What if Europe's most overlooked rural regions held the key to longer, healthier lives—not despite their simplicity, but because of it?

Blue Zones and the Active and Conscious Ageing potential of CEE Countries

Analysis and Strategy Paper

2026

CONSCIOUS AGEING
HEKATE FOUNDATION
HUNGARY

Blue Zones and the Active and Conscious Ageing potential of CEE Countires

written by Kinga Milankovics
president of Hekate Conscious Ageing Foundation, Hungary

Contents

Executive Summary

This study examines the relevance of the “Blue Zones” concept, regions characterized by exceptional longevity, for Central and Eastern European (CEE) countries, particularly their rural and peripheral areas. It situates ageing within Europe’s broader “polycrisis,” including demographic decline, regional inequality, care workforce migration, and welfare state pressures. While ageing is often framed as a burden, the study reframes it as a potential driver of sustainable and socially embedded development.

The analysis demonstrates that many deprived rural regions in CEE share key structural characteristics with established Blue Zones: agricultural dependence, low income levels, geographic isolation, limited integration into global capital flows, and relatively strong community ties. However, despite these similarities, outcomes diverge significantly. Blue Zones achieve high levels of healthy ageing and longevity, whereas CEE regions often experience poorer health outcomes, social exclusion of the elderly, and demographic decline.

The study identifies that economic structure alone does not determine longevity. Instead, outcomes depend on the interaction between lifestyle, diet, social cohesion, environmental conditions, and governance. In Blue Zones, these factors combine to create health-promoting ecosystems characterized by natural physical activity, plant-based diets, strong intergenerational relationships, and a sense of purpose. In contrast, CEE rural regions face structural barriers, including weak welfare systems, mental health challenges, and the erosion of community structures due to migration and neoliberal economic transformation.

Building on this comparative analysis, the study proposes a strategic framework for transforming deprived regions, particularly those with favorable climatic conditions, into environments supportive of active and conscious ageing. Key policy directions include:

- Strengthening local food systems and promoting healthy, plant-based diets
- Designing built environments that encourage everyday physical activity
- Reinforcing social cohesion and intergenerational integration
- Addressing socioeconomic deprivation and inequality
- Reforming governance structures to support inclusive, community-based development
- Integrating health, spatial planning, and sustainability policies

The study concludes that CEE regions should not be viewed solely as lagging peripheries but as potential laboratories for innovative development models. By

leveraging existing structural features, such as small-scale agriculture, local networks, and spatial cohesion, and combining them with targeted policy interventions, these regions could transition toward “conscious and active ageing” pathways.

Ultimately, the paper calls for a shift in European policy thinking: from managing ageing as a crisis to harnessing it as a strategic opportunity. It advocates for a “European Conscious Ageing Alliance” that recognizes regional diversity as an asset and promotes longevity-oriented, sustainable, and socially cohesive development across the continent.

Keywords

Blue Zones, Central and Eastern Europe (CEE), Active and conscious ageing, Longevity, Rural development, Social cohesion, Health inequalities, Demographic ageing, Sustainable development, Lifestyle and environment, Agricultural livelihoods, Regional disparities, Policy innovation, Community-based development, Well-being and mental health

Introduction

Europe is undergoing profound structural transformation. Demographic ageing, accelerating regional disparities, welfare state pressures, climate instability, labour market restructuring, and growing mental health challenges are not isolated phenomena but interconnected dimensions of what is increasingly described as a polycrisis. Within this complex landscape, Central and Eastern European (CEE) countries occupy a particularly sensitive position. They face rapid population ageing, rural depopulation, care workforce outmigration, widening regional inequalities, and the long-term consequences of post-socialist economic restructuring.

At the same time, ageing itself is often framed primarily as a fiscal and social burden—an escalating cost driver for health systems, pension regimes, and long-term care infrastructures. The dominant narrative emphasizes dependency ratios, labour shortages, and care deficits. Western European countries increasingly attract care workers from Eastern Europe, intensifying what may be described as a care migration imbalance, whereby already fragile rural regions lose working-age populations while simultaneously ageing faster. This dynamic exacerbates territorial inequalities and deepens the vulnerability of peripheral regions.

However, this problem-oriented perspective on ageing stands in contrast to a growing body of research on exceptional longevity. The concept of "Blue Zones" describes geographically delimited regions where populations exhibit unusually high concentrations of centenarians and extended healthy life expectancy. **These regions,** identified through rigorous demographic validation, **demonstrate that longevity is not merely a product of advanced medical systems or high income levels, but emerges from the interaction of lifestyle, social cohesion, environmental conditions, dietary patterns, and community structures.**

The existence of Blue Zones challenges conventional assumptions. **Many of these regions are economically modest, geographically peripheral, and structurally simple**. Yet they produce outcomes—healthy ageing, psychological resilience, and social integration of the elderly—that more affluent regions struggle to achieve. The Blue Zone phenomenon thus opens a critical analytical question: under what conditions can economic marginality coexist with or even support longevity and well-being?

This question is particularly relevant for rural regions in Central and Eastern Europe. As this study demonstrates, deprived CEE rural areas share a number of structural characteristics with canonical Blue Zones: agricultural dependence, geographic peripherality, limited integration into global capital flows, modest material standards, and strong, though strained, community ties. Yet the outcomes differ markedly. Instead

of exceptional longevity, many CEE rural regions experience health inequalities, social exclusion of the elderly, welfare state weaknesses, and demographic decline.

The central puzzle addressed in this study is therefore not whether CEE regions resemble Blue Zones economically, they often do, but **why similar structural conditions produce divergent ageing outcomes**. The analysis proceeds from the hypothesis that economic structure alone does not determine longevity. Rather, the **decisive factors lie in the interplay between material conditions, social organization, lifestyle practices, governance structures, and environmental context**.

This reframing allows ageing to be understood not merely as a crisis, but as a transformative opportunity. **If certain structural features present in deprived rural regions — such as small-scale agriculture, local food systems, strong informal networks, and spatial cohesion — can be combined with targeted policy interventions, community-level environmental design, and inclusive governance, they may form the foundation for active and conscious ageing trajectories.** In this perspective, ageing regions are not problems to be managed, but potential laboratories for innovative, low-consumption, socially embedded development models.

Such models are urgently needed. Europe faces not only a demographic transition but also housing pressures, sustainability deficits, mental health challenges, and the erosion of social infrastructures. Recultivating social spaces — both physical and relational — becomes essential. **Walkable settlements, green and blue infrastructure, intergenerational integration, local food production, and community-based governance are not merely quality-of-life enhancements; they represent systemic responses to intertwined crises of health, inequality, and ecological sustainability.**

The Blue Zones concept, despite its methodological debates and limitations, offers a heuristic framework for examining how environmental design, lifestyle, and community structure shape ageing outcomes. When critically assessed and adapted, it can serve not as a romanticized ideal but as a strategic template for territorial transformation.

This study is structured in three parts. First, it provides a comprehensive overview of the Blue Zone concept, including its methodological foundations, characteristics, and critiques. Second, it examines the economic similarities between Blue Zones and deprived rural areas in Central and Eastern European EU member states, highlighting structural parallels and key divergences. Third, it develops strategic pathways through which regions — particularly those with favourable climatic and environmental conditions — can transition from deprivation toward conditions supportive of exceptional longevity.

By situating ageing within broader structural transformations and by comparing seemingly disparate regions through a shared analytical lens, this study aims to contribute to a more constructive narrative of demographic change. Rather than treating ageing as a fiscal threat or rural peripherality as an inevitable decline, it proposes that under the right policy, environmental, and social conditions, structurally simple regions can become models of resilient, sustainable, and health-promoting development.

In doing so, it invites policymakers, regional planners, and community actors to reconsider the relationship between deprivation and potential, and to explore how the structural features already present in many CEE rural regions might be mobilized — not as remnants of backwardness — but as assets in building a European future rooted in longevity, cohesion, and sustainable well-being.

1. Blue Zones: a comprehensive overview

1.1 Definition and origins of the Blue Zone concept

The term "Blue Zone" was coined and formally defined by Poulain and colleagues to describe geographically delimited regions of the world where populations exhibit exceptional longevity (Poppel et al., 2025; , Poulain et al., 2004). Specifically, a Blue Zone has been defined as "a relatively limited and rather homogenous geographical area where the population shares the same lifestyle and environment and its longevity has been proved exceptionally high" (Poppel et al., 2025; , Soriano et al., 2013; . More precisely, Lozada-Martínez and Anaya propose that a Blue Zone should be considered as "the geographical area where there is a prevalence of centenarians higher than expected by demography (regardless of the centenarian's gender)," theoretically reflecting an area that possesses unique characteristics allowing the development of genuine healthy extreme longevity (Lozada-Martínez & Anaya, 2024). This longevity is further characterized not merely by chronological age of 100 years or older, but by a biological age that is younger—reflecting a slower ageing process compared to the general population (Lozada-Martínez & Anaya, 2024).

The concept originated from a National Geographic expedition led by Dan Buettner, who was intrigued by data from the World Health Organization showing that residents of Okinawa, Japan, lived into their eighties, nineties, and even hundreds with little disability or dementia (Firpo-Cappiello, 2024). Buettner subsequently embarked on wide-ranging research, collaborating with demographers, scientists, and anthropologists to identify and characterize these regions (Buettner & Skemp, 2016). The first formally reported Blue Zone was Sardinia's Barbagia region in 2004, with three additional regions subsequently identified: Okinawa (Japan), Nicoya (Costa Rica), and Ikaria (Greece) (Kreouzi et al., 2022). A fifth Blue Zone, the Seventh-day Adventist

community in Loma Linda, California, USA, was later added to the list (Zábó et al., 2023), (Buettner, 2025), (Herbert et al., 2022).

1.2 The five canonical Blue Zones

The five globally recognized Blue Zones are consistently identified across the literature as:

1. **Sardinia, Italy** – specifically the central-eastern mountainous region
2. **Okinawa, Japan**
3. **Nicoya, Costa Rica**
4. **Ikaria, Greece**
5. **Loma Linda, California, USA**

Several studies have reported that individuals residing in these Blue Zone regions exhibit notably high life expectancy and are approximately ten times more likely to live to 100 years of age (Santos et al., 2025). These regions are generally characterized by mild climates, abundant natural resources, high levels of physical activity, social engagement, and diets rich in plant-based foods (Yamamoto et al., 2025).

1.3 Methodology for identifying Blue Zones

1.3.1 The Extreme Longevity Index

The primary methodological tool used to identify and validate Blue Zones is the Extreme Longevity Index (ELI), defined as the percentage of persons born in a given region within a specified birth cohort who subsequently became centenarians. In the original Sardinian study, Poulain et al. calculated the ELI for persons born between 1880 and 1900, and used a Gaussian smoothing method to identify the spatial clustering of longevity (Poulain et al., 2004). This approach has since been adopted in other regional studies, including analyses of Dutch birth cohorts spanning 1812–1923 (Poppel et al., 2025).

1.3.2 Validation requirements

A critical prerequisite for Blue Zone identification is the rigorous validation of age and vital status data (Deeg et al., 2024), (Kreouzi et al., 2022). According to Kreouzi et al., the validation of population longevity requires the use of death certificates and social security records (Kreouzi et al., 2022). Pes et al. note that no rigorous age validation processes have been conducted in several additional populations that have claimed Blue Zone status, presenting major challenges for comparative analysis (Pes et al., 2022). Indeed, some scholars have pointed out that for a number of supposed extreme longevity hotspots, the evidence may be an artefact attributable to deficient validation of data, and that supercentenarian birthdates have been characterized by patterns indicative of widespread fraud and error (Poppel et al., 2025; , Deeg et al., 2024).

1.3.3 Spatial delimitation

The preliminary steps for identifying any new Blue Zone include the spatial delimitation of the alleged Blue Zone and the validation of the extreme longevity of the population living in that area Soriano et al., 2013; . Standardizing methodology across different Blue Zone populations is considered paramount when searching for longevity determinants, as it enables meaningful comparison of characteristics and behaviors Soriano et al., 2013; .

1.4 Characteristics of Blue Zone populations

1.4.1 Lifestyle and behavioral factors

Research across the Blue Zones has identified a set of common lifestyle and behavioral patterns that are believed to contribute to exceptional longevity. Buettner and colleagues distilled these into nine commonalities, termed the "Power 9," which include: **moving naturally, eating wisely, improving resilience to stress, getting adequate sleep, keeping strong family ties, stimulating strong community support, respect for the planet, and having a purpose in life** (Kreouzi et al., 2022, Buettner, 2025). These principles are broadly consistent with the six pillars of Lifestyle Medicine: healthy eating, exercising, avoidance of smoking and other risky substances, stress management, restorative sleep, and forming and maintaining relationships (Kreouzi et al., 2022).

Common lifestyle characteristics observed among Blue Zone inhabitants include **family engagement, social engagement, less smoking, moderate alcohol intake, regular physical activity, and a plant-based diet** (Santos et al., 2025). In the Blue Zone of Ikaria, Greece, for example, a large survey concluded that the majority of the oldest old participants reported daily physical activities, healthy eating habits, avoidance of smoking, frequent socializing, midday naps, and extremely low rates of depression (Soriano et al., 2013).

1.4.2 Physical activity

A scoping review by Herbert et al. found that **81% of the activities engaged in by Blue Zone centenarians are of moderate intensity** (Herbert et al., 2022). Blue Zone centenarians represent significantly high physical functioning and high levels of activity through **labouring occupations, outdoor hobbies, and in-home activities, with agricultural activities being the most predominant mode**. The key finding is that environmental and cultural influences of each region significantly shape the nature and extent of physical activity (Herbert et al., 2022). In the Sardinian Blue Zone specifically, the mountainous terrain contributes to increased physical and cardiovascular activity, as older inhabitants habitually walk long distances (Fastame et al., 2021).

1.4.3 Dietary patterns

The diets of Blue Zone populations have attracted considerable scientific attention, though it is important to note that the **diets adopted in the various Blue Zones are quite different from each other**, reflecting different historical backgrounds, cultural traditions, and environmental features (Pes et al., 2022). The identification of Blue Zones provided a new model to test the relationship between dietary habits and health and longevity, though the assumption that longevity stems primarily from diet is often made a priori without convincing evidence. **Common dietary features include the prevalent consumption of self-produced foods, antioxidant-rich diets, and generally low caloric intake** (Pes et al., 2022). In Sardinia, for example, the Mediterranean diet—including moderate consumption of meat and dairy products and a high intake of plant-based products—has been associated with longevity Fastame et al., 2021, Benedetto & Carboni, 2023). In Loma Linda, the Seventh-day Adventist community is the only Blue Zone that overtly and intensively promotes a plant-based dietary intake pattern (Santos et al., 2025).

1.4.4 Psychological and social factors

Research on Blue Zones has also identified important psychological and social dimensions of longevity. Individuals living in Blue Zones have been observed to exhibit a younger biological age compared to their chronological age, a region-specific slowing of ageing processes attributed to unique lifestyle, dietary, and social factors (Zábó et al., 2023). Studies in the Sardinian Blue Zone have documented that community-dwelling older adults self-report less depressive signs and better psychological well-being than peers living in comparable areas (Fastame et al., 2021). Fastame et al. found that participants in the Sardinian Blue Zone reported better mental well-being and satisfaction with family and non-family ties than older people living in urban areas. Psychological resilience and competence have been identified as key promoters of successful ageing in Blue Zone populations, with cultivating a sense of purpose, nurturing social connections, and adopting a healthy lifestyle all contributing to longevity (Zábó et al., 2023).

1.5 Genetic and biological dimensions

1.5.1 The role of genetics

The Danish Twin Study established that longevity is predominantly (approximately 80%) determined by lifestyle choices and environmental influences on healthy habits, with genetic heritability playing a comparatively minor role (Lakshmanan et al., 2020), (Buettner & Skemp, 2016). However, heritability estimates of longevity suggest that about a third of the phenotypic variation associated with the trait is attributable to genetic factors, with the rest influenced by epigenetic and environmental factors (Govindaraju et al., 2015). In Blue Zone populations, genetic factors may play a more

prominent role than in the general population (Davinelli et al., 2012). For instance, research in the Sardinian Blue Zone has identified associations between specific genetic variants—such as those of the TAS2R38 bitter taste receptor gene—and the attainment of exceptional longevity (Melis et al., 2019). Deeg et al. found that Blue Zone participants in the Netherlands more often had a polygenic risk score linked to longevity compared to non-Blue Zone participants (Deeg et al., 2024).

1.5.2 Gut microbiota

Emerging research has highlighted the gut microbiota (GM) as a potential factor associated with the establishment of a favorable health phenotype that allows for extreme longevity (Lozada-Martínez et al., 2024). Findings derived from cohorts studied in Blue Zones with high rates of long-lived populations, such as in Italy or China, have shown that their GM is enriched with *Ruminococcaceae*, *Akkermansia*, and *Christensenellaceae*, which have been classified as potentially beneficial bacteria linked to body mass index, immunomodulation, and healthy homeostasis (Lozada-Martínez et al., 2024). However, the evidence remains limited due to the extensive diversity of the microorganism community, which can vary based on geographic location, lifestyles, medication, or associated diseases (Lozada-Martínez et al., 2024).

1.6 The Sardinian Blue Zone: a case study

The Sardinian Blue Zone represents the most extensively studied of the five canonical Blue Zones. It is located in the central-eastern mountainous region of Sardinia, an Italian island in the Mediterranean Sea (Poulain et al., 2004, Fastame et al., 2021). A distinctive feature of the Sardinian Blue Zone is its unusually balanced sex ratio among centenarians: the female-to-male ratio is approximately 2:1, substantially higher than the well-established usual ratio of 5 centenarian females to 1 centenarian male found elsewhere (Ruiu et al., 2022). The inhabitants of this area are historically mainly shepherds, very keen on preserving their local traditions and conducting a very simple lifestyle (Ruiu et al., 2022; Fastame et al., 2021).

The peculiar climatic and cultural features of this zone, including nutrition and lifestyles of the population, are considered shared characteristics favoring extreme longevity (Poulain et al., 2004). The estimated life expectancy in the Blue Zone is longer than in the remaining territory of the island, especially for men, and the male-to-female ratio among centenarians born in this area is 1.35 compared to 2.43 in the rest of Sardinia (Poulain et al., 2004). An alternative hypothesis for this exceptional longevity is that the high rate of inbreeding determined by frequent marriages between consanguineous individuals and low immigration rates have progressively decreased the variability of the genetic pool and facilitated the emergence of genetic characteristics that protect individuals from diseases that are major causes of mortality in older individuals (Poulain et al., 2004).

1.7 The Blue Zones Project: community-level application

Beyond the identification of naturally occurring Blue Zones, the concept has been operationalized into a community health initiative known as the Blue Zones Project (BZP). The BZP adopts specific lifestyle habits shared among longevity hotspots around the world and aims to transform communities through the implementation of policy and environmental changes that can positively impact life expectancy (Lakshmanan et al., 2020). This includes implementation of innovative, evidence-based policies and environmental engineering aimed at improving daily physical movement, dietary patterns, and building purposeful communities (Lakshmanan et al., 2020).

Buettner and Skemp describe how the BZP was piloted in Albert Lea, Minnesota, and subsequently expanded to larger cities, including the Beach Cities of Los Angeles (Buettner & Skemp, 2016). Results from these interventions showed reductions in smoking rates, decreases in BMI, and increases in reported healthy behaviors (Buettner & Skemp, 2016). A study of the Beach Cities of Southern California found that the prevalence of zero coronary artery calcium (CAC)—a marker of ideal cardiovascular health—was significantly higher in these certified Blue Zone communities compared to the rest of California, with significantly lower rates of obesity, smoking, diabetes, and hypertension (Lakshmanan et al., 2020).

1.8 Criticisms and limitations of the Blue Zone concept

The Blue Zone concept has attracted significant criticism. An early and persistent criticism is that in the regions identified as Blue Zones, illiteracy is high and self-reporting of age is far from exact, with population registers being far from perfect Deeg et al., 2024). Newman argued that supercentenarian birthdates are characterized by patterns indicative of widespread fraud and error (Poppel et al., 2025). Lozada-Martínez and Anaya note that many authors arbitrarily and heterogeneously use the term "Blue Zones" without an operational definition, affecting the validity, applicability, and reproducibility of results concerning longevity, centenarians, and healthy ageing (Lozada-Martínez & Anaya, 2024).

Furthermore, Pes et al. caution that the Blue Zones appear to be fragile communities, and it is not possible to predict whether they will continue to exist in the future, as in some of them there are early signs of a decline of their longevity advantage (Pes et al., 2022). In Okinawa, for example, recent decades have witnessed significant alterations in dietary habits and lifestyle, leading to deteriorating health conditions and a reduction in life expectancy, particularly among men—a shift described as moving from a "Blue Zone" to a "Red Zone" (Yamamoto et al., 2025). Deeg et al. emphasize that research on the Blue Zone concept using high-quality data is needed, with a first prerequisite being the existence of a population registry that allows reliable age and vital status ascertainment (Deeg et al., 2024).

1.9 Expanding the Blue Zone concept

Research has explored whether Blue Zones can be identified in regions beyond the five canonical ones. Studies in the Netherlands have identified spatial clusters of high ELI values in both rural isolated areas and urbanized regions, with municipal-level analyses showing that the proportion of Catholics and infant mortality were negatively related with ELI, while the proportion of workers in agriculture was positively related (Poppel et al., 2025). Deeg et al. identified one Dutch municipality satisfying three Blue Zone criteria—more exceptionally longevous inhabitants, higher life expectancy, and a more stable population—though with mixed findings regarding favorable health characteristics (Deeg et al., 2024). A study in Menorca, Spain, however, found no evidence of extreme longevity or a Blue Zone in the investigated area (Soriano et al., 2013). These findings collectively suggest that while the Blue Zone concept has broad applicability, rigorous validation remains essential and not all claimed Blue Zones withstand scientific scrutiny (Poppel et al., 2025; Soriano et al., 2013; Deeg et al., 2024).

2. Economic similarities between Blue Zones and deprived rural areas in Central and Eastern EU countries

2.1 Introduction

The juxtaposition of Blue Zones—regions of exceptional longevity characterized by specific lifestyle, dietary, social, and environmental conditions—with deprived rural areas in Central and Eastern European (CEE) EU member states reveals a set of striking and underappreciated economic parallels. While Blue Zones such as Sardinia's Barbagia region, Okinawa, Nicoya, Ikaria, and Loma Linda are celebrated for their health outcomes, they share with deprived CEE rural areas a number of structural economic characteristics: agricultural dependence, low incomes, geographic peripherality, limited integration into global capital flows, and social cohesion born partly of necessity (Poulain et al., 2004; , Swain, 2016). Understanding these parallels is not merely an academic exercise; it offers a framework for identifying which features of economic marginality may paradoxically support longevity, and which represent genuine barriers to well-being that must be addressed through targeted policy.

This analysis synthesizes evidence from the Blue Zone literature and from the extensive body of research on CEE rural economic development, inequality, and social policy to identify the key economic similarities between these two types of regions, and to reflect on their implications for health, ageing, and regional development policy.

2.2 Agricultural dependence and rural livelihoods

2.2.1 Agriculture as the Economic Backbone

One of the most consistent economic features shared by Blue Zones and deprived rural CEE areas is a **heavy dependence on agriculture as the primary livelihood**. In the canonical Blue Zones, **agricultural activity is not merely an economic necessity but a central mode of physical activity and social organization**. A scoping review of Blue Zone centenarians found that **agricultural activities are the most predominant mode of physical activity**, with Blue Zone centenarians representing significantly high physical functioning and high levels of activity through labouring occupations, outdoor hobbies, and in-home activities (Herbert et al., 2022). In the **Sardinian Blue Zone specifically, the inhabitants are historically mainly shepherds, very keen on preserving their local traditions and conducting a very simple lifestyle** (Ruiu et al., 2022).

In CEE rural areas, agriculture similarly constitutes the dominant economic activity, though it has undergone dramatic transformation since the post-socialist transition. The

Common Agricultural Policy (CAP) of the EU has had a profound and ambiguous impact on Eastern European rurality, resulting in scenarios similar to developments in Western Europe but in a more extreme form, with the weaknesses of the CAP reproduced in the east in a more extreme form (Swain, 2016). The share of the population at risk of poverty is higher in thinly populated areas (21%) compared with intermediate (14%) and densely populated areas (15%), with CAP funding being poorly targeted in CEE (Swain, 2016). This structural dependence on agriculture, combined with inadequate policy support, creates economic conditions in CEE rural areas that bear a strong resemblance to the subsistence-oriented agricultural economies of Blue Zones.

2.2.2 Self-produced food and subsistence agriculture

A key dietary feature of Blue Zone populations is the prevalent consumption of self-produced foods, antioxidant-rich diets, and generally low caloric intake (Pes et al., 2022). This pattern of subsistence food production is also characteristic of deprived rural CEE areas, where **home gardening and local food production have persisted as both economic necessity and cultural practice**. Research in Hungary documents that locally embedded examples of food sovereignty led by local women are highly relevant for understanding civil society development in Central and Eastern Europe, with practices of food sovereignty constituting a conscious choice opposing the common understanding that local food production in CEE is a necessity (Bródy et al., 2023). This parallel between Blue Zone dietary self-sufficiency and CEE rural subsistence agriculture suggests that the economic marginality of both types of regions may inadvertently support health-promoting dietary patterns.

Furthermore, the Polish countryside offers an extensive and unique research potential given that more than half of the country's population lived in rural areas, with nearly 50% of Poles working in agriculture and peasant (family) farms accounting for nearly four-fifths of Poland's agricultural land (Halamska, 2022). This structural feature of CEE rural economies—the persistence of small-scale, family-based agricultural production—mirrors the agricultural organization of Blue Zone communities, where self-produced food and small-scale farming are central to both economic life and dietary patterns (Pes et al., 2022; , Halamska, 2022).

2.3 Low incomes, material deprivation, and poverty

2.3.1 Income levels and poverty rates

Both Blue Zones and deprived rural CEE areas are characterized by relatively low incomes and significant material deprivation. In CEE, income inequality has grown significantly more since the collapse of socialism than previously thought, with the average Gini index of inequality in Eastern Europe approximately 3 percentage points higher than in the rest of Europe (Brzeziński & Sałach, 2022). Bulgaria, Serbia, and Romania are the most unequal by the end of the 2010s, followed by the Baltics, Poland,

Albania, and Croatia (Brzeziński & Sałach, 2022). The share of the population at risk of poverty is systematically higher in rural areas, with thinly populated areas exhibiting poverty rates of 21% compared to 14-15% in more densely populated areas (Swain, 2016).

In Blue Zones, low incomes and material simplicity are similarly characteristic. One emerging theme from the Blue Zone literature is that Blue Zone centenarians had reduced access to food or intake of calories, and many Blue Zone residents lived in an environment that was non-obesogenic but did not produce malnutrition (Littlewood et al., 2025). The economic simplicity of Blue Zone communities—characterized by subsistence agriculture, limited consumer culture, and modest material standards—parallels the material deprivation of CEE rural areas, though with importantly different health outcomes. This paradox suggests that material deprivation per se is not the determining factor in health outcomes; rather, it is the combination of material simplicity with strong social cohesion, physical activity, and dietary quality that produces longevity in Blue Zones (Buettner & Skemp, 2016, Kreouzi et al. 2022).

2.3.2 Energy poverty and material hardship

A specific dimension of material deprivation shared by deprived CEE rural areas is energy poverty—the inability of a household to secure a socially and materially necessitated level of energy services in the home. CEE states have recorded Europe's highest energy poverty levels, with the vulnerability of citizens in countries such as Estonia, Lithuania, Latvia, Poland, Czechia, Slovakia, Hungary, Slovenia, Croatia, Romania, and Bulgaria attributable to the legacies of the centrally planned economy, including poor thermal insulation properties of the housing stock and historically low energy prices (Bouzarovski & Herrero, 2016). The CEE region contains several worst-case scenarios—Bulgaria, Latvia, Lithuania, Croatia, and Romania—where conditions are significantly more difficult than the rest of the EU in terms of high and increasing poverty rates and high and increasing domestic gas and electricity prices (Bouzarovski & Herrero, 2016).

While energy poverty is not a feature explicitly discussed in the Blue Zone literature, the material simplicity and low energy consumption of Blue Zone communities—characterized by traditional housing, limited mechanization, and subsistence lifestyles—represents a structural parallel to the energy poverty of CEE rural areas. Both types of regions are characterized by low-energy, low-consumption lifestyles that, in the case of Blue Zones, are associated with health benefits, and in the case of CEE rural areas, represent a form of involuntary deprivation (Bouzarovski & Herrero, 2016, Pes et al., 2022).

2.4 Geographic peripherality and isolation

2.4.1 Spatial marginality as a shared feature

Geographic peripherality is a defining characteristic of both Blue Zones and deprived rural CEE areas. The original Sardinian Blue Zone was identified in the central-eastern mountainous region of the island, an area characterized by geographic isolation, low immigration rates, and high rates of inbreeding (Poulain et al., 2004). Most of the longevity hotspots identified in various regions of the world have been located in mountainous geographical areas (Poulain et al., 2004). Similarly, the Nicoya Peninsula in Costa Rica and Ikaria in Greece are geographically peripheral regions with limited integration into national and global economic systems (Buettner, 2025).

In CEE, geographic peripherality is a major driver of rural deprivation. One of the most striking features of post-1989 socioeconomic development in CEE has been a rapid increase in regional disparities, with the number of NUTS3 CEE regions with development levels lower than 75% of the respective national average increasing by almost 50% between 2000 and 2008 (Swain, 2016). The spatial impact of foreign capital favors metropolitan and western regions, while the spatial impact of macro-geographical adjustments related to openness and integration into the European economy suggests that the closer to Europe's gravitational center a country is, the greater its potential for attracting higher-order economic functions (Blažek & Netrdová, 2012). This core-periphery dynamic within CEE countries mirrors the geographic marginality of Blue Zones, where isolation from mainstream economic flows has paradoxically preserved traditional lifestyles and social structures associated with longevity.

2.4.2 Socio-spatial polarization

The process of socio-spatial polarization—the concentration of economic development in metropolitan areas at the expense of rural and peripheral regions—is a shared structural feature of CEE countries that parallels the geographic isolation of Blue Zones. In the Baltic States, for example, there is extreme rates of demographic, economic, and social polarization, with strong similarities between Estonia, Latvia, and Lithuania in terms of socio-economic and demographic concentration in the capital regions to the disadvantage of the rest of the country (Lang et al., 2021). The rapid economic transformation in the transition period resulted in a sweeping redistribution of the population from old-industrial and agricultural locations to central and foreign locations offering new jobs and higher salaries (Lang et al., 2021).

This polarization dynamic creates in CEE rural areas a form of involuntary geographic isolation that, while economically disadvantageous, may preserve some of the social and lifestyle characteristics associated with Blue Zone longevity. Substandard living conditions in small towns and the countryside are being debated, with limited access to

health services and health-enhancing services such as multifunctional green spaces, accessible public space, and recreational activities (Lang et al., 2021). The parallel with Blue Zones is instructive: geographic isolation in Blue Zones has preserved traditional lifestyles, while in CEE rural areas, geographic isolation has produced deprivation without the compensating social and lifestyle factors that characterize Blue Zones.

2.5 Limited integration into global capital flows

2.5.1 Foreign Direct Investment (FDI) and economic dependency

Both Blue Zones and deprived rural CEE areas are characterized by limited integration into global capital flows, though for different reasons. In CEE, the mode of accumulation has been very dependent on foreign capital inflows from Western Europe in key sectors, with the exception of Slovenia (Onaran, 2011). The spatial impact of foreign capital favors metropolitan and western regions, creating a dual economy in which export-oriented, high-tech FDI enterprises are concentrated in more developed western regions (Blažek & Netrdová, 2012). Rural and peripheral CEE regions are largely bypassed by FDI flows, remaining dependent on subsistence agriculture and low-productivity activities.

In Blue Zones, limited integration into global capital flows is a structural feature that has preserved traditional economic and social organization. The peculiar climatic and cultural features of Blue Zone areas, including nutrition and lifestyles of the population, are considered shared characteristics favoring extreme longevity (Poulain et al., 2004). The economic simplicity of Blue Zone communities—characterized by limited exposure to global consumer culture, processed food industries, and sedentary work patterns—parallels the limited FDI integration of CEE rural areas, though again with importantly different health outcomes.

2.5.2 The middle-income trap and structural economic challenges

CEE countries face the challenge of the middle-income trap—when wages are not so low anymore to compete with less developed countries, while innovation is not developed enough yet to compete with developed countries (Győrffy, 2021). This structural economic challenge is particularly acute in rural and peripheral CEE regions, where the transition from low-cost, export-oriented growth to innovation-led development has been slow and uneven (Peredy et al., 2022). The CEE countries have been forced to restructure their economies, making a significant shift from the previous export-oriented, foreign capital inflow (FDI) attractive exogenous factors driven economic growth toward the endogenous, innovation and knowledge-based economy driven development (Peredy et al., 2022).

This structural economic challenge has no direct parallel in Blue Zones, which are not integrated into global value chains in the same way. However, the economic

vulnerability of both types of regions—Blue Zones to the erosion of traditional lifestyles by modernization, and CEE rural areas to the pressures of global economic competition—represents a shared structural fragility. The Blue Zones appear to be fragile communities, and it is not possible to predict whether they will continue to exist in the future, as in some of them there are early signs of a decline of their longevity advantage (Pes et al., 2022). In Okinawa, for example, recent decades have witnessed significant alterations in dietary habits and lifestyle, leading to deteriorating health conditions—a shift described as moving from a "Blue Zone" to a "Red Zone" (Yamamoto et al., 2025).

2.6 Social cohesion and community structures

2.6.1 Strong social ties as an economic and health resource

One of the most important economic similarities between Blue Zones and deprived rural CEE areas is the role of strong social ties and community cohesion as both an economic resource and a health-promoting factor. In Blue Zones, common lifestyle characteristics include family engagement, social engagement, and strong community support (Santos et al., 2025). The Blue Zones' Power 9 principles include keeping strong family ties and stimulating strong community support (Kreouzi et al. 2022). Research in the Sardinian Blue Zone has documented that participants reported better mental well-being and satisfaction with family and non-family ties than older people living in urban areas (Fastame et al., 2021).

In CEE rural areas, strong social ties and community cohesion have similarly persisted as both an economic necessity and a cultural tradition. Research in Hungary documents that locally embedded examples of food sovereignty led by local women are highly relevant for understanding civil society development in Central and Eastern Europe, with practices of food sovereignty constituting a conscious choice and a form of community resistance (Bródy et al., 2023). The persistence of family-based agricultural production, mutual aid networks, and community solidarity in CEE rural areas parallels the social cohesion of Blue Zone communities, suggesting that this shared feature may represent a potential foundation for health-promoting interventions.

2.6.2 Social exclusion of the elderly

A critical divergence between Blue Zones and deprived CEE rural areas lies in the treatment of the elderly. In Blue Zones, older adults are integrated into community life, maintain active roles in agricultural and social activities, and benefit from strong intergenerational relationships (Herbert et al., 2022; , Santos et al., 2025). In CEE rural areas, by contrast, the elderly face significant social exclusion. Analysis has shown that elderly in CEE are significantly more excluded than the rest of the population, with the most problematic areas being material deprivation, health, and interpersonal exclusion (Hrast et al., 2013). Furthermore, the exclusion of the elderly in CEE is significantly

higher than in other European countries, further characterized by a much higher difference in the level of exclusion of the elderly than the population in general (Hrast et al., 2013).

This contrast is economically significant: **the social exclusion of the elderly in CEE rural areas represents both a failure of welfare systems and a missed opportunity to leverage the social capital and community knowledge of older adults**. Post-socialist welfare states do not promote inclusion of the elderly to a satisfactory degree, with welfare systems characterized by high levels of turbulence leading to more social exclusion of the population in general and especially of more vulnerable groups such as the elderly (Hrast et al., 2013). **Addressing this exclusion—by integrating older adults into community economic and social life, as is characteristic of Blue Zones—represents a key policy lever for deprived CEE rural areas.**

2.7 Inequality, redistribution, and welfare systems

2.7.1 Income inequality and redistribution failures

Both Blue Zones and deprived CEE rural areas are embedded in broader contexts of income inequality, though the mechanisms differ. In CEE, income inequality has grown significantly since the collapse of socialism, driven initially by privatization, liberalization, and deregulation reforms, and more recently amplified by technological change and globalization coupled with relatively ungenerous income and wealth redistribution policies (Brzeziński & Sałach, 2022). The Baltic countries represent the neoliberal model of capitalism with high pre-tax pre-transfer income inequality, which is also reduced to a relatively small degree by a tax and transfer system (Brzeziński, 2018).

The EU's cohesion policy funds, which were intended to reduce regional inequalities in CEE, have had limited impact on income differentials. The receipt of EU cohesion funds does not affect income differentials, with structural funds more likely to shape the pre-tax-and-transfer income distribution by stimulating economic activity and diverting income streams to particular social groups (Petrova & Lee, 2023). This finding is particularly relevant for deprived CEE rural areas, which have received significant EU funding but have not seen commensurate improvements in income equality or living standards.

2.7.2 Welfare state weaknesses and health outcomes

The weakness of welfare states in CEE countries has significant implications for health outcomes in rural areas. The effect of EU policy and its legal framework on health care in CEE member states has been complex, with the instruments the EU has used to handle the economic crisis somewhat offsetting improvements in health care access (Sokol, 2020). Several CEE member states reported cuts in their health care budgets from the start of the crisis until 2011, including Bulgaria, Croatia, Estonia, Hungary,

Latvia, and Romania, with some cuts amounting to more than 20% of the entire health budget. In terms of per capita health care spending, Romania is at the bottom of the EU, preceded by Bulgaria, Poland, Latvia, Croatia, Hungary, Lithuania, Slovakia, Estonia, and the Czech Republic (Sokol, 2020).

This welfare state weakness contrasts sharply with the health outcomes of Blue Zone populations, where longevity is achieved not through sophisticated healthcare systems but through lifestyle, dietary, and social factors (Buettner & Skemp, 2016, Kreouzi et al. 2022). **The implication is that deprived CEE rural areas cannot rely on healthcare system improvements alone to achieve Blue Zone-like health outcomes; rather, structural changes in lifestyle, diet, social cohesion, and physical activity are required—changes that are more consistent with the Blue Zone model than with the conventional healthcare investment model**.

2.8 Neoliberal policy pressures and their consequences

2.8.1 The neoliberal transformation of CEE rurale economies

The post-socialist transformation of CEE rural economies has been shaped by neoliberal policy prescriptions that have had profound and often negative consequences for rural communities. In post-socialist Central and Eastern Europe, the European Commission acted as an advocate of social and labour market policy change, promoting an almost ideal-typical neoliberal agenda, whose central tenets were fiscal sustainability in pensions and internal devaluation in wage setting (Guardiancich & Borgognoni, 2025). Post-socialist countries in Central and Eastern Europe continued to adopt neoliberal policies, even avant-garde ones—voucher privatization, flat taxes, uncompromising central bank independence, and pension privatization—decades after the transformational recessions were over (Guardiancich & Borgognoni, 2025).

These neoliberal policy pressures have contributed to the polarization of CEE rural economies, with the weaknesses of the CAP reproduced in the east in a more extreme form Swain, 2016; . The existence of polarization and pockets of rural poverty is not unique to CEE but is an inevitable concomitant of rural support that is sector-based, production-oriented, and congruous with neo-liberal principles (Swain, 2016). This structural feature of CEE rural economies—shaped by neoliberal policy prescriptions that prioritize market efficiency over social cohesion and territorial equity—represents a fundamental barrier to achieving Blue Zone-like conditions in these regions.

2.8.2 Labour market flexibilization and its social consequences

The flexibilization of labour markets in CEE countries has had significant social consequences for rural communities. Labour markets in post-transition countries have undergone radical changes, with a shift away from full employment and strong legal protection for employees, with the loosening of employment protection going in parallel

with growing income inequality and widening poverty levels (Lissowska, 2017). The flexibilization of youth transitions in the post-communist half of Europe has thrown young people sharply away from the certainty of previously firmly structured transition patterns into the sea of risks and uncertainties of market-regulated societies (Kovacheva, 2001).

This labour market flexibilization has contributed to rural depopulation and the erosion of the social cohesion that characterizes Blue Zone communities. The rapid economic transformation in the transition period resulted in a sweeping redistribution of the population from old-industrial and agricultural locations to central and foreign locations offering new jobs and higher salaries (Lang et al., 2021). **The resulting demographic decline of CEE rural areas—characterized by youth emigration, ageing populations, and declining agricultural communities—represents a structural challenge that is the inverse of the demographic stability and intergenerational cohesion characteristic of Blue Zones**.

2.9 Sustainability, regional development, and the SDG framework

2.9.1 Sustainability deficits in CEE rural areas

CEE countries, and particularly their rural regions, exhibit significant sustainability deficits across economic, social, environmental, and institutional dimensions. Eastern European and Mediterranean countries perform worse in sustainability assessments, showing major weaknesses especially in the economic and institutional dimensions, with a gap between the countries that joined the Union after 2004 and the other states (Ricciolini et al., 2023). For Bulgaria, the worst performing sub-dimension is productivity and income, recording the last position in the indicators referring to GDP per capita and income. Rural areas and peripheral regions extended in the eastern and southern parts of Romania are those with the poorest outcome in terms of sustainable development performance (Ricciolini et al., 2023).

These sustainability deficits contrast with the implicit sustainability of Blue Zone communities, where traditional agricultural practices, low-consumption lifestyles, and strong social cohesion create conditions that are broadly consistent with sustainable development principles (Buettner & Skemp, 2016, Pes et al., 2022). The identification of Blue Zones provided a new model to test the relationship between dietary habits and health and longevity, with the prevalent consumption of self-produced foods and generally low caloric intake representing a form of ecological sustainability (Pes et al., 2022).

2.9.2 EU Cohesion Policy and regional development

The EU's cohesion policy has been a major instrument for addressing regional disparities in CEE, but its effectiveness in reducing rural deprivation has been limited.

EU programs have reinvigorated declining rural areas in some countries, building infrastructure and generating new employment opportunities, but pervasive corruption surrounding the use of EU funds has limited their redistributive impact (Petrova & Lee, 2023). The enlargement of the EU to Central and Eastern Europe after 2004 was accompanied by great optimism about more dynamic economic development and a general further development of social standards, but the banking and debt crisis that started in 2008 revealed structural shortcomings that disrupted and partly reversed the desired trends (Kohl, 2015).

Much more public investment would be needed to produce equivalent living and working conditions through infrastructural and regional development, intensified training, and further education (Kohl, 2015). This policy prescription aligns with the Blue Zones Project's approach of transforming communities through the implementation of policy and environmental changes that can positively impact life expectancy (Lakshmanan et al., 2020). **The challenge for CEE rural areas is to leverage EU cohesion policy not merely for infrastructure investment but for the kind of holistic community transformation—encompassing lifestyle, diet, social cohesion, and physical activity—that characterizes the Blue Zones Project.**

2.10 Mental health and psychological well-being

2.10.1 Mental health challenges in CEE rural areas

Mental health represents a critical dimension of the economic and social comparison between Blue Zones and deprived CEE rural areas. In CEE, the post-communist legacy is characterized by asylum-like psychiatric hospitals, institutionalization and centralization, a biomedical orientation, marginalization of social and psychological aspects of health, and an authoritarian approach to clinical decision-making (Winkler et al., 2025). Systemic deficiencies include weak public health infrastructure and expertise, non-transparent decision-making, human rights violations, and low mental health literacy including pervasive stigma (Winkler et al., 2025).

This mental health landscape contrasts sharply with the psychological well-being characteristic of Blue Zone populations. Studies in the Sardinian Blue Zone have documented that community-dwelling older adults self-report less depressive signs and better psychological well-being than peers living in comparable areas (Fastame et al., 2021). Participants in the Sardinian Blue Zone reported better mental well-being and satisfaction with family and non-family ties than older people living in urban areas (Fastame et al., 2021). **Psychological resilience and competence are key promoters of successful ageing in Blue Zone populations**, with cultivating a sense of purpose, nurturing social connections, and adopting a healthy lifestyle all contributing to longevity (Zábó et al., 2023).

2.10.2 The role of purpose and social engagement

The contrast in mental health outcomes between **Blue Zones and deprived CEE rural areas reflects deeper differences in social organization and community cohesion**. In Blue Zones, having a purpose in life and strong community support are identified as key longevity factors Kreouzi et al. (2022), Buettner, 2025). **In deprived CEE rural areas, by contrast, social isolation, economic insecurity, and the erosion of traditional community structures have contributed to higher rates of depression and psychological distress** (Hrast et al., 2013; , Lang et al., 2021). The social exclusion of the elderly in CEE is significantly higher than in other European countries, with material deprivation, health, and interpersonal exclusion being the most problematic areas (Hrast et al., 2013).

Addressing this mental health gap—by building the social cohesion, community engagement, and sense of purpose characteristic of Blue Zones—represents a key policy priority for deprived CEE rural areas. The Blue Zones Project's community transformation approach, which works with policy makers, local businesses, schools, and individuals to shape environments, offers a model for **inclusive community development that could be adapted to the CEE rural context** (Buettner & Skemp, 2016).

2.11 Synthesis: key economic similarities and their implications

Drawing together the evidence reviewed above, the key economic similarities between Blue Zones and deprived rural CEE areas can be summarized as follows:

1. **Agricultural dependence**: Both types of regions are characterized by heavy reliance on agriculture as the primary livelihood, with small-scale, family-based farming being the dominant mode of production (Herbert et al., 2022; , Swain, 2016; , Halamska, 2022).
2. **Low incomes and material simplicity**: Both types of regions exhibit relatively low incomes and modest material standards, with Blue Zones characterized by non-obesogenic but non-malnourishing conditions and CEE rural areas by significant material deprivation (Littlewood et al., 2025; , Swain, 2016; , Brzeziński & Sałach, 2022).
3. **Geographic peripherality**: Both types of regions are geographically peripheral, with limited integration into national and global economic systems, and characterized by isolation from mainstream economic flows (Poulain et al., 2004; , Swain, 2016; , Blažek & Netrdová, 2012; , Lang et al., 2021).
4. **Limited FDI integration**: Both types of regions are largely bypassed by foreign direct investment, remaining dependent on traditional economic activities (Blažek & Netrdová, 2012; , Onaran, 2011).

5. **Self-produced food systems**: Both types of regions exhibit patterns of subsistence food production and local food sovereignty, though with different motivations and health outcomes (Pes et al., 2022; , Bródy et al., 2023).
6. **Social cohesion under economic pressure**: Both types of regions have developed strong social ties and community cohesion partly as a response to economic marginality, though the health outcomes of this cohesion differ significantly (Kreouzi et al. 2022, Santos et al., 2025; , Hrast et al., 2013; , Bródy et al., 2023).
7. **Welfare state weaknesses**: Both types of regions are embedded in contexts of inadequate welfare state support, with limited access to healthcare and social services (Sokol, 2020; , Hrast et al., 2013).
8. **Sustainability challenges**: Both types of regions face sustainability challenges, with CEE rural areas exhibiting significant sustainability deficits and Blue Zones facing the erosion of traditional lifestyles by modernization (Pes et al., 2022; , Ricciolini et al., 2023).

The **critical difference** between Blue Zones and deprived CEE rural areas lies not in their economic structures—which are in many respects similar—**but in the social, cultural, and lifestyle factors that transform economic marginality into longevity in Blue Zones, and into deprivation in CEE rural areas**. The Blue Zones' Power 9 principles—moving naturally, eating wisely, improving resilience to stress, getting adequate sleep, keeping strong family ties, stimulating strong community support, respect for the planet, and having a purpose in life (Kreouzi et al. 2022)—represent the missing elements that could transform the economic marginality of CEE rural areas into a foundation for exceptional longevity, if supported by appropriate policy interventions.

3. From deprivation to Blue Zones: strategies for regions with good climate to achieve exceptional longevity

3.1 Introduction: the gap between deprivation and longevity

The contrast between regions characterized by socioeconomic deprivation and those identified as Blue Zones represents one of the most compelling challenges in public health and gerontology. Blue Zones are geographically delimited regions where populations exhibit exceptional longevity, defined by a prevalence of centenarians higher than expected by demography and characterized by a biological age younger than chronological age (Lozada-Martínez & Anaya, 2024). The five canonical Blue Zones—Sardinia (Italy), Okinawa (Japan), Nicoya (Costa Rica), Ikaria (Greece), and Loma Linda (California, USA)—share a set of environmental, lifestyle, dietary, and social characteristics that collectively promote extreme longevity (Buettner, 2025, Santos et al., 2025). A common feature of Blue Zone areas is that they typically exhibit a variety of advantageous features, such as a favourable climate, lower levels of air pollution, and ample space for agricultural activities, thereby promoting exercise and physical well-being (Littlewood et al., 2025).

Yet, favorable climate alone does not guarantee longevity. Socioeconomic deprivation plays a significant role in health disparities, affecting individuals across the life arc, with girls born in the most deprived areas expected to live up to 19 fewer years in good health compared to those in wealthier areas (Littlewood et al., 2025). This review synthesizes evidence on what regions with good climatic conditions but high levels of deprivation can do to transition toward Blue Zone status, drawing on lessons from existing Blue Zones and from urban health, environmental, and social policy research.

3.2 Understanding the Blue Zone Model as a template

3.2.1 Core characteristics of Blue Zones

Before addressing what deprived regions can do, it is essential to understand what makes Blue Zones distinctive. Research has distilled the evidence-based common denominators of Blue Zones into nine commonalities—the "Power 9"—which include moving naturally, eating wisely, improving resilience to stress, getting adequate sleep, keeping strong family ties, stimulating strong community support, respect for the planet, and having a purpose in life (Buettner & Skemp, 2016; , Kreouzi et al., 2022). These principles align closely with the six pillars of Lifestyle Medicine: healthy eating, exercising, avoidance of smoking and other risky substances, stress management, restorative sleep, and forming and maintaining relationships (Kreouzi et al., 2022).

Critically, the Blue Zones Project (BZP) has demonstrated **that these principles can be operationalized at the community level through policy and environmental changes, rather than relying solely on individual behavioral change** (Buettner & Skemp, 2016; . What began as a National Geographic expedition evolved into the discovery of five places around the world where people consistently live over 100 years old, and subsequently into a community transformation initiative (Buettner & Skemp, 2016; . **The BZP has shown that putting the responsibility of curating a healthy environment on an individual does not work, but through policy and environmental changes, communities have been able to increase life expectancy, reduce obesity, and make the healthy choice the easy choice** (Buettner & Skemp, 2016; .

3.2.2 The role of climate and environment

A favorable climate is a necessary but not sufficient condition for Blue Zone status. Blue Zone areas typically exhibit a variety of advantageous features, such as a favourable climate, lower levels of air pollution, and ample space for agricultural activities, thereby promoting exercise and physical well-being Littlewood et al., 2025). In the Sardinian Blue Zone, for example, the mountainous terrain contributes to increased physical and cardiovascular activity, as older inhabitants habitually walk long distances (Fastame et al., 2021). The Nicoya Peninsula in Costa Rica and Ikaria in Greece similarly benefit from mild Mediterranean or tropical climates that facilitate year-round outdoor activity and agricultural production (Buettner, 2025).

However, climate alone does not produce longevity. One emerging theme is that Blue Zone centenarians had reduced access to food or intake of calories, and many Blue Zone residents lived in an environment that was non-obesogenic but did not produce malnutrition (Littlewood et al., 2025). This suggests that the interaction between climate, food systems, physical activity, and social structures is what produces longevity outcomes, not climate in isolation.

3.3 Addressing socioeconomic deprivation as a prerequisite

3.3.1 The Deprivation-Longevity Nexus

Socioeconomic deprivation is a fundamental barrier to achieving Blue Zone-like longevity outcomes. The UK, for example, is experiencing a decline in healthy life expectancy, now at 62.4 years for men and 60.9 years for women, with socioeconomic deprivation playing a significant role in health disparities (Littlewood et al., 2025). Health inequalities are particularly severe for ethnic minorities, with Black and Asian individuals reporting poorer health at a younger age (Littlewood et al., 2025). In old age, 2.1 million older adults live in poverty, with Black and Asian communities again disproportionately affected (Littlewood et al., 2025).

Virtually all factors generating detrimental effects on the quality of ageing—including dietary habits, unhealthy lifestyle, economic deprivation, iniquities and inequalities, and environmental pollution—are modifiable (Ciaula et al., 2021). This is a critical insight: the barriers to longevity posed by deprivation are not immutable, and targeted interventions can address them. The intersection of noncommunicable diseases (NCDs) with socioeconomic deprivation highlights the role of socio-economic deprivation in NCD burden and increased individual vulnerability (Ciaula et al., 2021).

3.3.2 Multidimensional poverty and its spatial dimensions

Deprivation is multidimensional and spatially concentrated. Research in Bhutan demonstrates that multidimensional poverty is disproportionately concentrated in remote mountain districts, where food insecurity, child undernutrition, and systemic exclusion from basic services persist (Rasul, 2025). These vulnerabilities are further compounded by climate change, human–wildlife conflict, and rural–urban migration, resulting in labour shortages and declining agricultural productivity. Spatial inequality compounds these challenges, as remote communities face higher costs of service delivery and weaker institutional reach (Rasul, 2025).

For regions with good climate that aspire to Blue Zone status, addressing these spatial dimensions of deprivation is essential. Policies that work in settled and agricultural communities often do not reflect the ecological or social needs of other communities, and co-production of viable policies with continuous engagement with local communities is necessary for understanding development needs and modes of delivery (Cavanaugh et al., 2024). This co-production approach mirrors the community-centered ethos of the Blue Zones Project (Buettner & Skemp, 2016).

3.4 Lifestyle and behavioral interventions

3.4.1 Promoting natural physical activity

One of the most consistent findings across Blue Zones is the **high level of natural, moderate-intensity physical activity**. A scoping review found that 81% of the activities engaged in by Blue Zone centenarians are of moderate intensity, with agricultural activities being the most predominant mode. Blue Zone centenarians represent significantly high physical functioning and high levels of activity through labouring occupations, outdoor hobbies, and in-home activities. Environmental and cultural influences of each region significantly shape the nature and extent of physical activity (Herbert et al., 2022).

For deprived regions with good climates, this suggests that promoting agricultural livelihoods, outdoor occupations, and active transportation can serve as powerful longevity interventions. Urban planning that enables walkable, mixed-use, and compact neighbourhoods fosters health, makes communities more resilient, and

allows curbing of climate emissions (Lehmann, 2020). Active transport contributes to emissions reductions while increasing physical activity (Duren et al., 2022). Regions with favorable climates are particularly well-positioned to leverage outdoor physical activity as a health intervention, given that year-round outdoor engagement is feasible.

3.4.2 Dietary transformation

Diet is a central pillar of Blue Zone longevity, though the diets adopted in the various Blue Zones are quite different from each other, reflecting different historical backgrounds, cultural traditions, and environmental features (Pes et al., 2022). Common dietary features include the prevalent consumption of self-produced foods, antioxidant-rich diets, and generally low caloric intake (Pes et al., 2022). One emerging theme is that Blue Zone centenarians had reduced access to food or intake of calories, with calorie restriction thought to manipulate ageing by acting as a mild stressor that promotes homeostatic responses (Littlewood et al., 2025).

For deprived regions, improving food security and dietary quality is a prerequisite. Poverty and inequality in Latin America are often coupled with higher exposure to harmful urban environmental features, including obesogenic environments (Duren et al., 2022). Conditional cash transfer programs, such as Brazil's Bolsa Família, have the potential to reduce health inequities and poverty levels, though challenges remain in nutrition inequities (Duren et al., 2022). Regions with good climates can leverage their agricultural potential to promote self-produced, plant-based diets—a key feature of Blue Zone populations—while addressing food insecurity through targeted social protection programs.

3.4.3 Stress reduction and mental health

Psychological resilience and competence are key promoters of successful ageing in Blue Zone populations, with cultivating a sense of purpose, nurturing social connections, and adopting a healthy lifestyle all contributing to longevity (Zábó et al., 2023). Studies in the Sardinian Blue Zone have documented that community-dwelling older adults self-report less depressive signs and better psychological well-being than peers living in comparable areas. Participants in the Sardinian Blue Zone reported better mental well-being and satisfaction with family and non-family ties than older people living in urban areas (Fastame et al., 2021).

Deprivation, by contrast, is associated with higher rates of depression, social isolation, and psychological distress (Littlewood et al., 2025). Addressing mental health in deprived regions requires both individual-level interventions and structural changes that reduce the stressors associated with poverty, insecurity, and social exclusion. The Blue Zones Project's emphasis on community-level environmental engineering—creating spaces and social structures that naturally reduce stress—offers a model for deprived regions (Buettner & Skemp, 2016).

3.5 Environmental and urban planning interventions

3.5.1 Green and Blue Space as health infrastructure

Access to green and blue spaces is a critical environmental determinant of health that is systematically unequal across socioeconomic groups. Blue space is positively associated with health at a population level, including with obesity, all-cause mortality, general health, and mental health (Hunter et al., 2023). Some studies have shown that urban green and blue spaces (UGBS) can contribute to better mental health and reduced stress, particularly in more deprived communities, which can result in substantial healthcare savings. One study showed that every 10% increase in exposure to UGBS translated to a decrease in the number of physical and mental health symptoms, which equated to a reduction of 5 years in age (Hunter et al., 2023).

However, access to quality green space is systematically unequal. Research in Melbourne found a concerning disparity in the quality of greenspace between low- and high-socioeconomic status settings, with a "medium" distinction between the spaces on average. Existing literature has prioritized distribution, proximity, and accessibility domains when assessing inequitable greenspace, revealing that low-SES communities consistently receive lower-quality green space (Ghanem & Edirisinghe, 2023). **For deprived regions with good climates, investing in high-quality, accessible green and blue spaces—particularly in low-SES neighborhoods—represents a powerful lever for improving health outcomes and moving toward Blue Zone conditions.**

New indicators have been proposed, such as the **3-30-300 green space guidance, which stipulates that every citizen should be able to see at least 3 trees from their home, should have 30% tree canopy cover in their neighbourhood, and should not live more than 300 m away from the nearest park or green space** (Hunter et al., 2023). Implementing such standards in deprived regions with favorable climates would be particularly impactful, given that the climate facilitates year-round use of outdoor spaces.

3.5.2 Walkable and active urban design

Urban design that promotes natural movement is a cornerstone of the Blue Zones Project's community transformation approach (Buettner & Skemp, 2016). The BZP adopts specific lifestyle habits shared among longevity hotspots and aims to transform communities through the implementation of policy and environmental changes that can positively impact life expectancy (Lakshmanan et al., 2020). This includes implementation of innovative, evidence-based policies and environmental engineering aimed at improving daily physical movement, dietary patterns, and building purposeful communities (Lakshmanan et al., 2020).

In deprived regions, urban planning that enables walkable, mixed-use, and compact neighbourhoods fosters health, makes communities more resilient, and allows curbing of climate emissions (Lehmann, 2020). The enhancement of public and private transportation is also a frequent strategy in cities, which typically brings good to all and particularly to low-income households (Reckien et al., 2017). Regions with good climates can leverage their environmental advantages to create outdoor spaces, walking paths, cycling infrastructure, and agricultural areas that naturally promote physical activity—mirroring the conditions found in Blue Zones.

3.5.3 Addressing urban heat and environmental inequity

Lower socioeconomic communities are more likely to be situated in urban heat islands and have higher heat exposures than their higher SES counterparts, and this inequality is expected to intensify due to climate change. Research in New York City found widespread disparities in surface temperatures associated with lower neighborhood SES, with specific geographic areas identified for targeted interventions to mitigate heat exposure disparities. These findings underscore the need for targeted policies and community interventions, including equitable urban planning and cooling strategies, to mitigate heat exposure in vulnerable neighborhoods (Sprague et al., 2024).

For regions with good climates aspiring to Blue Zone status, ensuring that the benefits of the climate are equitably distributed is essential. Urban greening programs, tree canopy expansion, and the creation of cool public spaces can mitigate heat disparities while simultaneously providing the green space access associated with better health outcomes (Hunter et al., 2023; , Sprague et al., 2024). However, caution is needed: urban greening programs may end up displacing informal settlements or low-income neighborhoods through processes of green gentrification (Robinson et al., 2022, Blok, 2020). **Without appropriate safeguards, creating green spaces in urban areas can displace deprived populations in favour of more affluent ones** (Robinson et al., 2022). Policies must therefore be designed with equity at their core, ensuring that environmental improvements benefit existing residents rather than displacing them.

3.6 Social and community cohesion

3.6.1 Building social capital and community networks

Social cohesion is a defining feature of Blue Zone communities. Common lifestyle characteristics observed among Blue Zone inhabitants include family engagement, social engagement, less smoking, moderate alcohol intake, regular physical activity, and a plant-based diet (Santos et al., 2025). In Ikaria, Greece, the majority of the oldest old participants reported frequent socializing and extremely low rates of depression (Soriano et al., 2013). The Blue Zones Project's community transformation approach explicitly targets the building of purposeful communities and social networks (Lakshmanan et al., 2020).

For deprived regions, building social capital and reducing isolation are critical. Cities can support the development of social capital and reduce isolation, as social capital is considered "an indicator of community resilience to climate, environmental and public health issues" (Armitage et al., 2023). Social isolation, violence, and extreme poverty create a vicious cycle that impoverishes communities by decreasing the availability of social support and access to social and health services, thus weakening social cohesion (Calandrini et al., 2023). Interventions that strengthen community networks, intergenerational relationships, and civic participation can help deprived regions develop the social infrastructure characteristic of Blue Zones.

3.6.2 Religious and cultural community structures

The role of religious and cultural community structures in promoting longevity is evident in several Blue Zones. The Seventh-day Adventist community in Loma Linda, California, is the only Blue Zone that overtly and intensively promotes a plant-based dietary intake pattern, and the community's religious structure provides a powerful framework for health-promoting behaviors (Santos et al., 2025). Research in the Netherlands found that Blue Zone participants attached higher importance to religion, among other distinguishing characteristics (Deeg et al., 2024).

For deprived regions with good climates, leverageing existing religious and cultural community structures as vehicles for health promotion represents a low-cost, high-impact strategy. Community organizations, religious institutions, and cultural associations can serve as platforms for disseminating Blue Zone principles, promoting healthy dietary practices, facilitating social engagement, and providing psychological support.

3.7 Health system and policy interventions

3.7.1 Integrated health and social policy

Achieving Blue Zone-like longevity outcomes in deprived regions **requires integrated health and social policy that addresses the multiple determinants of health simultaneously**. Siloed policy action across urban sectors that does not take health into account may miss opportunities to promote health while reducing harmful urban health impacts (Duren et al., 2022). The One Health approach advocates for a better understanding, acceptance, and use of a broader and transdisciplinary set of assessment metrics, recognizing the interdependence of human health, animal health, and environmental health (Queenan et al., 2017).

Urban development not only creates job opportunities and wealth for citizens but also presents multifaceted and interactive environment and health interactions. Urban development without the provision of natural green space exacerbates air pollution, reduces opportunities to exercise, and produces subtle negative effects on physical and

mental health (Queenan et al., 2017). For deprived regions, integrating health considerations into urban planning, housing policy, transportation policy, and food systems policy is essential for creating the conditions that support longevity.

3.7.2 Addressing noncommunicable diseases

Noncommunicable diseases (NCDs) are a major barrier to longevity in deprived regions. Virtually all factors generating detrimental effects on the quality of ageing—including dietary habits, unhealthy lifestyle, economic deprivation, iniquities and inequalities, and environmental pollution—are modifiable. The intersection of NCDs with socioeconomic deprivation highlights the role of socio-economic deprivation in NCD burden. Amid policies generally adopted for tackling wrong individual behaviours, the commercial determinants of health and unsustainable industrial productions largely driving unhealthy behaviours are usually ignored (Ciaula et al., 2021).

For deprived regions aspiring to Blue Zone status, addressing NCDs requires both individual-level interventions (promoting healthy diets, physical activity, and smoking cessation) and structural interventions (regulating the food environment, reducing exposure to environmental pollutants, and ensuring access to healthcare). The Blue Zones Project's approach of making the healthy choice the easy choice through environmental engineering offers a model for NCD prevention that does not rely solely on individual willpower (Buettner & Skemp, 2016).

3.7.3 Ecosystem restoration as a health intervention

Ecosystem restoration offers a powerful, nature-based approach to improving health in deprived regions. Restoration-based health interventions, sometimes known as green prescriptions, can encourage education, exercise, and broad lifestyle changes that reduce risk factors for metabolic diseases (Robinson et al., 2022). COVID-19 has emphasised and exacerbated pre-existing environmental inequalities, and interventions should aim to counter these inequalities, particularly in regions that already have high levels of poverty and heavily degraded environments (Robinson et al., 2022).

For regions with good climates, ecosystem restoration can simultaneously improve environmental quality, promote physical activity, enhance food security through agricultural restoration, and strengthen community cohesion. Greening and general improvements to urban built and natural green and blue environments can improve health and quality of life while mitigating greenhouse gas emissions and reducing vulnerability to extreme events (Duren et al., 2022). If these and other public health interventions from ecosystem restoration are to be realised, then urgent policy action is required at all levels, from local government to intergovernmental platforms (Robinson et al., 2022).

3.8 Governance and equity considerations

3.8.1 Equity-centered governance

Achieving Blue Zone-like outcomes in deprived regions requires governance frameworks that explicitly prioritize equity. Climate change impacts, adaptation, and mitigation policies risk not only perpetuating existing inequalities but also creating new ones through processes of maladaptation (Gonçalves et al., 2025). Outcome-based equity relates to the consequences of a policy, action, or developmental trend, while procedural equity refers to impartiality and fairness in the process of delivering and administering justice (Reckien et al., 2020).

For deprived regions, equity-centered governance means ensuring that health-promoting environmental improvements benefit existing residents, that community members have meaningful participation in planning processes, and that the costs and benefits of interventions are fairly distributed (Gonçalves et al., 2025; , Reckien et al., 2020). **The Blue Zones Project's community transformation approach, which works with policy makers, local businesses, schools, and individuals to shape environments, offers a model for inclusive governance** (Buettner & Skemp, 2016).

3.8.2 Avoiding green gentrification

A critical risk in transforming deprived regions with good climates into Blue Zone-like communities is the phenomenon of green gentrification—the displacement of low-income residents as a result of environmental improvements that increase property values (Blok, 2020). Over the past few decades, notions of environmental, ecological, or green gentrification in cities have entered the lexicon of critical urban scholars and activists alike, amidst growing concerns that the current policy and planning emphasis on making cities more sustainable serves in some cases to exacerbate socio-material inequalities in the city via forms of residential displacement (Blok, 2020). Without appropriate safeguards, creating green spaces in urban areas can displace deprived populations in favour of more affluent ones (Robinson et al., 2022).

Policies must therefore be designed with anti-displacement safeguards, including affordable housing protections, community land trusts, and inclusive planning processes that ensure existing residents benefit from environmental improvements (Blok, 2020, Armitage et al., 2023). Anti-sprawl policies are criticized for pushing up housing prices, with subsequent displacement of low-income residents, a process referred to as "environmental gentrification" (Reckien et al., 2017). Addressing these risks is essential for ensuring that the transition from deprivation to Blue Zone status is genuinely inclusive.

3.8.3 Sustainable Development Goals as a framework

The Sustainable Development Goals (SDGs) offer a framework and unique opportunity for integrated approaches to health, environment, and equity (Queenan et al., 2017). The 2030 Agenda for Sustainable Development is a plan of action for people, planet, and prosperity, with countries and all stakeholders acting in collaborative partnership to implement this plan (Secretariat, 2017). SDG 3 (Good Health and Well-Being), SDG 11 (Sustainable Cities and Communities), and SDG 1 (No Poverty) are particularly relevant for deprived regions aspiring to Blue Zone status.

Ways in which green spaces and nature are integrated in the community, the ability to care for parts of cities and human settlements, and awareness of the importance of sustaining the natural environment are all identified as key elements of sustainable urban development (Secretariat, 2017). For deprived regions with good climates, aligning Blue Zone transformation strategies with the SDGs provides a coherent policy framework that can attract international support and investment.

3.9 Synthesis: a roadmap from deprivation to Blue Zone

Drawing together the evidence reviewed above, a roadmap for deprived regions with good climates to achieve Blue Zone-like longevity outcomes can be articulated across several interconnected domains:

1. **Address multidimensional poverty** through targeted social protection programs, conditional cash transfers, and investment in basic services, recognizing that deprivation is a fundamental barrier to longevity (Duren et al., 2022, Littlewood et al., 2025, Rasul, 2025).
2. **Promote natural physical activity** through agricultural livelihoods, permaculture, walkable urban design, active transportation infrastructure, and outdoor recreational spaces that leverage the favorable climate (Buettner & Skemp, 2016; , Herbert et al., 2022; , Lehmann, 2020).
3. **Transform food environments** to promote self-produced, plant-based, antioxidant-rich diets while addressing food insecurity and obesogenic environments (Pes et al., 2022; , Santos et al., 2025; , Littlewood et al., 2025).
4. **Invest in high-quality, equitably distributed green and blue spaces** that provide health benefits to all residents, particularly those in low-SES communities, while implementing anti-displacement safeguards (Ghanem & Edirisinghe, 2023, Hunter et al., 2023, Robinson et al., 2022, Blok, 2020).
5. **Build social capital and community cohesion** through community organizations, religious institutions, cultural associations, and intergenerational

programs that foster the social engagement characteristic of Blue Zones (Buettner & Skemp, 2016, Santos et al., 2025, Armitage et al., 2023).

6. **Implement integrated health and social policy** that addresses NCDs, mental health, and the social determinants of health simultaneously, rather than through siloed sectoral approaches (Duren et al., 2022, Queenan et al., 2017, Ciaula et al., 2021).
7. **Adopt equity-centered governance** that ensures community participation in planning processes, fair distribution of costs and benefits, and protection of existing residents from displacement (Gonçalves et al., 2025, Reckien et al., 2020, Blok, 2020).
8. **Leverage ecosystem restoration** as a nature-based health intervention that simultaneously improves environmental quality, promotes physical activity, enhances food security, and strengthens community cohesion (Robinson et al., 2022).
9. **Align with the SDGs** to provide a coherent policy framework that attracts international support and ensures that Blue Zone transformation is sustainable and inclusive (Queenan et al., 2017, Secretariat, 2017).

3.10 Conclusion

The transition from deprivation to Blue Zone status is neither simple nor automatic, even in regions with favorable climates. Climate is a necessary but not sufficient condition for exceptional longevity. The evidence from existing Blue Zones demonstrates that longevity ensues from the right environment—an ecosystem of factors that make the healthy choices both easy and unconscious (Buettner, 2025). **For deprived regions, achieving this ecosystem requires addressing the structural determinants of health, investing in equitable environmental infrastructure, building social cohesion, and implementing integrated, equity-centered governance.** The Blue Zones Project's demonstration that community-level environmental engineering can produce measurable improvements in health outcomes—including reductions in smoking rates, decreases in BMI, and higher prevalence of zero coronary artery calcium—provides proof of concept that such transformation is achievable (Buettner & Skemp, 2016, Lakshmanan et al., 2020). The challenge for deprived regions with good climates is to harness these lessons while ensuring that the benefits of transformation are equitably shared among all residents.

Conclusion: from periphery to resource – a European perspective on Conscious, Active Ageing, Longevity and structural renewal

This study began with a paradox. Regions characterized by economic marginality, agricultural dependence, geographic peripherality, and modest material standards can, under certain conditions, become environments of exceptional longevity. The research on Blue Zones demonstrates that long and healthy lives are not necessarily the product of wealth, technological intensity, or highly medicalized systems. Rather, they emerge from the interaction of social cohesion, embedded lifestyles, environmental conditions, and community-oriented governance.

When these insights are placed alongside the structural realities of rural Central and Eastern Europe (CEE), a new perspective becomes possible. Many deprived CEE regions share several structural characteristics with canonical Blue Zones: small-scale agriculture, local food production, walkable settlements, modest consumption patterns, and strong—though often strained—community ties. Yet instead of longevity advantages, these regions often experience social exclusion, welfare weaknesses, outmigration, and demographic ageing framed as decline.

The key lesson is not that CEE rural areas are already Blue Zones, but that they contain underrecognized structural assets that, if supported by coherent policy, could contribute to a broader European strategy for healthy ageing, sustainability, and social resilience.

Reframing Europe's East–West Narrative

For much of modern European history, development narratives have followed a linear West-to-East gradient. Western Europe industrialized earlier, accumulated capital, consolidated welfare states, and achieved higher income levels. Central and Eastern Europe, shaped by different political and economic trajectories, has frequently been positioned as "catching up," "converging," or "lagging behind."

However, the polycrises confronting Europe today—demographic ageing, climate instability, housing affordability pressures, care shortages, mental health challenges, and territorial polarization—are transforming the very criteria by which advancement is measured. In a context where overconsumption, sedentary lifestyles, environmental degradation, and hyper-individualization undermine health and cohesion, some structural characteristics long considered signs of backwardness may reveal adaptive value.

Good climatic conditions in many CEE regions, available land, comparatively affordable housing, preserved small-scale agricultural knowledge, permaculture practices, lower-

consumption mobility patterns, and still-existing intergenerational and community-based social structures represent assets in a Europe seeking sustainable and health-promoting development pathways. What was once interpreted as peripheral simplicity may now offer components of systemic resilience.

This shift does not romanticize deprivation. Poverty, welfare weaknesses, and social exclusion remain serious structural challenges. But it does suggest that the future of European cohesion cannot be built solely on transferring capital from West to East, nor on replicating Western urban-industrial development models everywhere. Instead, it requires recognizing the diversity of European territories as a strategic resource.

European diversity as a strategic asset

The European Union was built not only as a single market but as a community of diverse social, cultural, and territorial systems. This diversity is often treated as an administrative challenge. Yet in the context of demographic and ecological transformation, it becomes a source of innovation.

Western European countries currently face acute care workforce shortages, high housing prices, growing social isolation, and rising lifestyle-related noncommunicable diseases. At the same time, parts of Central and Eastern Europe struggle with depopulation, underutilized land, ageing housing stock, and outward labour migration. These dynamics are deeply interconnected: care migration from East to West sustains Western welfare systems while accelerating demographic imbalance in CEE regions.

A forward-looking European strategy would not reinforce this asymmetry but rebalance it through cooperation grounded in mutual benefit. CEE regions can serve not merely as labour reservoirs but as laboratories for integrated ageing strategies, sustainable food systems, low-consumption mobility models, and community-based living arrangements. Western European partners, in turn, bring institutional capacity, research infrastructure, financial instruments, and policy innovation that can support structural upgrading without eroding local strengths.

In this sense, CEE should be understood as a European resource—not in extractive terms, but as a foundational space for developing territorial responses to Europe's polycrises.

From the Care Crisis to Longevity Strategy

Ageing is often framed as a burden on pension systems and healthcare budgets. This study has argued for a different framing: ageing as an opportunity to redesign social and spatial systems around longevity, resilience, and intergenerational cohesion.

The Blue Zone framework demonstrates that healthy ageing is deeply embedded in everyday environments. Walkable communities, meaningful roles for older adults,

strong family and community ties, plant-based and locally produced diets, and natural physical activity are not high-cost medical interventions. They are features of social organization and spatial design.

Many CEE rural regions already possess elements of this embeddedness:

- compact settlement structures,
- traditions of subsistence or small-scale agriculture,
- informal mutual support networks,
- lower dependence on car-based mobility in some areas,
- cultural practices emphasizing intergenerational proximity.

With targeted investments—modernized infrastructure, accessible healthcare, digital connectivity, sustainable housing renovation, and inclusive governance—these features can be strengthened rather than replaced.

At EU level, cohesion policy, rural development funds, climate transition instruments, and social innovation programs could explicitly integrate longevity-oriented territorial strategies. Instead of measuring success solely through GDP convergence, European policy could incorporate indicators of healthy life expectancy, social cohesion, access to green space, and community participation.

Housing, land, and territorial renewal

Europe's housing crisis is concentrated in high-demand metropolitan areas. Meanwhile, many CEE rural and small-town areas face underused housing stock and affordable property prices. Climate-resilient settlement strategies, remote and hybrid work models, and digital infrastructure expansion open new possibilities for territorial redistribution.

If supported by EU-level coordination, regions with available land and moderate climates could attract intergenerational living models, cooperative housing projects, agro-ecological initiatives, and climate-adaptive community developments. Such initiatives could address multiple crises simultaneously: housing affordability, rural depopulation, mental health, food security, and ageing.

This does not imply large-scale relocation policies, but rather the creation of enabling frameworks that allow voluntary mobility, circular migration, and new forms of rural-urban connectivity.

Avoiding romanticization and ensuring equity

Recognizing CEE as a European resource must not obscure structural inequalities. Welfare state weaknesses, energy poverty, limited healthcare funding, and social

exclusion of the elderly remain pressing concerns. Any strategy based on leveraging regional assets must be equity-centered and participatory.

Transformation should avoid green gentrification, speculative land acquisition, and displacement of local populations. It must ensure that environmental and infrastructural improvements benefit existing residents and strengthen local capacity.

The lesson from the Blue Zones Project is that community transformation is most effective when policy, environment, and local participation align. European-level support can provide scale and coordination, but legitimacy and sustainability require local ownership.

Toward a European Conscious Ageing Alliance

The future of Europe's demographic transition will not be secured by isolated national responses. It requires an integrated European longevity strategy that recognizes territorial diversity and encourages cross-regional learning.

Western Europe's institutional maturity and financial capacity, combined with CEE's climatic advantages, land availability, agricultural traditions, and still-embedded community structures, create the potential for a new East–West partnership paradigm.

Instead of a one-directional model of modernization, Europe can move toward a reciprocal model of mutual adaptation:

- Western regions learning from low-consumption, community-based practices,
- Eastern regions supported in upgrading infrastructure and social services without losing structural strengths,
- Joint research on sustainable ageing environments,
- Coordinated territorial policies linking active ageing, circular economy, short supply chains, organic food production, housing, health, and climate adaptation.

In this framework, Central and Eastern Europe becomes not the periphery of Europe's development story, but a central arena for experimenting with resilient responses to demographic and ecological transformation.

Final reflection

This study has shown that the boundary between deprivation and longevity is not determined by income alone. It is shaped by how material conditions interact with social cohesion, lifestyle practices, governance, and environment. Blue Zones demonstrate what is possible when these elements align. CEE rural regions

demonstrate how similar structural foundations can produce divergent outcomes under different policy and social contexts.

The challenge, and opportunity, for the European Union is to consciously align these structural foundations with inclusive, sustainability-oriented governance. By recognizing the assets embedded in CEE territories and integrating them into EU-wide strategies, Europe can transform perceived peripheries into pillars of resilience.

In an era defined by polycrisis, the future of European cohesion will depend less on uniformity and more on the intelligent mobilization of diversity. Central and Eastern Europe is not merely catching up. It is, potentially, helping to redefine what sustainable and healthy development in Europe can mean.

References

Armitage, A., Doyon, A., Madénian, H., & Neste, S. (2023). Approaches to Equity and Justice in Urban Climate Plans: A Comparison of Vancouver and Montreal., 149-172. https://doi.org/10.1515/9782766300839-008

Benedetto, G. and Carboni, D. (2023). The Health effects of wine: The case of longevity in Sardinia. Bio Web of Conferences, 56, 04004. https://doi.org/10.1051/bioconf/20235604004

Blažek, J. and Netrdová, P. (2012). Regional unemployment impacts of the global financial crisis in the new member states of the EU in Central and Eastern Europe. European Urban and Regional Studies, 19(1), 42-61. https://doi.org/10.1177/0969776411428650

Blok, A. (2020). Urban green gentrification in an unequal world of climate change. Urban Studies, 57(14), 2803-2816. https://doi.org/10.1177/0042098019891050

Bouzarovski, S. and Herrero, S. (2016). The energy divide: Integrating energy transitions, regional inequalities and poverty trends in the European Union. European Urban and Regional Studies, 24(1), 69-86. https://doi.org/10.1177/0969776415596449

Bródy, L., Farkas, J., Gál, I., Milánkovics, K., Nagy, E., & Sági, M. (2023). Local food as resistance: Integrating women's experiences in the Hungarian food sovereignty movement. Intersections, 9(4), 141-158. https://doi.org/10.17356/ieejsp.v9i4.1142

Brzeziński, M. (2018). Income inequality and the Great Recession in Central and Eastern Europe. Economic Systems, 42(2), 219-247. https://doi.org/10.1016/j.ecosys.2017.07.003

Brzeziński, M. and Sałach, K. (2022). Determinants of inequality in transition countries. Iza World of Labor. https://doi.org/10.15185/izawol.496

Buettner, D. (2025). Lessons From the Blue Zones: There is No Silver Bullet (or Magic Pill) for a Long, Healthy Life. American Journal of Lifestyle Medicine, 19(7), 1052-1062. https://doi.org/10.1177/15598276251334310

Buettner, D. and Skemp, S. (2016). Blue Zones. American Journal of Lifestyle Medicine, 10(5), 318-321. https://doi.org/10.1177/1559827616637066

Calandrini, E., Paglione, L., Bargagli, A., Agabiti, N., Battisti, A., Salvatori, L., ... & Cacciani, L. (2023). Does Urbanization Correlate with Health Service Assistance? an Observational Study in Rome, Italy., 95-111. https://doi.org/10.1007/978-3-031-16182-7_6

Cavanaugh, A., Bixby, H., Mangwani, S., Agyei-Mensah, S., Awuni, C., Baumgartner, J., ... & Robinson, B. (2024). From consumption to context: assessing poverty and inequality across diverse socio-ecological systems in Ghana. Environmental Research Communications, 6(9), 091009. https://doi.org/10.1088/2515-7620/ad76ff

Ciaula, A., Krawczyk, M., Filipiak, K., Geier, A., Bonfrate, L., & Portincasa, P. (2021). Noncommunicable diseases, climate change and iniquities: What COVID-19 has taught us about syndemic. European Journal of Clinical Investigation, 51(12). https://doi.org/10.1111/eci.13682

Davinelli, S., Willcox, D., & Scapagnini, G. (2012). Extending healthy ageing: nutrient sensitive pathway and centenarian population. Immunity & Ageing, 9(1). https://doi.org/10.1186/1742-4933-9-9

Deeg, D., Tilburg, T., Visser, M., Braam, A., Stringa, N., & Timmermans, E. (2024). Identification of a “Blue Zone” in the Netherlands: A Genetic, Personal, Sociocultural, and Environmental Profile. The Gerontologist, 64(11). https://doi.org/10.1093/geront/gnae132

Duren, N., Benítez, B., Bonilla, J., Regalía, F., Bilal, U., Ibáñez, A., ... & Martínez-Herrera, E. (2022). Inclusive Cities: Healthy Cities for All.. https://doi.org/10.18235/0004459

Fastame, M., Mulas, I., & Pau, M. (2021). Mental health and motor efficiency of older adults living in the Sardinia’s Blue Zone: a follow-up study. International Psychogeriatrics, 33(12), 1277-1288. https://doi.org/10.1017/s1041610220001659

Fastame, M., Ruiu, M., & Mulas, I. (2021). Hedonic and Eudaimonic Well-Being in Late Adulthood: Lessons From Sardinia’s Blue Zone. Journal of Happiness Studies, 23(2), 713-726. https://doi.org/10.1007/s10902-021-00420-2

Firpo-Cappiello, R. (2024). Longevity Secrets. Brain & Life, 20(1), 14-18. https://doi.org/10.1097/01.nnn.0001007084.94134.dd

Ghanem, A. and Edirisinghe, R. (2023). Socio-economic disparities in greenspace quality: insights from the city of Melbourne. Smart and Sustainable Built Environment, 13(2), 309-329. https://doi.org/10.1108/sasbe-11-2022-0247

Gonçalves, J., Narendra, N., & Verma, T. (2025). Everything about climate change is disproportionate: Principles for spatial justice in urban climate action. Geo Geography and Environment, 12(2). https://doi.org/10.1002/geo2.70024

Govindaraju, D., Atzmon, G., & Barzilai, N. (2015). Genetics, lifestyle and longevity: Lessons from centenarians. Applied & Translational Genomics, 4, 23-32. https://doi.org/10.1016/j.atg.2015.01.001

Guardiancich, I. and Borgognoni, E. (2025). The post-socialist neoliberal agenda through the prism of Europeanization in social and labour market policy. Journal of European Social Policy. https://doi.org/10.1177/09589287251331577

Győrffy, D. (2021). The middle-income trap in Central and Eastern Europe in the 2010s: institutions and divergent growth models. Comparative European Politics, 20(1), 90-113. https://doi.org/10.1057/s41295-021-00264-3

Halamska, M. (2022). Fifty years of rural and agricultural research. The Institute of Rural and Agricultural Development at the Polish Academy of Sciences (1971–2022). Eastern European Countryside, 28(1), 155-177. https://doi.org/10.12775/eec.2022.007

Herbert, C., House, M., Dietzman, R., Climstein, M., Furness, J., & Kemp-Smith, K. (2022). Blue Zones: Centenarian Modes of Physical Activity: A Scoping Review. Journal of Population Ageing, 18(1), 5-41. https://doi.org/10.1007/s12062-022-09396-0

Hrast, M., Mrak, A., & Rakar, T. (2013). Social exclusion of elderly in Central and Eastern Europe. International Journal of Social Economics, 40(11), 971-989. https://doi.org/10.1108/ijse-05-2012-0082

Hunter, R., Nieuwenhuijsen, M., Fabian, C., Murphy, N., O'Hara, K., Rappe, E., ... & Kahlmeier, S. (2023). Advancing urban green and blue space contributions to public health. The Lancet Public Health, 8(9), e735-e742. https://doi.org/10.1016/s2468-2667(23)00156-1

Kohl, H. (2015). Convergence and divergence – 10 years since EU enlargement. Transfer European Review of Labour and Research, 21(3), 285-311. https://doi.org/10.1177/1024258915585939

Kovacheva, S. (2001). Flexibilisation of youth transitions in Central and Eastern Europe. Young, 9(1), 41-60. https://doi.org/10.1177/110330880100900104

Kreouzi, M., Theodorakis, N., & Constantinou, C. (2022). Lessons Learned From Blue Zones, Lifestyle Medicine Pillars and Beyond: An Update on the Contributions of Behavior and Genetics to Wellbeing and Longevity. American Journal of Lifestyle Medicine, 18(6), 750-765. https://doi.org/10.1177/15598276221118494

Lakshmanan, S., Kinninger, A., Golub, I., Dahal, S., Birudaraju, D., Ahmad, K., ... & Budoff, M. (2020). 20-Year trend of high prevalence of zero coronary artery calcium in beach cities of Southern California: A blue zone?. American Journal of Preventive Cardiology, 4, 100098. https://doi.org/10.1016/j.ajpc.2020.100098

Lang, T., Burneika, D., Noorkõiv, R., Plüschke-Altof, B., Pociūtė-Sereikienė, G., & Sechi, G. (2021). Socio-spatial polarisation and policy response: Perspectives for regional development in the Baltic States. European Urban and Regional Studies, 29(1), 21-44. https://doi.org/10.1177/09697764211023553

Lehmann, S. (2020). The unplanned city: public space and the spatial character of urban informality. Emerald Open Research, 1(5). https://doi.org/10.1108/eor-05-2023-0007

Lissowska, M. (2017). The financial crisis and changing labour markets in post-transition countries. European Journal of Industrial Relations, 23(1), 17-32. https://doi.org/10.1177/0959680116685490

Littlewood, K., Gegic, J., Hickman, M., Henson, R., Bishop, J., Kershaw, T., ... & Henson, S. (2025). Metabolic dysfunction over a life course key to healthy ageing inequality. Ageing Clinical and Experimental Research, 37(1). https://doi.org/10.1007/s40520-025-03034-3

Lozada-Martínez, I. and Anaya, J. (2024). What are blue zones? An argument in favor of its definition based on the most successful model of biological ageing. Ageing Medicine, 7(4), 446-448. https://doi.org/10.1002/agm2.12343

Lozada-Martínez, I., Lozada-Martinez, L., & Anaya, J. (2024). Gut microbiota in centenarians: A potential metabolic and ageing regulator in the study of extreme longevity. Ageing Medicine, 7(3), 406-413. https://doi.org/10.1002/agm2.12336

Melis, M., Errigo, A., Crnjar, R., Pes, G., & Barbarossa, I. (2019). TAS2R38 bitter taste receptor and attainment of exceptional longevity. Scientific Reports, 9(1). https://doi.org/10.1038/s41598-019-54604-1

Onaran, Ö. (2011). From transition crisis to the global crisis: Twenty years of capitalism and labour in the Central and Eastern EU new member states. Capital & Class, 35(2), 213-231. https://doi.org/10.1177/0309816811402648

Peredy, Z., Laki, B., & Péli, L. (2022). Lessons learnt from past economic growth patterns and regional disparities in Central and Eastern European countries. Studia Mundi - Economica, 9(2), 71-89. https://doi.org/10.18531/studia.mundi.2022.09.02.71-89

Pes, G., Dore, M., Tsofliou, F., & Poulain, M. (2022). Diet and longevity in the Blue Zones: A set-and-forget issue?. Maturitas, 164, 31-37. https://doi.org/10.1016/j.maturitas.2022.06.004

Petrova, B. and Lee, A. (2023). The effect of European integration on economic redistribution in Central and Eastern Europe. European Union Politics, 25(1), 17-41. https://doi.org/10.1177/14651165231210943

Poppel, F., Ekamper, P., & Stoeldraijer, L. (2025). Regional Differences in the Chance to Become a Centenarian in Nineteenth and Early Twentieth Century Dutch Birth Cohorts. Population Space and Place, 31(7). https://doi.org/10.1002/psp.70101

Poulain, M., Pes, G., Grasland, C., Carru, C., Ferrucci, L., Baggio, G., ... & Deiana, L. (2004). Identification of a geographic area characterized by extreme longevity in the

Sardinia island: the AKEA study. Experimental Gerontology, 39(9), 1423-1429. https://doi.org/10.1016/j.exger.2004.06.016

Poulain, M., Pes, G., Grasland, C., Carru, C., Ferrucci, L., Baggio, G., ... & Deiana, L. (2004). Identification of a geographic area characterized by extreme longevity in the Sardinia island: the AKEA study. Experimental Gerontology, 39(9), 1423-1429. https://doi.org/10.1016/j.exger.2004.06.016

Queenan, K., Garnier, J., Nielsen, L., Buttiġieġ, S., Meneghi, D., Holmberg, M., ... & Kock, R. (2017). Roadmap to a One Health agenda 2030.. Cabi Reviews, 1-17. https://doi.org/10.1079/pavsnnr201712014

Rasul, G. (2025). Poverty and Deprivation in Bhutan's Mountains: Spatial Patterns, Structural Challenges, and Policy Responses. Poverty & Public Policy, 17(4). https://doi.org/10.1002/pop4.70046

Reckien, D., Creutzig, F., Fernandez, B., Lwasa, S., Tovar-Restrepo, M., McEvoy, D., ... & Satterthwaite, D. (2017). Climate change, equity and the Sustainable Development Goals: an urban perspective. Environment and Urbanization, 29(1), 159-182. https://doi.org/10.1177/0956247816677778

Reckien, D., Lwasa, S., Satterthwaite, D., McEvoy, D., Creutzig, F., Montgomery, M., ... & Bautista, E. Equity, Environmental Justice, and Urban Climate Change., 173-224. https://doi.org/10.1017/9781316563878.013

Ricciolini, E., Tiralti, A., Paolotti, L., Rocchi, L., & Boggia, A. (2023). Sustainable development according to 2030 agenda in European Union countries: Evidence of the enlargement policy. Sustainable Development, 32(3), 1894-1912. https://doi.org/10.1002/sd.2758

Robinson, J., Aronson, J., Daniels, C., Goodwin, N., Liddicoat, C., Orlando, L., ... & Breed, M. (2022). Ecosystem restoration is integral to humanity's recovery from COVID-19. The Lancet Planetary Health, 6(9), e769-e773. https://doi.org/10.1016/s2542-5196(22)00171-1

Ruiu, M., Carta, V., Deiana, C., & Fastame, M. (2022). Is the Sardinian Blue Zone the New Shangri-La for mental health? Evidence on depressive symptoms and its correlates in late adult life span. Ageing Clinical and Experimental Research, 34(6), 1315-1322. https://doi.org/10.1007/s40520-021-02068-7

Santos, H., Alabadi-Bierman, A., Paalani, M., Padilla, S., Alvarez, A., Beeson, W., ... & Fraser, G. (2025). Living longer and lifestyle: A report on the oldest of the old in the Adventist Health Study-2. Journal of Ageing Research and Lifestyle, 14, 100010. https://doi.org/10.1016/j.jarlif.2025.100010

Secretariat, C. (2017). Curriculum Framework for the Sustainable Development Goals.. https://doi.org/10.14217/comsec.1064

Sokol, T. (2020). The Effect of EU Integration on Health Care in Central and Eastern Europe. Journal of Health Politics Policy and Law, 46(1), 147-175. https://doi.org/10.1215/03616878-8706651

Soriano, J., Vázquez, S., Carretero, S., González, M., Soriano, C., Romaguera, D., ... & Poulain, M. (2013). Description of extreme longevity in the Balearic Islands: Exploring a potential Blue Zone in Menorca, Spain. Geriatrics and Gerontology International, 14(3), 620-627. https://doi.org/10.1111/ggi.12148

Sprague, N., Uong, S., Kelsall, N., Jacobowitz, A., Quinn, J., Keyes, K., ... & Rundle, A. (2024). Using geographic effect measure modification to examine socioeconomic-related surface temperature disparities in New York City. Journal of Exposure Science & Environmental Epidemiology, 35(5), 792-801. https://doi.org/10.1038/s41370-024-00714-6

Swain, N. (2016). Eastern European Rurality in a Neo-Liberal, European Union World. Sociologia Ruralis, 56(4), 574-596. https://doi.org/10.1111/soru.12131

Winkler, P., Guerrero, Z., Kågström, A., Petrášová, M., Pashoja, A., Qirjako, G., ... & Thornicroft, G. (2025). Mental health in Central and Eastern Europe: a comprehensive analysis. The Lancet Regional Health - Europe, 57, 101464. https://doi.org/10.1016/j.lanepe.2025.101464

Yamamoto, S., Arai, Y., Kosaka, T., Matsumoto, M., Yamada, R., Yoshikawa, T., ... & Yanagita, M. (2025). Healthy ageing and ageing-related kidney diseases: lessons from centenarians. Clinical Kidney Journal, 18(Supplement_2), ii1-ii9. https://doi.org/10.1093/ckj/sfaf284

Zábó, V., Csiszár, A., Ungvári, Z., & Purebl, G. (2023). Psychological resilience and competence: key promoters of successful ageing and flourishing in late life. Geroscience, 45(5), 3045-3058. https://doi.org/10.1007/s11357-023-00856-9