderly people: their integration into today's society. Elderly members are often far from their family environments, when they have one, and then there's the issue of property retrofitting. This can present unique challenges in a country like Italy, where the housing stock is often in the hands of families. It is interesting to note that in the past these properties were seen as safe havens, and today, it is heartening to see that nearly 80% of these families are direct owners of such properties. However, Istat (Italian National Institute of Statistics) has reported an increase in the percentage of homes with elderly residents out of the total number of owner-occupied homes,

which now stands at 41% (Auser, 2015; Liberopensiero Immobiliare, 2016). The challenge here is twofold. On the one hand, there is the issue of finding the motivation that can drive an elderly person to undertake renovation work. If an elderly person lives alone, what desire might they have to engage in renovation? Furthermore, the properties are generously proportioned, with floor space that may exceed the requirements of a single elderly person. The main challenge that arises is therefore to find financial solutions that enable elderly people to solve the problem of loneliness, while ensuring adequate maintenance and renovation of their properties, allowing social housing solutions.

Redevelopment is a topic that has sparked a great deal of discussion within the Community. Unfortunately, this has also led to establishing a specific "standard" in building design, perhaps without fully grasping the richness of our country's diversity and cultural heritage. Culture and diversity are part of our widespread built heritage, which is of monumental value, and it is undoubtedly true that this does not meet the new generation of energy criteria. Current planning does not allow for adaptation to respect the existing fabric's historical and artistic fabric (a real intellectual and operational limitation). Moreover, we are frequently faced with a conflict between preserving monumental value and avoiding fuel poverty, i.e. the inability to meet the costs of heating and cooling buildings due to low household income. The tendency to focus on mandatory regulatory compliance, dictated by a consumer market for the sale of heating and electrical systems, may be causing us to overlook the cooling and heating systems of existing buildings.

The study of historical air conditioning systems in houses within the context of monumental value, such as country houses, is important, as they are built with a specific orientation and calibrated, functional openings. Once the existing situation has been analyzed, it may be possible to design the surrounding green space in a way that improves both the functional system and the microclimate.

In the spirit of cooperation and to enhance the usability and operational effectiveness of the adaptation and mitigation measures and policies on vulnerability outlined in the Methodology, it might be beneficial to consider their inclusion, where feasible, in national legislation and regulations concerning construction and urban greenery (Ministry of the Environment and Protection of Land and Sea, 2018). It is worth noting that this is particularly relevant in passages that may, directly and indirectly, affect both public and private open spaces (as well as buildings near them).

The current regulations incorporate concepts such as acoustic, energy, thermal performance, and soil permeability (index). The same cannot be said for the microclimate and urban components that can affect it. For instance, at the national level, there is a degree of influence over free building activities, such as repair, renovation, and replacement of building finishes that do not require a building permit from the municipality. For example, the permeability index is now indicated in the replacement of paving and the finishing of outdoor spaces and parking areas, with reference to the municipal urban planning instrument. Consider introducing guidelines on a minimum albedo threshold for materials. At the municipal level in the Emilia Romagna region, some municipalities have introduced mandatory guidelines that aim to respond with adaptation measures. However, these involve

obligations are often conflicting with the desire to combat climate change, such as planting distances, increased CO<sub>2</sub> from construction zones and elevated noise pollution levels, and becoming an inherent nuisance to surrounding neighbors.

For example, this has led to a situation where owners who fail to plant the number of trees, specified by law for the square meters of land they occupy, must pay for this failure. Another option would be to increase the diameter of sewer pipes during maintenance and upgrade work on the network, for example, by working on sections of neighborhoods at a time.

In public administration construction projects, the integrated action agreement between these parties could provide a microclimatic assessment (ex-ante/ex-post) of new works. In this case, we are referring to works in urban areas or works that may impact UHIs in the existing context. Public administrations could receive financial incentives from the region to undertake this work; otherwise, there is a risk of remaining stuck in an empty rhetoric about climate change.

Generally, urban regeneration projects involving increased floor space would ensure a permeability index and an albedo threshold in line with the municipal urban planning instrument. Where this is not specified, guidelines should be provided. To further facilitate urban regeneration, consideration could be given to increasing the percentage reduction in the building contribution by including microclimate safety measures, such as niches and microclimate paths, among the works. These measures could be incorporated into the areas to be regenerated/redeveloped. When paying the building contribution for urbanization works in facilities intended for tourism, commercial activities, and services, it may be possible to introduce incentives for activities that apply adaptation and mitigation measures (construction cost calculation). For new construction or urban redevelopment projects, consideration could be given to incorporating microclimate assessment into the provisions of the implementation plans and negotiated agreements.

Regarding policies for vulnerable people, Italian urban planning and building legislation made significant progress in 2009 by replacing the term 'handicapped' with 'disabled' in all existing regulations, thus encompassing a broader range of categories. A further step is now important to facilitate the necessary paradigm shift and clarify that disability does not lie in the diversity or categories of individuals, but in urban policy, which fails to respond to their needs.

Furthermore, properly organizing loading and unloading areas for goods deliveries is crucial to encourage small, neighborhood shops and 'natural shopping centers', such as farmers' or community markets, in the city. This action has been overlooked, causing the historic center to become more of an administrative hub than a commercial center. While aesthetically attractive roads and pavements are being built, they are being constructed close to shops that are on the verge of closure and places that are becoming increasingly unwelcoming, which is causing safety problems.

Another regulatory provision that could be addressed by implementing adaptation solutions, such as pocket parks, to promote socialization in dense urban areas, as it relates to outdoor spaces that serve food and beverages. When issuing the necessary authorizations and concessions, it would be interesting to explore the possibility of an agreement between the public administration (PA) and commercial

businesses. For instance, if the PA plans to create a pocket park near a commercial establishment that serves food and beverages, such as a bar, the PA could solicit the help of the bar to manage the pocket park, in exchange for maintenance and management of the entire facility, resulting in a tax relief or other government funding. The establishment would be obliged to provide a certain number of shaded seats and access to public, potable water.

## **Conclusions**

Such complexities cannot be resolved with simplistic, ideological answers, such as the 15-minute city. For example, a lawn may appear to mitigate climate change, but it can also pose a barrier for disabled people, forcing them to take greater risks due to the need to take a more complex route. This lawn might be a green space, but it is not an NBS that targets the unique vulnerabilities of the individual citizens that we need to protect the most. The combination of targets 11 and 13 of the 2030 Sustainable Development Goals (SDGs) Agenda therefore, highlight the need for urban systems to engage with public administrations, as demonstrated by the PINQuA (Innovative Programme for Quality Living, 2019), as well as with intermediate bodies, trade associations, voluntary associations, and all stakeholders – particularly public health services and vulnerable community members.

An analysis of today's challenges, therefore, reveals the need for urban planning capable of grasping complexities, abandoning standardized concepts, and incorporating diversity into its models. This is not an easy task, but it is necessary given today's challenges. These challenges emerge most forcefully in metropolitan systems and regional connections. What does a metropolitan city mean without equal knowledge of the territory, demographics, and tools for making informed choices? Knowledge is not only awareness of the current state of affairs but also the ability to choose from a range of options. Modeling and digital twins are now an indispensable tool in urban planning because it enables the optimal choice to be made from a range of options. However, for harmonious territorial development, all stakeholders — public administrations, professional associations, and other groups — must have easy access to these tools. This is possible but requires organization according to specific themes, or an appropriate training plan.

Returning to today's challenges alongside urban regeneration, the increase in average life expectancy means that the Longevity City model is becoming increasingly prevalent among urban planning models. This model aims to create spaces that promote cognitive and physical well-being in all age groups.

However, urban regeneration alone may not be sufficient to sustain a system where the percentage of young people is much lower than that of the elderly population. Moreover, this demographic is shrinking year over year, at least in Italy, as it is attracted by the job and lifestyle guarantees offered by other countries. Baby boomers are currently seen as an indispensable resource in finance and the economy, as they have both capital and the financial knowledge to manage their wealth in line with the evolving economic landscape. The global financial sector has set out guidelines for policymakers and entrepreneurs to follow in the coming years, which

could help to address the financial, economic, and health challenges we are already facing. The first paradigm shift is to stop considering aging as a cognitive and physical decline and to start considering it for its strengths: history, wisdom and culture. Older people are seen as mature consumers with knowledge and self-awareness. If they are in good health, they become careful selectors of products and thoughtful about their dependencies, such as the use of technology, as well as seekers of quality time and connection. If they are not in good health, we need to consider more equitable solutions to ensure their long-term well-being and access to quality, healthy food and other essential services. We need to ensure that the growing risks for heat waves (and other climate risks) do not diminish their good health by enabling their isolation or solitude, but instead, utilize climate mitigation and adaptation tools to promote outdoor spaces for cooling, rest and socialization when engaging in daily activities. This does not necessarily need to be encompassed within the 15-minute city, but it does need to have an individualized approach that targets specific disabilities.

Improving the health and well-being of the elderly population can save money on social and healthcare costs. Another area of action concerns the millennial and younger generations: increasing financial literacy to promote informed, financially sustainable economic choices. This would improve life expectancy for families in general (World Economic Forum, 2025).

## Acknowledgments

This study was conducted in the frame of the project Climate-Resilient Development Pathways in Metropolitan Regions of Europe (CARMINE) funded by the European Union under the Horizon Europe Programme (Grant agreement 101137851).

## References

- Birkmann J, Liwenga E, Pandey R, Boyd E, Djalante R, Gemenne F, Leal Filho W, Pinho PF, Stringer L, Wrathall D (2022) Poverty, Livelihoods and Sustainable Development. In: Pörtner HO, Roberts DC, Tignor M, Poloczanska ES, Mintenbeck K, Alegría A, Craig M, Langsdorf S, Lösschke S, Möller V, Okem A, Rama B (eds.) *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the IPCC*. Cambridge University Press, Cambridge, UK and New York, NY, USA, 1171–1274. <https://doi.org/10.1017/9781009325844.010>
- Dahlgren G, Whitehead M (1991) *Policies and strategies to promote social equity in health*. Stockholm: Institute for Futures Studies.
- Gamble JL, Balbus J, Berger M, Bouye K, Campbell V, Chief K et al. (2016) Chapter 9: Populations of Concern. In: Crimmins A, Balbus J, Gamble JL et al. (eds.) *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. U.S. Global Change Research Program, Washington, 247–285. Available at: [https://health2016.globalchange.gov/low/ClimateHealth2016\\_09\\_Populations\\_small.pdf](https://health2016.globalchange.gov/low/ClimateHealth2016_09_Populations_small.pdf) (Accessed: 5 January 2025)

- Mylona K, Maragkoudakis P, Bock AK, Wollgast J, Caldeira S, Ulberth F (2016) Delivering on EU food safety and nutrition in 2050 – Future challenges and policy preparedness. *EUR27957 EN*. Publications Office of the European Union, Luxembourg. <https://doi.org/10.2787/625130>
- Salat S, Ollivier G (n.d.) *Transforming the urban space through transit-oriented development: The 3V approach*. World Bank, Washington, DC. Available at: <https://openknowledge.worldbank.org/bitstreams/0818e8e4-5463-5102-90c1-6dd9b9df0f39/download> (Accessed: 2 July 2024)
- Smets V, Cant J, Vandevijvere S (2022) The changing landscape of food deserts and swamps over more than a decade in Flanders, Belgium. *International Journal of Environmental Research and Public Health*, 19(21):13854. <https://doi.org/10.3390/ijerph192113854>

## Web Sources

- Anffas (n.d.) *Progetto di vita policy*. Available at: <https://www.anffas.net/it/cosa-facciamo/supporto-alle-persone-con-disabilita/progetto-di-vita/> (Accessed: 20 May 2025)
- Auser (2015) *Presentation of the Second Report on the housing conditions of elderly people living in their own homes in Italy* (in Italian). Available at: <https://auser.it/comunicati-stampa/presentazione-del-secondo-rapporto-sulle-condizioni-abitative-degli-anziani-in-italia-che-vivono-in-case-di-proprietà-2015/> (Accessed: 5 June 2025)
- Blue Green Solution Project (2015) Available at: <https://bgd.org.uk/> (Accessed: 20 October 2024)
- Confcommercio (2013) *Natural shopping centres: the Italian way sets an example* (in Italian). Available at: <https://www.confcommercio.it/-/centri-commerciali-naturali-la-via-italiana-fa-scuola> (Accessed: 22 July 2024)
- Eclipse Project (2017) *An impact evaluation framework to support planning and evaluation of nature-based solutions projects*. Available at: <https://climate-adapt.eea.europa.eu/en/metadata/publications/an-impact-evaluation-framework-to-support-planning-and-evaluation-of-nature-based-solutions-projects> (Accessed: 10 June 2024)
- European Commission (n.d.) *Farm to Fork Strategy*. Available at: [https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy\\_en?prefLang=it](https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en?prefLang=it) (Accessed: 20 May 2025)
- European Union (n.d.) *A 'Small Business Act' for European SMEs*. Available at: <https://eur-lex.europa.eu/EN/legal-content/summary/a-small-business-act-for-european-smes.html> (Accessed: 12 May 2024)
- Horizon Europe CARMINE Project. Available at: <https://carmine-project.eu/> (Accessed: 4 June 2025)
- Lemoy R (2024) Monocentric or polycentric city? An empirical perspective. Available at: <https://doi.org/10.48550/arXiv.2403.07624> (Accessed: 14 June 2025)
- Libero Pensiero Immobiliare (2016) *La questione abitativa in Italia e a Bologna* (in Italian). Available at: <https://www.liberopensieroimmobiliare.com/la-questione-abitativa-in-italia-e-a-bologna> (Accessed: 6 June 2025)
- Ministry of the Environment and Protection of Land and Sea (2018) *Strategia nazionale del verde urbano* (in Italian). Available at: [https://www.mase.gov.it/portale/documents/d/guest/strategia\\_verde\\_urbano-pdf](https://www.mase.gov.it/portale/documents/d/guest/strategia_verde_urbano-pdf) (Accessed: 15 September 2024)
- PInQUa Programme (2019) (in Italian). Available at: <https://territorio.regione.emilia-romagna.it/politiche-abitative/erp/programmi-di-intervento/pinqua> (Accessed: 10 June 2025)
- Regione Piemonte (1999) *Resolution of the Regional Council of Piedmont n° 563-13414* (in Italian). Available at: <https://legislazionetecnica.it/node/2652484> (Accessed: 22 July 2024)

- Rogers K (2024) *Food desert*. *Encyclopedia Britannica*. Available at: <https://www.britannica.com/topic/food-desert> (Accessed: 20 June 2025)
- StudySmarter (n.d.) *Food desert*. Available at: <https://www.studysmarter.co.uk/explanations/human-geography/agricultural-geography/food-desert/> (Accessed: 10 April 2025)
- The World Population Pyramid (1950–2100). Available at: <https://www.populationpyramid.net> (Accessed: 12 June 2025)
- United Nations (n.d.) *Convention on the Rights of Persons with Disabilities* (in Italian). Available at: <https://www.lavoro.gov.it/temi-e-priorita/disabilita-e-non-autosufficienza/focus-on/Convenzione-ONU/Documents/Convenzione%20ONU.pdf> (Accessed: 10 April 2025)
- World Economic Forum (2025) *Future-Proofing the Longevity Economy: Innovations and Key Trends*. White Paper. Available at: [https://reports.weforum.org/docs/WEF\\_Future\\_Proofing\\_the\\_Longevity\\_Economy\\_2025.pdf](https://reports.weforum.org/docs/WEF_Future_Proofing_the_Longevity_Economy_2025.pdf) (Accessed: 10 January 2025)