



Citation: Lazzarini, G., & Lucia, M.G. (2024) Demographic aging: challenges and opportunities for ecological transition. *Journal of Emerging Perspectives* 1: 77-83. doi: 10.36253/jep-16902

Received: September 12, 2024

Revised: October 11, 2024

Published: December 16, 2024

© 2024 Author(s). This is an open access, peer-reviewed article published by Firenze University Press (<https://www.fupress.com>) and distributed, except where otherwise noted, under the terms of the CC BY 4.0 License for content and CC0 1.0 Universal for metadata.

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Competing Interests: The Author(s) declare(s) no conflict of interest.

ORCID

MGL: 0000-0002-9582-6010

Case Studies

Demographic aging: challenges and opportunities for ecological transition

GUIDO LAZZARINI¹, MARIA GIUSEPPINA LUCIA^{2,*}

¹ *Infermieristica, University of Turin, Italy*

² *Department of Management, University of Turin, Italy*

E-mail: guido.lazzarini@unito.it; mariagiuseppina.lucia@unito.it

*Corresponding author.

Abstract. The literature on the ecological transition often overlooks the relationship with demographic aging. Thus, it is crucial to address this issue because achieving sustainability requires not only environmental regeneration but also the inclusion of the elderly, who currently represent a significant segment of the global population. In the light of these changes, sustainability goals must consider challenges posed by an aging population within ecological transition policies. This paper aims to examine how social policies and environmental programs can be integrated to meet the needs of an aging demographic while fostering sustainability. To tackle these themes, we will analyse the specific challenges related to demographic aging in the context of the ecological transition, followed by the discussion on the opportunities that the elderly can provide.

Keywords: ecological transition, demographic aging, sustainability, social policies, elderly inclusion.

1. INTRODUCTION

The extensive body of literature on the ecological transition process mainly focuses on the issues surrounding changes in production and consumption systems to attain climate neutrality, somewhat less emphasis is placed on its connection with demographic aging. It is crucial to address this topic as attaining sustainability requires not just environmental regeneration but also the integration of principles of social justice and inclusivity of all people (Wang & Lo, 2021), especially for the elderly who are increasingly becoming a larger share of the global population. Present demographic trends outline a significant shift in population structure characterized by an aging demographic, as the base of the age pyramid narrows, due to the declining birth rates. According to estimates from the United Nations Department of Economic and Social Affairs (UNDESA), individuals aged 65 and over will constitute 17% of the total population by 2050. Furthermore, life expectancy is projected to increase, with estimates at 75 years for men and 79 years for women, attributed to advancements in medicine, healthier lifestyles, and better education. Currently, approximately 10% of the global

population is already over 65, with countries like Japan (around 30%) and Italy (23%) leading in these percentages, followed by Portugal, Greece, and Finland. Regions like Sub-Saharan Africa and Oceania (excluding Australia and New Zealand) are still in the early stages of this demographic change, while nations in Central and South Asia, Western Asia, Northern Africa, Latin America, and the Caribbean are encountering intermediate phases (UNDESA, 2023).

These demographic trends pose a major challenge for economic growth, tax frameworks, retirement and welfare systems with rising healthcare costs, potentially undermining investments in ecological transition (Peterson, 2017).

The situation in the European Union exemplifies the difficulty of balancing investments in ecological transition with social policies. Recent forecasts estimate that the costs associated with aging will rise by 1.4% (pps) between 2019 and 2030 and by 2.5% points (pps) by 2050. At the same time implementing the EU Green Deal is projected to cost approximately 520 billion euros per year from 2021 to 2030 (European Environment Agency, 2023). Thus, policymakers face the critical challenge of finding an appropriate balance between funding social policies and supporting ecological transition efforts.

To achieve these goals, it is essential to reframe our perspectives of the elderly population, not merely viewing these as a burden but rather as valuable resource. Therefore, in this paper we aim to explore how environmental programs and social policies can be integrated to address the requirements of an aging population while fostering sustainability.

The discussion begins by considering diverse viewpoints on aging and the different needs of elderly individuals. For instance, while some may require care and medical treatments, others may focus on disease prevention, and many wish to remain in the workforce, volunteer for social causes, or engaged in environmental initiatives. This approach allows the elderly to live longer and lead fulfilling lives, as asserted by the advocates of the longevity revolution positioning them as a vital resource for their communities (Scott, 2024).

Additionally, we will explore how policymakers can navigate these complexities and harness the potential of the elderly to contribute to a sustainable and inclusive society and economic system. By recognizing the diverse capabilities and needs of the aging population, appropriate strategies that enhance not only the well-being of older individuals but also the overall sustainability goals of the communities, can be developed.

Taking these considerations into account, we will now examine the specific challenges that population aging

presents for the ecological transition, highlighting how these issues can be managed with integrated policies.

1. THE CHALLENGES OF DEMOGRAPHIC AGING IN THE CONTEXT OF THE ECOLOGICAL TRANSITION

As societies around the world strive to achieve ecological sustainability, it is crucial to consider the role that population aging plays. Developing policies that address both ecological concerns and the needs of the elderly is vital to ensuring a comprehensive and inclusive approach to sustainable development. Population aging presents a major challenge in the context of the ecological transition, necessitating thoughtful reflection on the links between these two trends. Before delving into how to promote positive relationships between them, it is crucial to understand the specific challenges that come with old age and their implications for the shift towards a more sustainable economic and social system.

The primary challenge that population aging poses to ecological transition initiatives is the increasing demand for services and infrastructure tailored for a vulnerable demographic. The growing elderly population requires access to healthcare and supportive services including hospitals, assisted living facilities and home care. Rising healthcare expenditures may potentially divert funds away from ecological transition efforts. However, proactively investing in healthcare and in public health prevention programs can help reduce costs while effectively meeting the needs of vulnerable individuals.

Another significant challenge posed by demographic aging to the ecological transition is the pension system (Lazzarini et al., 2015). In countries with well-established welfare system, there is an increasing number of retirees relying on a shrinking working-age population. For instance, Greece (42%) and Portugal (37%) have the highest percentages of retirees dependent on the active workforce, followed by Italy (35%), Germany (34%) and France (32%). This situation undermines the EU principle of solidarity established in the Nice Charter of 2000 and elevated to the status of “primary right” after the Lisbon Treaty of 2007 (De Caria, 2021; EU, 2024). The principle of solidarity stipulates that each generation should contribute to the community’s welfare according to its capabilities and it will benefit from this when it reaches retirement age. The ongoing trend of population aging along with the declining ratio of retirees to the workers present significant challenges. Dealing with these issues requires equitable social organization strategies and reforms aligned with sustainability principles. This include imple-

menting flexible pension systems and the reinforcement of private pension funds (Ludovico, 2019).

Another issue linked to population aging that is pertinent to the ecological transition is the physical and social environment that supports the well-being and independence of older individuals (Wahl et al. 2012). This concept, highlighted by the World Health Organization (WHO) builds on Lawton and Nahemow's ecological model from the early 1970s, which emphasised the need to adapt urban spaces to match with the lifestyle of the elderly. Unfortunately, these considerations are often seen as less critical to economic growth, knowledge, and technological innovation (De Donder et al., 2013). While cities offer considerable advantages like improved access to healthcare, cultural and recreational services, they also can foster insecurity and exclusion among the most vulnerable people. The WHO has outlined essential features that age-friendly cities should include, such as smooth sidewalk, safe pedestrian crossings, green spaces with amenities, public restrooms, buildings equipped with escalators and elevators. A particular area of concern is ensuring the accessibility of public transportation to facilitate safe and independent mobility for elderly individuals (WHO, 2008; van Hoof et al., 2021; Dikken et al., 2023; Marston & van Hoof, 2023). The WHO guidelines have led to the establishment of the WHO Global Network of Age-Friendly Cities in 2010, which consists of 250 cities working together to share best practices and create communities that meet the needs of an aging population, promoting attentive solidarity, cooperation, and intergenerational understanding (WHO, 2010).

The concept of age-friendly environments extends beyond urban areas; it also encompasses the various settings where older adults spend their daily lives, highlighting the need for innovative and technologically advanced housing solutions. According to the contemporary urban planning principles (Gargiulo, 2009), residences should function as "smart homes," that cater to the needs of their occupants. These homes ought to be equipped with sensors and monitoring systems that can identify several issues, and they should be linked with medical assistance centres to ensure a safe and independent living for the elderly (Bosia et al., 2017; Wang J. et al, 2021), at the same time easing the burden of their family members (Lazarini, 2022). Moreover, this approach must align with the urgent adaptations aimed at reducing emissions responsible for climate change. Implementing high-efficiency heating and cooling systems, LED lighting, low-energy appliances, and other similar technologies is essential while maintaining comfort and safety for residents.

Transforming cities and buildings to incorporate these features presents a significant challenge for public

policies. International studies indicate that a considerable proportion of elderly population is concentrated in urban areas: for instance, in the European Union, 21.4% of those aged 65 and over live in urban environments (Eurostat, 2020). The density of the elderly in urban regions and the progressively aging population presents an obstacle for the ecological transition that can only be overcoming by recognizing the elderly as an asset to the entire community.

Although these challenges call for substantial interventions, it is essential to view the elderly not just as a vulnerable demographic but also as a valuable resource for the society in the ecological transition.

2. ELDERLY POPULATIONS AS A RESOURCE IN THE ECOLOGICAL TRANSITION

When addressing the ongoing demographic shift from the lens of the ecological transition, it is important to engage with the recent debate concerning the issue of population aging. The increased longevity and well-being of many individuals over sixty have ushered in a new perspective on aging, moving away from the *disengagement theory* developed in the 1960s (Cumming & Henry, 1961), which is no longer in the line with the demographic realities of the subsequent decades, and towards the *activity theory*.

While the disengagement theory assert that the aging leads to an inevitable withdrawal from society and social relationships, the activity theory highlights the importance of finding alternative pursuits after exiting the workforce. This is essential for combating loneliness and ensuring a meaningful transition into older age, which can lead to a fulfilling experience for older individuals and have beneficial effect on society (Memini, 2021). Various concepts such as successful aging, active aging, productive aging, have been emerged as counterpoints to disengagement (Butler, 2009; Bülow & Söderquist, 2014). Specifically, active aging has been proposed as a framework developing policies to tackle the challenges associated with demographic change. Both paradigms, along with the World Health Organization's specific definition of healthy aging, emphasize the necessity of a comprehensive approach that enables older adults to remain a valuable resource for their families, communities, and the economy (Foster & Walker, 2021).

The concepts of active aging and productive aging are particularly significant in this context, even if these ideas have come under considerable criticisms. According to some authors (Dommaraju & Wong, 2021), the push to raise the retirement age and reintegrate retirees into the

workforce is primarily aimed at addressing issues related to solve public welfare spending and prioritizing social interests over those of older adults themselves. Furthermore, unpaid activities such as volunteering, caregiving, and support for social organizations are often viewed negatively because they do not take leisure time into account within the framework of active aging (Bülow & Söderquist, 2014), despite their clear benefits for physical and mental health (Ramia & Voicu, 2022). In the last few years, the concept of active ageing has expanded to include sports, travel and cultural events. These pursuits, categorized under the term silver economy that is expected to exceed \$ 27 trillions by 2025 (Rothschild & Co, 2023; Lucia, et al., 2022; Lucia & Epasto, in press).

In fact, many older individuals possess substantial financial assets and real estate wealth, which grant them purchasing power. This together with the propensity to decumulate and to focus on quality and longevity of products in their purchasing in contrast to younger generations, who are often more inclined to seek affordability in goods and services (Hervé & Mullet, 2009; Singh, 2011), can help steer companies towards a sustainable production system (Fengler, 2021).

When analysing the interconnections between population aging and the ecological transition, although we do not share all the criticism previously mentioned, they are certainly useful in the perspective of our analysis for understanding the new notion of the elderly population. But we believe that the well-being of the elder adults and society are deeply intertwined and we hold that promoting active aging can serve as a valuable asset in supporting the ecological transition.

To attain this goal, first of all it is vital to raise public awareness regarding the importance of active aging by leveraging the skills that older individuals have acquired and adapting them to new business needs through professional training programs. Moreover tax incentives for companies that hire older workers are needed, as well as financial support for those starting new ventures and promoting part-time and telecommuting options. The presence of older workers in companies can be useful for fostering investments in human capital development and technological innovation to maintain market competitiveness (Zeng, 2024). This is coupled with other benefits that the elderly can bring to the ecological transition. If mentoring and tutoring programs are established, the elderly can further contribute to the ecological transition by sharing their professional experience with younger generations (Amorós et al., 2024; Fasbender et al., 2021).

Furthermore, the elderly can significantly influence environmental policies and investments in the ecologi-

cal transition efforts due to their higher voter turnout than younger age groups. They are also acutely aware of their vulnerability to environmental disasters (Waidley & Petrich, 2001; Albalade et al., 2023).

However, the literature on this subject presents conflicting viewpoints. Some scholars argue that seniors are less likely to adopt sustainable behaviours and believe that allocating resources to fight climate change could lead to reductions in public spending on healthcare and other vital services. Many elderly value immediate well-being, potentially leading them to embrace sustainable practices in a “selfish” manner given to their shorter life expectancy relative to younger age generations (Albalade et al., 2023). Conversely, other scholars oppose this perspective by applying the *theory of generativity* in this context (Tonn et al., 2001; Milfont & Sibley, 2013; Afridi et al., 2021; Di Fabio & Svicher, 2023). Developed by psychologist Erik Erikson in the late 1950s, the concept of generativity suggests that old age is marked by a desire to leave a positive legacy for the benefit of future generations. When applied to environmental behaviours, generativity emphasizes the altruistic tendencies of the elderly, which are often also shaped by their traditional values, namely a disdain for waste and a propensity to save- values that can be passed down to younger generations (Frumkin et al., 2021; Wang Y. et al., 2021)

Engaging seniors’ citizens in environmental initiative is vital as they can make a significant impact through their availability of time to spend in civic engagement and volunteering (Chen et al, 2022). Their life experiences and skills can greatly benefit environmental causes. These often-overlooked abilities deserve more recognition for the positive effect that involving seniors in environmental organizations can have on communities (Pillemer et al., 2021). Seniors can engage in projects that focus on environmental sustainability, like monitoring urban green spaces, participating in urban gardening and creating neighbourhood gardens. These activities not only enable seniors to become active members in their community, but also allow them to leave a positive legacy for future generations (Smyer & Pachana, 2019). Furthermore, seniors play a fundamental role in enhancing the resilience of their communities, not just through volunteering but also by preserving historical knowledge and traditional practices. This wealth of knowledge can be invaluable in mitigating environmental risks, adapting to climate change, and preparing for more increasingly extreme events, by leveraging traditional skills to support ecological transition actions (Pillemer et al., 2021).

Incorporating the skills and experiences of the elderly into the initiatives for the ecological transition not only benefit the environment but also foster the

sense of community and intergenerational responsibility that can strengthen social cohesion.

3. CONCLUSIONS

Population aging and increased longevity reflect improvements in living standards, but they also significantly impact economic and social dynamics. This demographic shift places considerable strain on healthcare and pension systems, which are now facing greater demand for medical care and long-term support, along with the increasingly investment needed for sustainable development.

Additionally, these demographic changes bring about social issues like elderly isolation and age-based discrimination. Addressing this complex challenge requires a comprehensive approach that meets the needs of both the elderly and future generations. Therefore, public policies should commit to considering aging as a resource for creating an inclusive and sustainable society.

To tackle this multifaceted issue, policymakers must recognize aging as a resource in fostering inclusivity and sustainability. Key areas that need focus include reforming pension and healthcare system. Given the longer life expectancy, the retirement ages could be gradually raised, allowing for flexibility where individuals can choose to work longer in exchange for a higher pension, or opt for early retirement with a reduced monthly payment. Moreover, policies should encourage companies to hire or retain older workers, offer part-time positions, and enhance pension options. This approach will help ensure equal opportunities for the coming generations.

The healthcare system can also benefit from the adoption of advanced technologies including as assistive devices, smart homes, and digital health services. This innovation can enhance the safety and the independence of elderly individuals while simultaneously reducing the demand for public resources. For instance, the integration of advanced technologies into the healthcare systems could complement the broader goals of sustainability and social inclusion outlined in various programs by the EU. In fact, although there are no initiatives in the EU specifically targeting the interrelationship between population aging and the ecological transition, this issue is incorporated in various actions aimed at achieving economic, social, and environmental sustainability. Member states can leverage the European Social Fund and the Cohesion Fund for health and social initiatives aimed at the elderly. Furthermore, the ambitious EU Green Deal Plan, which aims for net-zero emissions by 2050, includes measures for economic and social inclu-

sion. The plan promotes the retraining of older workers, and advocates for urban adaptation to meet the needs of an aging population by improving building accessibility and energy efficiency.

In a similar vein, the Green Paper on Ageing, has started a constructive approach that encourages policies fostering active and healthy aging and indicate initiatives that involve the elderly in green economic activities, such as environmental volunteering or jobs in sustainability-related sectors. Recognizing the significance of population aging, the Circular Economy Action Plan emphasizes the promotion of products and services that are more accessible and suitable for the elder individuals while encouraging resource efficiency.

Additional, The Smart Cities Digitalization Plan promotes the use of digital technologies to improve urban living condition, making cities more sustainable and inclusive for residents of all ages, enhancing public services and reduce environmental impact. Furthermore, tools that can address the challenges of an aging population in conjunction with the ecological transition are available in the European Structural and Investment Funds (ESIF). These funds can be used to improve the energy efficiency of residential buildings, thereby enhancing living conditions for the elderly.

By integrating these features found in the aforementioned plans, the EU could develop a comprehensive approach to the issues of population aging and the ecological transition. In this way, although population aging presents unavoidable challenges, it can be viewed as an opportunity to create a more equitable, inclusive, and sustainable society through effective policies and innovative strategies and approaches. Therefore, it can be argued that a holistic approach to demographic changes and ecological transition could meet the needs of older individuals while preparing for a future where people of all ages can thrive.

REFERENCES

- Afridi, S. A., Khan, W., Haider, M., Shahjehan, A., & Afsar, B. (2021). Generativity and green purchasing behavior: Moderating role of man-nature orientation and perceived behavioral control. *SAGE Open*, 11(4), 215824402110544.
- Albalade, D., Bel, G., & Teixidó, J. J. (2023). The influence of population aging on global climate policy. *Population and Environment*, 45(3), 1-34.
- Amorós, J., Leporati, M., Torres-Martin, A. J., & Roses, S. (2024). Opportunity entrepreneurship after 65: Relevant factors in OECD countries. *Internation-*

- al Entrepreneurship and Management Journal*, 20, 1215-1244.
- Bosia, D., Zhang, Y., Thiebat, F., & Savio, L. (2017). Age-friendly cities: public and private space. *TECHNE-Journal of Technology for Architecture and Environment*, 319-327.
- Bülöw, M., & Söderquist, T. (2014). Successful ageing: A historical overview and critical analysis of a successful concept. *Journal of Ageing Studies*, 31, 139-149.
- Butler, R. N. (2009). The longevity revolution: Benefits and challenges of living a long life. Public Affairs.
- Chen, P. W., Chen, L. K., Huang, H. K., & Loh, C. H. (2022). Productive aging by environmental volunteerism: A systematic review. *Archives of Gerontology and Geriatrics*, 98, 104563.
- Cumming, E., & Henry, W. E. (1961). Growing old: The process of disengagement. Basic Books.
- De Caria, R. (2021). Il principio della solidarietà tra generazioni tra mutualizzazione dei debiti e divieto di finanziamento monetario. *Rivista Associazione Italiana dei Costituzionalisti*, 3, 120-140.
- De Donder, L., Buffel, T., De Witte, N., Dury, S., & Vert, D. (2013). Perceptual quality of neighbourhood design and feelings of unsafety. *Ageing & Society*, 33, 917-937.
- Di Fabio, A., & Svicher, A. (2023). The eco-generativity scale (EGS): A new resource to protect the environment and promote health. *International Journal of Environmental Research and Public Health*, 20(15), 6474.
- Dikken, J., Kazak, J. K., Soebarto, V., & van Hoof, J. (2023). Views of older people on environmental sustainability: The development of SustainABLE-16 questionnaire. *Building and Environment*, 242, 1-11.
- Dommaraju, P., & Wong, S. (2021). The concept of productive aging. In Assessments, treatments and modeling in aging and neurological disease (pp. 3-11). Academic Press.
- European Environment Agency (2023). Investments in the sustainability transition: leveraging green industrial policy against emerging constraints. Retrieved October 15, 2024, from <https://www.eea.europa.eu/publications/investments-into-the-sustainability-transition>.
- European Union. (2024). Shape the EU as we know it. <https://www.consilium.europa.eu/ro/shaping-the-eu-as-we-know-it-the-lisbon-treaty/>
- Eurostat. (2020). Ageing Europe - Looking at the lives of older people in the EU. <https://ec.europa.eu/eurostat>
- Fasbender, U., Gerpott, F. H., & Unger, D. (2021). Give or take? Knowledge exchange between older and young employees as a function of generativity and development striving. *Journal of Knowledge Management*, 25(10), 2420-2443.
- Fengler, W. (2021). The silver economy is coming of age: A look at the growing spending power of seniors. Retrieved October 15, 2024, from <https://www.brookings.edu/articles/the-silver-economy-is-coming-of-age-a-look-at-the-growing-spending-power-of-seniors/>
- Foster, L., & Walker, A. (2021). Active ageing across the life course: Towards a comprehensive approach to prevention. *BioMed Research International*, 2021, 6650414.
- Frumkin, H., Fried, L., & Moody, R. (2012). Aging, climate change, and legacy thinking. *American Journal of Public Health*, 102(8), 1434-1438.
- Gargiulo, C. (2021). Saggio introduttivo. In G. Carpentieri, F. Gaglione, C. Guida, F. Sgambati, & F. Zucaro (Eds.), Smart city, urban planning for a sustainable future. City and governance. Univ. Federico II, Napoli.
- Hervé, C., & Mullet, E. (2009). Age and factors influencing consumer behaviour. *International Journal of Consumer Studies*, 33(3), 235-357.
- Lazzarini, G., Ghidella, R., & Cugno, A. (2015). Un nuovo patto sociale. Ed. Vaticana.
- Lazzarini, G. (Ed.). (2022). Domiciliarità e/o residenzialità per il benessere degli anziani non autosufficienti. Marcianum Press.
- Lucia, M. G., Epasto, S., & Bollani, L. (2023). L'attrattività territoriale per la popolazione anziana. In S. Valdemarin & M. G. Lucia (Eds.), Geografia dell'attrattività territoriale. Comprendere e gestire lo sviluppo locale (pp. 81-92). Pearson.
- Lucia, M. G., & Epasto, S. (in press). Invecchiamento demografico: Da fattore frenante a stimolo di sviluppo dell'economia. *Bollettino della Società Geografica Italiana*.
- Ludovico, G. (2019). La solidarietà intergenerazionale nel sistema pensionistico: Fascino e limiti di un principio necessario. *Diritto delle Relazioni Industriali*, 28(1), 28-57.
- Marston, H. R., & van Hoof, J. (2019). Who doesn't think about technology when designing urban environments for older people? A case study approach to a proposed extension of the WHO's age-friendly cities model. *International Journal of Environmental Research and Public Health*, 16(19), 35-25.
- Memini, F. (2021). La teoria del disimpegno: la vita sociale. Retrieved October 13, 2024, from Aging Project Uniupo website: <https://www.agingproject.uniupo.it/per-i-professionisti/teorie-invecchiamento/la-teoria-del-disimpegno/>

- Milfont, T. L., & Sibley, C. G. (2011). Exploring the concept of environmental generativity. *International Journal of Hispanic Psychology*, 4(1), 21-30.
- Peterson, E. W. F. (2017). The role of population in economic growth. *SAGE Open*, 7(4), 215824401773609.
- Pillemer, K., Cope, M. T., & Nolte, J. (2021). Older people and action on climate change: A powerful but underutilized resource. *HelpAge International*, 1-13.
- Ramia, I., & Voicu, M. (2022). Life satisfaction and happiness among older Europeans: The role of active ageing. *Social Indicators Research*, 160(2), 667-687.
- Rothschild & Co. (2023). Thematic insights: The silver economy. Retrieved October 13, 2024, from <https://www.rothschildandco.com/en/newsroom/insights/2023/01/thematic-insights-the-silver-economy/>
- Singh, S.D. (2011), A study of consumer behaviour of older consumers with reference to green products. *Journal of International of Management & Information Systems*,15(4),101-104.
- Scott, A. (2024). Longevity revolution. Retrieved October 13,2024, from <https://www.sciencedirect.com/journal/new-scientist/vol/262/issue/3485>
- Smyer, M. A., & Pachana, N. A. (2019). Older adults and environmental voluntarism. In *Encyclopedia of Gerontology and Population Aging* (pp. 1–6). Cham: Springer International Publishing.
- Tonn, B.E., Waidle, G., & Petrich C (2001). The ageing US population and environmental policy. *Journal of Environmental Planning and Management*, 44(6), 851-876.
- UNDESA (2023). Leaving no one behind in an ageing world. Retrived October 13, 2024 from https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undesa_pd_2023_wsr-fullreport.pdf
- van Hoof, J., Marston, H. R., Kazak, J. K., & Buffel, T. (2021). Ten questions concerning age-friendly cities and communities and the built environment. *Building and environment*, 199, 107922.
- Wahl,H.W., Iwarson, S., & Oswald, F. (2012). Ageing well and the environment: toward an integrative model and research agenda for the future. <https://pubmed.ncbi.nlm.nih.gov/22419248/>
- Waidley, B.E. & Petrich, C. (2001). The ageing US population and environmental policy. *Journal of Environmental Planning and Management*, 44(6), 851-876.
- Wang, J., Cao, S., Yu, & C. W. (2021). Development trend and challenges of sustainable urban design in the digital age. *Indoor Built Environ.* 30(1), 3–6.
- Wang, X., & Lo, K. (2021). Just transition: A conceptual review. *Energy Research & Social Science*, 82(102291), 102291.
- Wang, Y., Hao, F., & Liu, Y. (2021). Pro-environmental behavior in an aging world: Evidence from 31 countries. *International Journal of Environmental Research and Public Health*, 18(4).
- WHO (2008). Global age friendly cities: a guide. Retrieved October 13, 2024, from <https://www.who.int/publications/i/item/9789241547307>.
- WHO (2010). About Global Network for Age-Friendly Cities and Communities. <https://extranet.who.int/agefriendlyworld/who-network/>
- Zeng, J. (2024). The impact of population aging on business innovation: a comprehensive overview. *Frontiers in Humanities and Social Sciences*, 4(6), 363–367.