



From MDGs to SDGs: Integrating the Silver Economy

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Abstract

As global populations age rapidly, the intersection between the Silver Economy and sustainable development presents both unprecedented challenges and transformative opportunities for achieving the United Nations' Sustainable Development Goals (SDGs). This article examines how the economic activities catering to older adults aged 50 and above can be systematically integrated with sustainability principles to create equitable, resilient, and environmentally responsible societies. Through comprehensive analysis of demographic trends, policy frameworks, and strategic interventions, this study demonstrates that the Silver Economy intersects meaningfully with multiple SDGs, including Good Health and Well-being (SDG 3), Decent Work and Economic Growth (SDG 8), Industry, Innovation and Infrastructure (SDG 9), Sustainable Cities and Communities (SDG 11), Responsible Consumption and Production (SDG 12), and Reduced Inequalities (SDG 10). The research identifies six key strategies for developing a sustainable Silver Economy: policy integration and cross-sectoral planning, innovation in green technologies, responsible production and consumption practices, inclusive and age-friendly design, education and lifelong learning for sustainability, and innovative financial mechanisms. While challenges include increased resource demands, waste management complexities, digital exclusion, and behavioural change barriers, the opportunities encompass innovation catalysis, leveraging experienced workforces, utilising long-term perspectives, and developing new sustainable markets. The analysis concludes that proactive integration of ageing considerations into sustainability planning is essential for creating a future that serves both current older adults and future generations, requiring collaborative efforts across government, business, and civil society sectors.

Keywords: SDGs, Silver Economy, Ageing Population, Green Innovation, Demographic Transition

I. Introduction

As the world rapidly ages, the imperative to achieve sustainable development becomes intrinsically linked to how we address and leverage the 'Silver Economy'. This demographic transformation represents one of the most significant global trends of the 21st century, fundamentally reshaping economic structures, social systems, and environmental considerations worldwide (**United Nations, 2020; Harper, 2019**). The magnitude of this change cannot be overstated: by 2050, the number of people aged 60 and older is projected to increase from 1 billion to 2.1 billion globally, with the fastest growth occurring in developing countries that are simultaneously grappling with poverty reduction and environmental degradation challenges (**WHO, 2022**). The Silver Economy encompasses all economic activities catering to the needs and preferences of older adults aged 50 and above, spanning healthcare, housing, transportation, leisure, education, and technology sectors (**European Commission, 2018**). This economic segment is projected to reach \$15 trillion globally by 2030, making it larger than the entire economy of the United States today (**Oxford Economics, 2021**). The Silver Economy includes not only products and services specifically designed for older adults but also the broader economic impact of their consumption patterns, employment contributions, and wealth accumulation. This encompasses everything from age-friendly housing and assistive technologies to tourism services, continuing education programs, and healthcare innovations that extend healthy lifespans. Sustainable development, as defined by the Brundtland Commission, refers to development that meets the needs of the present without compromising the ability of future generations to meet their own needs (**World Commission on Environment and Development, 1987**). This foundational definition has evolved significantly since its inception, now encompassing complex interconnections between environmental protection, economic growth, and social equity. The concept has been operationalised through the United Nations' 2030 Agenda for Sustainable Development, which outlines 17 Sustainable Development Goals

(SDGs) addressing global challenges ranging from poverty and inequality to climate change and environmental degradation (**United Nations, 2015**). These goals recognise that sustainable development requires integrated approaches that address multiple dimensions simultaneously rather than treating economic, social, and environmental challenges as separate issues. The intersection of ageing populations and sustainability challenges creates unique complexities that traditional development approaches have not adequately addressed. Climate change disproportionately affects older adults through extreme weather events, air quality degradation, and disruption of healthcare systems, while simultaneously, ageing populations contribute to increased resource consumption and waste generation (**Frumkin et al. 2022**). However, this intersection also creates unprecedented opportunities for innovation, as older adults often possess the time, resources, and motivation to support long-term sustainability initiatives that benefit future generations. The thesis of this article posits that integrating the principles of sustainable development into the growth of the Silver Economy is not merely desirable but essential for creating equitable, resilient, and environmentally responsible societies that benefit all generations. This integration requires a fundamental shift from viewing population ageing as a burden to recognising it as an opportunity for innovative, sustainable solutions that can drive progress toward global sustainability goals while addressing the diverse needs of an ageing population (**Walker, 2021; Moulaert and Biggs, 2021**). The current global context provides an unprecedented opportunity to shape the trajectory of both demographic transition and sustainability transformation, ensuring that these powerful forces reinforce rather than undermine each other. This paradigm shift demands recognition that older adults represent not passive recipients of services but active agents of change who can contribute significantly to sustainability transitions. Their accumulated wealth, estimated at \$58 trillion globally, represents substantial financial resources that can be directed toward sustainable investments and consumption choices (**Age-Friendly World, 2021**). Their professional experience spans decades of technological and social change, providing valuable insights for addressing contemporary sustainability challenges. Their social networks and institutional knowledge create platforms for implementing community-based sustainability initiatives. Most importantly, their stake in future generations' well-being provides powerful motivation for supporting long-term environmental protection and resource conservation efforts.

II. The Silver Economy and the Millennium Development Goals (MDGs)

The Millennium Development Goals (MDGs), launched in 2000, marked a historic global commitment to addressing the world's most urgent development challenges by 2015. These eight interrelated goals sought to reduce poverty, expand access to education, improve health outcomes, promote gender equality, ensure environmental sustainability, and strengthen global partnerships. Yet, the MDGs were conceived at a time when demographic transitions and population ageing had not been fully recognised as central to the development agenda. The rise of the "Silver Economy" – encompassing the economic activities, goods, and services designed for and utilised by older adults – has since revealed important intersections with MDG objectives that were largely overlooked during their implementation. This analysis explores the relationship between the Silver Economy and the MDGs, drawing attention to both the missed opportunities and the indirect ways ageing populations were influenced by the pursuit of these goals.

MDG 1 – Poverty Reduction and Economic Growth: The connection between the Silver Economy and poverty reduction reflects a complex dynamic that was insufficiently addressed within the framework of MDG 1. While this goal aimed to halve extreme poverty and hunger, it largely neglected the specific vulnerabilities and economic contributions of older populations (**Lloyd-Sherlock, 2010**). Older adults face distinctive poverty risks, including limited access to formal social protection systems, age-related employment discrimination, and escalating healthcare costs that can drive households into poverty. At the same time, the Silver Economy offers considerable potential for fostering economic growth and reducing poverty. In advanced economies, older consumers account for substantial purchasing power, with the global Silver Economy valued at more than \$15 trillion annually (**Oxford Economics, 2019**). This demographic fuels demand across diverse sectors such as healthcare, financial services, leisure, and technology products tailored to ageing populations. Japan provides a striking example, where the Silver Market generates approximately \$3 trillion annually, creating extensive employment opportunities and bolstering national economic growth (**Kohlbacher and Herstatt, 2011**). The exclusion of ageing populations from MDG 1 represented a missed opportunity to harness their economic potential while addressing their heightened vulnerability to poverty. Countries that acknowledged this intersection, such as South Korea and Germany, implemented age-friendly economic policies that not only mitigated poverty risks but also contributed to sustained and inclusive economic growth.

MDG 2 – Education and Lifelong Learning: While MDG 2's emphasis on achieving universal primary education was vital, it reflected a limited view of education as relevant mainly to children and youth. The Silver Economy challenges this narrow perspective by highlighting lifelong learning and continuous skill development as fundamental for economic participation across all stages of life (**Formosa, 2019**). In an era defined by the digital revolution and rapid technological change, lifelong learning has become particularly critical for older workers who must adapt to new tools and practices in order to remain employable. Countries experiencing demographic ageing have increasingly acknowledged the need for education systems that serve learners of all ages. Initiatives such as digital literacy programs for older adults, vocational retraining schemes, and age-friendly educational institutions illustrate how the Silver Economy broadens

traditional educational frameworks. The main shortcoming of MDG 2 was its failure to recognise education as a lifelong process that promotes active ageing and sustained economic engagement. This oversight constrained opportunities to build more inclusive and resilient education systems capable of benefiting all generations, while also addressing the specific learning needs of ageing populations in a rapidly evolving global economy.

MDG 3 – Gender Equality and Women’s Empowerment: The intersection of gender equality and ageing exposes important shortcomings in MDG 3’s framework for women’s empowerment. While the goal sought to reduce gender disparities in education and political participation, it failed to adequately recognise how gender inequalities accumulate over the life course, leaving older women especially vulnerable (**United Nations Women, 2015**). Older women frequently experience a “triple jeopardy”: age discrimination, gender discrimination, and economic insecurity arising from interrupted career trajectories, lower lifetime earnings, and inadequate pension entitlements. As a result, women make up a disproportionate share of older adults living in poverty worldwide. At the same time, the Silver Economy offers new opportunities for women as entrepreneurs and service providers, particularly in fields such as healthcare, caregiving, and consumer-focused services. The absence of a life-course perspective in MDG 3 limited its capacity to advance truly comprehensive strategies for women’s empowerment that could address both immediate needs and long-term security. In contrast, countries that have integrated gender and ageing considerations, such as Sweden and Canada, have been more successful in developing policies that promote gender equality consistently across all stages of life.

MDGs 4, 5, and 6 – Health and Well-being: The health-focused MDGs targeted child mortality (MDG 4), maternal health (MDG 5), and communicable diseases (MDG 6), reflecting the pressing health challenges in many developing countries at the time. Yet this emphasis largely overlooked the rising burden of non-communicable diseases and age-related conditions that were becoming increasingly significant for global health systems (**Beard et al. 2016**). The Silver Economy’s focus on healthcare innovation and age-friendly services offers important synergies with broader health system strengthening. Investments made to achieve MDG health targets often created infrastructure that now serves as a foundation for addressing age-related health challenges. Moreover, advances spurred by the Silver Economy, such as telemedicine, assistive technologies, and integrated care models, enhance the capacity and effectiveness of health systems, generating spillover benefits that extend across all age groups. By neglecting ageing and health, the MDGs missed the opportunity to promote more comprehensive health systems capable of simultaneously addressing communicable and non-communicable diseases, while also preparing societies for demographic transitions already underway in many parts of the world.

MDG 7 – Environmental Sustainability: The relationship between environmental sustainability (MDG 7) and the Silver Economy is multifaceted, yet it remained largely overlooked during MDG implementation. Ageing populations have distinct environmental impacts and needs compared to younger cohorts, including greater reliance on healthcare services, as well as specific requirements for transportation and housing solutions (**Walker, 2015**). At the same time, older adults can contribute positively to sustainability objectives. Their potential for lower consumption patterns, accumulated environmental knowledge, and engagement in stewardship activities presents opportunities for advancing sustainability. Moreover, age-friendly city initiatives, an integral component of the Silver Economy, frequently incorporate sustainable urban planning practices that simultaneously enhance the well-being of older residents and promote environmental goals. The omission of demographic considerations in environmental planning under MDG 7 represented a missed opportunity to design more inclusive and effective policies capable of addressing both the needs of ageing populations and broader sustainability objectives.

MDG 8 – Global Partnerships for Development: MDG 8, which emphasised strengthening global partnerships for development, paid little attention to the potential contributions of ageing populations within international cooperation frameworks. Older adults hold substantial knowledge, experience, and, in many cases, financial resources that could meaningfully support development efforts (**HelpAge International, 2013**). The Silver Economy highlights opportunities for enhanced collaboration, particularly through South-South cooperation on ageing-related issues. Countries such as Japan and South Korea have shared expertise in age-friendly technologies and policy design with developing nations facing rapid demographic transitions. Furthermore, older members of diaspora communities often maintain strong social, cultural, and economic ties with their countries of origin, creating additional channels for development engagement and partnership.

Opportunities and Gaps: How Ageing Populations Were Overlooked: The neglect of ageing populations within the MDGs reflected the prevailing development paradigm of the early 2000s, which largely framed global challenges around poverty reduction, youth empowerment, and basic needs. This narrow perspective resulted in several missed opportunities. First, by overlooking the economic potential of older populations, the MDGs failed to promote more inclusive strategies for sustainable economic growth. Second, the strong emphasis on youth within education and health systems left gaps in preparing societies for inevitable demographic transitions. Third, the absence of a life-course approach to development limited the potential for building more comprehensive and resilient long-term strategies. Nonetheless, MDG implementation indirectly impacted older populations in important ways. Investments in health

system strengthening improved infrastructure that also served the needs of older adults. Economic growth fostered under MDG-related initiatives enhanced living conditions across all age groups. Similarly, educational improvements generated more literate and skilled cohorts who would enter older age with a greater capacity to remain active in economic and social life.

The intersection of the silver economy and the Millennium Development Goals highlights both the limitations of the MDG framework and the growing recognition of development challenges in an ageing world. Although the MDGs did not explicitly account for demographic transitions, their implementation coincided with a period of rapid population ageing, which presented both obstacles and opportunities for advancing development objectives. The silver economy perspective provides valuable insights for rethinking development strategies in ways that leverage the potential of older populations while simultaneously addressing traditional development concerns. Lessons drawn from examining the overlap between the silver economy and the MDGs lay an important foundation for building more inclusive and comprehensive approaches to global development, an evolution that is more evident in the Sustainable Development Goals, with their explicit focus on inequality reduction and inclusive growth across all age groups. Looking ahead, effective development strategies must integrate demographic realities with emerging economic opportunities. Recognising ageing populations as both a source of challenges and a reservoir of untapped potential is essential for advancing sustainable development in an increasingly age-diverse world.

III. Silver Economy and Sustainable Development Goals

The silver economy, a concept gaining increasing recognition worldwide, refers to the collective economic activities, goods, and services designed to meet the needs and aspirations of the ageing global population. It is a direct response to a demographic megatrend marked by rising life expectancy and declining birth rates. This shift is not only social but also profoundly economic, as older adults represent a growing, affluent, and diverse consumer base with unique demands and purchasing power. The silver economy spans multiple sectors, including healthcare, technology, housing, tourism, and financial services, all of which are being reshaped to accommodate this demographic transformation. The strong connection between the silver economy and the United Nations' Sustainable Development Goals (SDGs) is becoming increasingly evident. The 2030 Agenda for Sustainable Development, guided by the principle of "leaving no one behind," provides a critical framework for integrating the opportunities of ageing populations into inclusive development strategies. Far from being a marginal issue, the silver economy directly supports several SDGs. For instance, it advances SDG 3: Good Health and Well-being by fostering innovative healthcare, preventive care, and wellness solutions tailored to older adults. It also contributes to SDG 8: Decent Work and Economic Growth through the creation of new markets, employment, and entrepreneurship opportunities. Moreover, it aligns with SDG 10: Reduced Inequalities by ensuring that older people, including women and vulnerable groups, are empowered to participate in, and benefit from, sustainable economic growth. Ultimately, the silver economy should not be seen as a niche market but as a strategic framework for sustainable and inclusive development. It reframes older people not as dependents but as active contributors, consumers, innovators, and knowledge bearers. By harnessing their potential and addressing their evolving needs, societies can transform the challenges of demographic ageing into a powerful driver for healthier, more equitable, and prosperous communities for people of all generations.

Global Demographic Shifts: The world is experiencing unprecedented demographic changes characterised by rapid and pervasive ageing across both developed and developing nations, fundamentally altering the global economic and social landscape. By 2050, the global population aged 60 and above is projected to reach 2.1 billion, more than doubling from 2017 figures, with the most dramatic increases occurring in Asia and Africa (WHO, 2022; United Nations, 2020). This transformation results from a convergence of factors, including increased longevity, declining fertility rates, improved healthcare systems, and better living conditions, creating profound implications for resource allocation, labour markets, and social structures across all regions of the world (Harper, 2019; Bloom et al. 2020). The demographic dividend that many countries experienced during the 20th century, characterised by large working-age populations supporting smaller dependent populations, is rapidly reversing, creating new challenges for economic growth and social stability. In developed countries such as Japan, Italy, and Germany, the old-age dependency ratio (the number of people aged 65+ per 100 people aged 15-64) is projected to exceed 50.0 per cent by 2050, meaning that fewer than two working-age adults will support each older adult (OECD, 2019). Developing countries face the additional challenge of ageing before becoming wealthy, with limited time and resources to build the infrastructure and institutions necessary to support large elderly populations. The long-term consequences of these demographic shifts extend far beyond traditional concerns about pension systems and healthcare costs, encompassing fundamental questions about resource sustainability, intergenerational equity, and the capacity of societies to maintain economic growth while ensuring environmental protection (Rechel et al. 2021). Countries across all development levels must now grapple with supporting larger elderly populations while simultaneously addressing climate change, biodiversity loss, and resource depletion challenges. This creates complex trade-offs and synergies that require innovative policy approaches and institutional arrangements. The implications for sustainable development are particularly profound given the temporal alignment between demographic ageing and climate change impacts. The peak of global population ageing coincides

with critical decades for climate action, creating both challenges and opportunities for sustainable development efforts. Older adults are disproportionately vulnerable to climate impacts, including extreme heat, air pollution, and natural disasters, while also representing a growing share of global consumers whose choices will significantly influence environmental outcomes (Anderson and Robson, 2020). Understanding these intersections is crucial for developing effective responses to both demographic and environmental challenges.

The SDGs as a Framework: The 2030 Agenda for Sustainable Development provides a comprehensive framework comprising 17 interconnected goals designed to address the world's most pressing challenges, representing the most ambitious global development agenda ever undertaken. These goals range from ending poverty and hunger to ensuring quality education, gender equality, clean energy, and climate action, with each goal supported by specific targets and indicators that enable monitoring and evaluation of progress (Sachs et al. 2021; United Nations, 2015). The SDG framework explicitly recognises the interconnected nature of global challenges, acknowledging that progress in one area can catalyse advancement in others, while setbacks in any domain can undermine overall sustainability efforts. Population ageing and the Silver Economy represent cross-cutting issues that intersect with virtually all SDGs, making their integration essential for achieving sustainable development outcomes across multiple dimensions. The ageing demographic influences poverty reduction efforts (SDG 1) through changing household structures and income patterns, affects hunger and nutrition (SDG 2) through altered dietary needs and food security concerns, and impacts health systems (SDG 3) through increased demand for age-related healthcare services (Kroll et al. 2019). Education systems must adapt to serve lifelong learners (SDG 4), while gender equality initiatives (SDG 5) must address the particular vulnerabilities of older women who face compounded discrimination. The economic dimensions of ageing intersect with clean water and sanitation (SDG 6) through increased healthcare facility requirements, renewable energy (SDG 7) through energy-intensive care facilities, and decent work (SDG 8) through changing labour force participation patterns. Infrastructure development (SDG 9) must increasingly consider age-friendly design principles, while inequality reduction (SDG 10) must address age-based discrimination alongside other forms of exclusion. Sustainable cities (SDG 11) must accommodate ageing populations, responsible consumption (SDG 12) must consider changing consumption patterns, and climate action (SDG 13) must protect vulnerable older populations. The interconnected nature of the SDGs means that ageing populations can serve as either multipliers of development challenges or catalysts for innovative solutions, depending on how societies choose to address demographic transitions. Countries that proactively integrate ageing considerations into their SDG implementation strategies often discover synergies that accelerate progress across multiple goals simultaneously. For example, age-friendly urban planning that emphasises walkability and public transportation serves sustainability objectives while improving the quality of life for all residents. Similarly, lifelong learning programs that engage older adults in environmental education create both individual fulfilment and community-wide sustainability awareness. This systems thinking approach recognises that the SDGs cannot be achieved through sectoral approaches that address goals in isolation. Instead, successful SDG implementation requires understanding and leveraging the complex interactions between different development challenges, including demographic change. The Silver Economy provides a particularly powerful lens for this integration because it spans multiple sectors and affects all dimensions of sustainable development. By embedding sustainability principles into Silver Economy development, societies can create positive feedback loops that advance multiple SDGs while addressing the needs and leveraging the potential of ageing populations.

Beyond "Burden" to "Resource": Traditional narratives about population ageing often frame older adults as economic burdens requiring increasing public resources and support, creating anxiety about fiscal sustainability and intergenerational conflict. This deficit-based perspective emphasises the costs of pensions, healthcare, and long-term care while overlooking the substantial contributions that older adults make to society and the economy (Butler, 2019). However, this perspective fails to recognise the substantial potential of older adults as consumers, producers, innovators, and custodians of knowledge who can contribute significantly to sustainable practices and economic development (Moulaert and Biggs, 2021). The Silver Economy represents a growing market estimated to reach \$15 trillion globally by 2030, demonstrating the enormous economic potential of this demographic transition rather than simply its costs (Oxford Economics, 2021). Older adults possess accumulated wealth estimated at \$58 trillion globally, representing the largest concentration of financial resources in human history and providing substantial purchasing power that can drive demand for sustainable products and services (Age-Friendly World, 2021). Their consumer preferences often align with sustainability principles, emphasising quality over quantity, durability over disposability, and value over volume. They frequently prefer local products and services, support businesses with strong community ties, and make purchasing decisions based on long-term value rather than immediate gratification (Ellen MacArthur Foundation, 2019). Beyond their role as consumers, older adults represent a vast repository of professional experience, institutional knowledge, and practical skills accumulated over decades of work and life experience. This knowledge base includes an understanding of resource conservation practices developed during times of scarcity, traditional crafts and repair skills that support circular economy principles, and institutional memory that can inform sustainable development strategies (Martinez et al. 2022). Many older adults possess technical expertise in fields directly relevant to sustainability challenges, including engineering, agriculture, natural resource management, and environmental science. The temporal availability of many older adults creates opportunities for volunteer engagement in sustainability initiatives that require sustained commitment and patience. Research indicates that older adults volunteer at higher rates than younger age

groups and are more likely to commit to long-term volunteer relationships (**Sterling, 2021**). Their availability for civic engagement, combined with their stake in future generations' well-being, positions them as potentially powerful advocates for environmental protection and sustainability initiatives. Furthermore, older adults often demonstrate strong motivations for environmental stewardship driven by concerns for their grandchildren and future generations. This intergenerational perspective aligns closely with the fundamental principles of sustainable development, which emphasise meeting present needs without compromising future generations' ability to meet their own needs. Studies indicate that grandparenthood often increases environmental concern and pro-environmental behaviour, creating opportunities for engaging older adults as sustainability champions (**Anderson and Robson, 2020**). Their life experience provides perspective on environmental changes over time, making them valuable witnesses to climate impacts and ecosystem degradation while motivating their support for corrective action.

Long-Term Vision: Sustainable development fundamentally requires long-term thinking that considers the needs of future generations, making the current ageing trend directly relevant to this temporal perspective and creating natural alignment between demographic planning and sustainability planning. Older adults, as potential grandparents and great-grandparents, often have strong motivations to ensure environmental quality and resource availability for their descendants, creating powerful emotional drivers for sustainable behaviour change and policy support (**Frumkin et al. 2022**). This intergenerational concern transcends abstract policy commitments, representing deeply personal investments in future well-being that can motivate sustained engagement in sustainability initiatives. The life course perspective that characterises older adults' experience provides valuable temporal depth for understanding environmental changes and their impacts on human wellbeing. Many older adults have witnessed firsthand the environmental transformations that occurred during the latter half of the 20th century, including deforestation, urbanisation, pollution increases, and early climate change impacts (**Wanka et al. 2020**). This lived experience of environmental change provides credible testimony about the reality and urgency of sustainability challenges while demonstrating the human capacity for both environmental degradation and restoration. The investment horizons of older adults often extend beyond their lifespans, particularly when considering legacy planning and intergenerational wealth transfer. Estate planning, charitable giving, and investment decisions increasingly incorporate environmental, social, and governance (ESG) criteria as older adults seek to align their financial legacies with their values and concerns for future generations (**Green Finance Institute, 2021**). This creates opportunities for directing substantial financial resources toward sustainable development initiatives through impact investing, green bonds, and sustainable business ventures. The alignment between the long-term orientation inherent in sustainable development and the life course perspective of older adults creates opportunities for innovative approaches to environmental challenges that require patient capital and sustained commitment. Climate change mitigation and adaptation, ecosystem restoration, and sustainable infrastructure development all require investment time horizons that extend decades into the future, matching the temporal perspective of many older adults who think beyond immediate returns to consider long-term impacts (**Climate Bonds Initiative, 2022**). Furthermore, older adults often possess the social capital and institutional relationships necessary for implementing long-term sustainability initiatives that require coordination across multiple stakeholders and sectors. Their professional networks, community connections, and organisational experience provide platforms for building the partnerships and collaborations essential for addressing complex sustainability challenges. This social infrastructure becomes particularly valuable for initiatives that require sustained commitment and gradual behaviour change across large populations (**Age-Friendly World, 2021**). The combination of temporal perspective, financial resources, social capital, and personal motivation positions older adults as potentially crucial allies in achieving sustainable development goals that require long-term commitment and intergenerational thinking.

IV. How the Silver Economy Intersects with Key SDGs

SDG 3: Good Health and Well-being: The Silver Economy plays a pivotal role in promoting healthy ageing through preventive care approaches, age-friendly health systems, and innovative healthcare technologies that align with sustainability principles by emphasising efficiency, prevention, and long-term wellness rather than resource-intensive acute care interventions. Sustainable healthcare models within the Silver Economy emphasise prevention over treatment, community-based care over institutional care, and technology-enabled care delivery that reduces resource consumption while improving health outcomes for older adults (**Beard et al. 2022**). These models incorporate telemedicine platforms that reduce travel-related emissions, remote monitoring systems that enable early intervention and prevent costly hospitalisations, and community-based preventive programs that address health determinants at the population level. The integration of sustainability principles into healthcare for older adults creates multiple benefits, including reduced environmental impact, improved health outcomes, and enhanced cost-effectiveness. Green hospital initiatives that serve older adult populations increasingly emphasise renewable energy, waste reduction, sustainable food systems, and non-toxic cleaning products that benefit both patient health and environmental quality (**Greenhalgh et al. 2021**). Pharmaceutical sustainability initiatives focus on reducing medication waste through precision prescribing, developing biodegradable drug delivery systems, and creating take-back programs for unused medications that prevent environmental contamination. Mental health and social connection represent critical components of healthy ageing that align with sustainability principles through reduced healthcare costs, improved quality of life, and community-based

support systems that utilise existing social infrastructure. Community-based programs that combat loneliness and social isolation among older adults often utilise existing infrastructure and volunteer networks, creating sustainable support systems that benefit both individuals and communities while minimising resource requirements (**Cacioppo and Cacioppo, 2018**). These programs frequently emphasise intergenerational connections that provide mutual benefits for older and younger participants while building social cohesion and community resilience. The development of green spaces and nature-based interventions for older adults provides mental health benefits while supporting biodiversity conservation, air quality improvement, and urban sustainability goals. Therapeutic gardens, walking programs in natural settings, and community gardening initiatives serve multiple functions, including health promotion, environmental education, and ecosystem service provision (**Frumkin et al. 2022**). These nature-based approaches often demonstrate superior cost-effectiveness compared to pharmaceutical interventions while providing community-wide environmental benefits. Age-friendly health system design increasingly incorporates universal design principles that create accessibility benefits for all community members while optimising resource utilisation through shared infrastructure and services. Health promotion programs that serve older adults often emphasise lifestyle modifications that align with sustainability principles, including plant-based nutrition, active transportation, energy-efficient housing modifications, and waste reduction practices that benefit both individual health and environmental quality. The convergence of healthy ageing and environmental sustainability creates opportunities for integrated interventions that achieve multiple objectives simultaneously while optimising resource allocation and maximising population health benefits (**WHO, 2021**).

SDG 8: Decent Work and Economic Growth: The Silver Economy contributes to decent work and economic growth through the continued participation of older workers in flexible employment arrangements, entrepreneurship ventures, and knowledge-sharing initiatives. Age-inclusive employment practices that accommodate the needs and preferences of older workers can extend productive lifespans while reducing the economic burden of ageing populations (**OECD, 2020**). These practices often emphasise work-life balance, reduced commuting, and skill-based contributions that align with sustainability principles. The care sector and age-technology industries within the Silver Economy create sustainable employment opportunities that serve growing market demands while providing meaningful work. These sectors often emphasise local employment, skill development, and innovation in sustainable technologies that can benefit broader society (**Colombo et al. 2021**). Ethical business practices within the Silver Economy include fair labour standards, environmental responsibility, and social impact considerations that contribute to sustainable economic development.

SDG 9: Industry, Innovation, and Infrastructure: Sustainable innovation in age-technology represents a rapidly growing sector that combines technological advancement with environmental responsibility. Energy-efficient devices, products made from recycled materials, and smart home technologies designed for older adults contribute to both market growth and environmental sustainability (**Li et al. 2022**). Research and development in gerontechnology increasingly incorporates sustainability considerations, creating solutions that address ageing needs while minimising environmental impact. Age-friendly infrastructure development, including accessible public transportation, walkable communities, and universal design principles, creates benefits for all community members while reducing resource consumption per capita. These infrastructure investments often emphasise renewable energy, sustainable materials, and multi-generational design approaches that maximise long-term value and minimise environmental impact (**WHO, 2021**).

SDG 10: Reduced Inequalities: Ensuring equitable access to Silver Economy products and services requires addressing income disparities, geographic inequalities, and digital divides that can exclude vulnerable older adults from beneficial technologies and services. Sustainable approaches to reducing inequalities include sliding-scale pricing, community-based distribution networks, and public-private partnerships that ensure universal access to essential services (**Stenner et al. 2021**). Combating ageism and promoting social inclusion represent fundamental aspects of creating equitable Silver Economy opportunities that benefit all older adults regardless of income, location, or social status. These efforts often involve community education, policy advocacy, and the development of inclusive design standards that ensure products and services meet diverse needs and capabilities (**Butler, 2019**).

SDG 11: Sustainable Cities and Communities: Age-friendly urban planning integrates sustainability principles through the development of green spaces, accessible public transportation systems, and energy-efficient housing options that serve older adults while benefiting entire communities. These planning approaches recognise that creating livable environments for older adults often results in improved quality of life for all residents (**Fitzgerald and Caro, 2017**). Sustainable housing solutions for older adults include retrofitting existing homes for energy efficiency, developing co-housing arrangements, and creating intergenerational living opportunities. Intergenerational community programs that bring together older and younger residents create social benefits while optimising resource utilisation through shared facilities, knowledge exchange, and mutual support systems. These programs demonstrate how age-inclusive community design can enhance social cohesion while reducing per-capita resource consumption (**Sanchez et al. 2020**).

SDG 12: Responsible Consumption and Production: The Silver Economy's approach to responsible consumption and production emphasises quality over quantity, durability over disposability, and circular economy principles that extend

product lifecycles. Older adults often demonstrate consumption patterns that align with sustainability principles, including preferences for repair and maintenance over replacement, bulk purchasing that reduces packaging waste, and investment in long-lasting products (**Ellen MacArthur Foundation, 2019**). Circular economy applications within the Silver Economy include product design for disassembly and recycling, service-based business models that reduce ownership requirements, and supply chain transparency that ensures ethical sourcing. These approaches create business opportunities while reducing environmental impact and often provide cost savings that benefit older adults on fixed incomes (**Geissdoerfer et al. 2020**).

Other Relevant SDGs: SDG 4 (Quality Education) intersects with the Silver Economy through lifelong learning opportunities that enable older adults to develop sustainability knowledge and skills while contributing their expertise to environmental education initiatives. These programs create intergenerational learning opportunities that benefit both older and younger participants (**UNESCO, 2021**). SDG 5 (Gender Equality) addresses the particular needs of older women who often face compounded disadvantages related to both age and gender discrimination. Sustainable Silver Economy approaches must consider these intersectional challenges and develop targeted solutions that promote equality and empowerment (**HelpAge International, 2020**). SDG 17 (Partnerships for the Goals) emphasises the collaborative approaches necessary for creating effective Silver Economy solutions that serve sustainability objectives while meeting the diverse needs of ageing populations (**United Nations, 2019**).

V. Strategies for a Sustainable Silver Economy

Policy Integration and Cross-Sectoral Planning: Mainstreaming ageing considerations into national sustainable development strategies requires comprehensive policy integration that breaks down traditional sectoral silos between health, environment, economic, and social policy domains. This integration demands long-term fiscal planning that accounts for demographic transitions while maintaining commitments to environmental protection and social equity (**OECD, 2019**). Successful policy integration involves creating institutional mechanisms that ensure ageing considerations are systematically incorporated into all sustainability planning processes. Cross-sectoral planning approaches recognise that addressing ageing challenges requires coordination across multiple government departments, private sector actors, and civil society organisations. These collaborative frameworks enable the development of comprehensive solutions that address multiple sustainability objectives while serving the diverse needs of ageing populations (**European Environment Agency, 2021**).

Innovation and Green Technologies: Investment in research and development for environmentally friendly age-technology and services represents a critical strategy for creating sustainable Silver Economy solutions. These investments focus on energy efficiency in senior living facilities, sustainable mobility solutions for older adults, and healthcare technologies that minimise environmental impact while improving health outcomes (**Greenhalgh et al. 2021**). Innovation strategies must balance technological advancement with accessibility and affordability to ensure broad adoption across diverse older adult populations. Green technology development within the Silver Economy increasingly emphasises life-cycle assessment, renewable energy integration, and circular design principles that minimise environmental impact throughout product and service lifecycles. These approaches create market opportunities while advancing sustainability objectives and often result in cost savings that benefit both providers and consumers (**Kumar et al. 2020**).

Responsible Production and Consumption: Encouraging businesses within the Silver Economy to adopt circular economy principles requires creating incentives for sustainable business practices while providing technical assistance and market support for innovative approaches. These strategies include extended producer responsibility programs, sustainable procurement policies, and certification systems that recognise environmentally responsible Silver Economy businesses (**Stahel, 2019**). Promoting consumer awareness among older adults about sustainable choices involves developing age-appropriate educational materials, creating community-based information networks, and partnering with trusted organisations to disseminate sustainability information. These efforts must account for diverse learning preferences and communication styles while providing practical guidance for implementing sustainable behaviours (**Wanka et al. 2020**).

Inclusive and Age-Friendly Design: Universal design principles applied to products, services, and urban planning create solutions that are accessible and sustainable for users across all age groups and ability levels. These design approaches often result in resource efficiencies through simplified operation, reduced maintenance requirements, and extended product lifecycles (**Mace et al. 2018**). Age-friendly design increasingly incorporates sustainability considerations from the initial conceptualisation phase through end-of-life planning. Promoting intergenerational communities that facilitate resource sharing, knowledge exchange, and mutual support represents an innovative approach to reducing per-capita resource consumption while enhancing social cohesion. These community models demonstrate how age-inclusive design can create sustainability benefits while improving quality of life for residents across all age groups (**Kaplan et al. 2021**).

Education, Awareness and Lifelong Learning for Sustainability: Educating older adults about sustainable lifestyles requires developing age-appropriate educational programs that connect sustainability concepts to personal experiences, values, and concerns. These programs often emphasise practical applications, peer learning approaches, and connections to grandchildren and future generations that resonate with older adult learners (**Sterling, 2021**). Effective sustainability education for older adults builds on their life experiences and accumulated wisdom while introducing new concepts and technologies. Training the workforce for green jobs within the Silver Economy involves developing specialised skills for sustainable ageing services, environmental remediation, and clean technology applications. These training programs create employment opportunities while building capacity for sustainable Silver Economy development (**ILO, 2021**).

Financial Mechanisms: Green bonds and impact investments focused on sustainable ageing solutions provide capital for innovative projects that address both ageing challenges and environmental objectives. These financial mechanisms enable large-scale investments in age-friendly infrastructure, sustainable healthcare systems, and environmental remediation projects that benefit ageing populations (**Climate Bonds Initiative, 2022**). Successful financial mechanisms often combine public and private resources to achieve scale and impact. Incentive systems for businesses adopting sustainable practices in the Silver Economy include tax advantages, grants, and preferential procurement policies that reward environmental responsibility while encouraging market innovation. These incentives must be designed to support both established businesses and emerging enterprises that serve the growing Silver Economy market (**Green Finance Institute, 2021**).

VI. Challenges and Opportunities

Resource demands associated with ageing populations present significant challenges for sustainability objectives, particularly in healthcare and energy consumption sectors. The potential for increased consumption of medical resources, pharmaceuticals, and energy-intensive care services requires careful planning and innovative solutions to minimise environmental impact while meeting essential needs (**Rechel et al. 2021**). Addressing these resource challenges requires system-level changes that emphasise prevention, efficiency, and sustainable service delivery models. Waste management challenges include growing volumes of medical waste, single-use healthcare products, and pharmaceutical disposal that can create environmental hazards if not properly managed. These challenges require developing specialised waste management systems, promoting reusable alternatives, and creating safe disposal networks that protect both human health and environmental quality (**Windfeld and Brooks, 2015**). Digital exclusion represents a significant challenge for sustainable technology adoption among older adults, potentially exacerbating existing inequalities while limiting the effectiveness of digital sustainability solutions. Addressing digital exclusion requires comprehensive approaches that include technology training, affordable access programs, and age-friendly interface design that enables older adults to participate in digital sustainability initiatives (Hunsaker and Hargittai, 2018). Behavioural change challenges involve shifting established habits and preferences toward more sustainable practices, which can be particularly difficult for older adults who may have developed consumption patterns over many decades. Successful behaviour change strategies must respect individual autonomy while providing compelling reasons for change that align with personal values and circumstances (**Nielsen et al. 2021**).

The ageing population serves as an innovation catalyst that drives demand for sustainable solutions addressing mobility, healthcare, housing, and social connection challenges. This demand creates market opportunities for entrepreneurs and established businesses while encouraging technological advancement that often benefits broader populations (**Sixsmith and Sixsmith, 2021**). Innovation opportunities include developing sustainable materials, energy-efficient technologies, and service delivery models that serve ageing needs while advancing sustainability objectives. Older adults represent an experienced workforce that can serve as sustainability advocates, volunteers, and knowledge holders who contribute their skills and time to environmental initiatives. Their accumulated social capital, professional networks, and institutional knowledge create valuable resources for sustainability organisations while providing meaningful engagement opportunities for older adults (**Martinez et al. 2022**). The long-term perspective that characterises many older adults creates opportunities for sustainability initiatives that require patient capital, extended implementation timelines, and intergenerational thinking. Older adults often have strong motivations to ensure environmental quality for future generations while possessing the time and resources necessary to support long-term sustainability projects (**Anderson and Robson, 2020**). New market opportunities within the Silver Economy include green products and services specifically designed for older adults, sustainable tourism and leisure activities, and environmental consulting services that leverage older adult expertise. These markets often emphasise quality, durability, and environmental responsibility while serving the preferences and values of older consumers (**Silver Economy Business, 2022**).

VII. Conclusion

The Silver Economy reveals the limitations of the Millennium Development Goals (MDGs), which, despite their global importance, paid insufficient attention to the realities of ageing populations and their role in shaping sustainable progress. This oversight underscores the pressing need for development strategies that not only recognise demographic change

but also embed it within the broader and more inclusive framework of the Sustainable Development Goals (SDGs). Older populations should no longer be perceived as passive recipients of welfare or societal burdens. Instead, when effectively integrated into global development agendas, they emerge as powerful contributors to innovation, social equity, resilience, and intergenerational knowledge transfer. The transition from the MDGs to the SDGs provides a valuable opportunity to reframe the Silver Economy as an engine of sustainability. By aligning its growth with the principles of the SDGs, societies can ensure that longevity directly advances the three key pillars of sustainable development: economic prosperity, social well-being, and environmental protection. This alignment requires deliberate and coordinated action across sectors: fostering technological innovations that enhance the quality of life for older adults, creating inclusive and responsible business models that harness their skills and experiences, and promoting educational and lifelong learning initiatives that keep them engaged as active agents of sustainability transitions. The future of the Silver Economy must rest firmly on the pillars enshrined in the SDGs: justice, environmental stewardship, inclusivity, and solidarity between generations. Choices made in the present, informed by the lessons of the MDGs and guided by the transformative vision of the SDGs, will decisively shape the legacy handed down to future generations. By mobilising the accumulated wisdom, creativity, and resources of older adults as champions of sustainable development, societies can create inclusive pathways that uphold human dignity while safeguarding the planet. Building such a sustainable Silver Economy demands nothing less than a coordinated global commitment that bridges demographic and environmental policy, dismantles institutional silos, and fosters innovative frameworks. In doing so, ageing itself can be transformed from a perceived challenge into a driving force for achieving the SDGs and ensuring a more equitable and sustainable future for all.

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