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Climate resilience in Canadian age-friendly initiatives: Implications for the age-friendly cities and communities framework

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Abstract

Background. Climate change poses increasing risks to older adults, yet climate resilience remains weakly integrated into age-friendly policy and planning. This study examined how age-friendly community initiatives support climate resilience for older adults, focusing on the Canadian policy context. Methods. A rapid realist review synthesized literature on age-friendly interventions, climate resilience, and older adults using a context-mechanism-outcome approach informed by socio-ecological systems theory. Studies were eligible where populations were identified as older adults; although a minimum threshold of 55 years was permitted to reflect contextual variation, most included evidence concerned adults aged 60 or 65 years and above. A jurisdictional scan of 92 Canadian municipal seniors strategies assessed how climate change, weather, and emergency preparedness were incorporated into age-friendly planning. Findings were contextualized through three key informant interviews. Results. Twenty-two sources were included. Climate resilience was supported through mechanisms spanning individual, community, institutional, planning, and policy levels, including social connectedness, emergency preparedness, climate-responsive urban design, accessible communication, cross-sectoral collaboration, and older adults' participation. However, only 11 of 92 Canadian seniors strategies referenced climate change, compared with 16 addressing weather and 27 addressing emergency preparedness. Policy responses were

often fragmented and weighted toward individual preparedness rather than systems-level action. Discussion and Implications. Climate resilience cuts across all Age-Friendly Cities and Communities domains. This study proposes a complementary climate-resilience lens for use alongside the WHO AFCC framework, integrating adaptation, mitigation, and older adults as active change-makers. Greater cross-sectoral coordination and systems-level action are needed to strengthen age-friendly communities in a changing climate.

Keywords

Age-Friendly Cities and Communities; climate resilience; climate change; older adults; municipal policy; rapid realist review

1. Introduction

Climate change is the "biggest global health threat facing the world in the 21st century" (The Lancet, 2009, p. 1659), with older adults disproportionately affected by many of its impacts (Haq & Gutman, 2014; Prina et al., 2024). Climate-related risks are shaped by intersecting physiological, social, and environmental factors, including reduced capacity to regulate body temperature, social isolation, mobility constraints, and characteristics of the built environment (Meade et al., 2020; Molinsky & Forsyth, 2023; Prina et al., 2024). These factors can heighten exposure and reduce the capacity to prepare for, respond to, and recover from hazards such as extreme heat and disasters requiring evacuation. The consequences are evident in mortality data. During the 2021 Western North America heat wave, the majority of the 619 people who died in British Columbia were older adults, particularly those living alone (Egilson, 2022), while adults aged 60 years and older accounted for approximately 75% of deaths associated with Hurricane Katrina (Adams et al., 2011).

Alongside a worsening climate crisis, the global aging population has brought increased attention to how cities and communities can better support an older population. The widely-used World Health Organization's (WHO) Age-friendly Cities and Communities (AFCC) Framework outlines eight domains that support healthy aging: outdoor spaces and buildings, transportation, housing, social participation, respect and social inclusion, civic participation and employment, communication and information, and community support and health services (WHO, 2007). The AFCC framework is highly influential in shaping municipal planning to meet the needs of older adults. As of May 2025, the Global Network for Age-Friendly Cities and Communities (the Global

Network) includes 1705 cities and communities in 60 countries, representing over 330 million people worldwide (WHO, n.d.). The AFCC domains shape how communities engage, plan, act, and evaluate their efforts within the Global Network. Given its widespread influence, the absence of climate resilience or sustainability considerations as an explicit domain is a significant and noteworthy gap (Dabelko-Schoeny et al., 2024).

The intersection of age-friendly communities and climate change is an increasingly important area of inquiry. In a rapid scoping review commissioned by the WHO Regional Office for the Western Pacific, Patrick et al. (2025) examined how age-friendly approaches have been applied to support older populations in the context of a changing climate, mapping targeted interventions across cities and communities. They found that climate change was discussed only minimally within the age-friendly literature and was often included primarily as contextual background, concluding that healthy aging interventions are "poorly, if at all, integrated with climate change policy" (p. 11). The review also found that the limited literature addressing climate-related impacts on older adults tended to emphasise health risks, particularly those associated with extreme heat, and in some cases positioned older adults primarily as passive recipients of protection rather than as active contributors to resilience.

Accordingly, Bayar and Aygun Ogur (2023) provide a theoretical review of how climate change responses might be integrated into age-friendly city domains. Drawing on a critical review of relevant literature, they propose a theoretical framework for the climate-responsive age-friendly city, identifying domains and planning approaches through which age-friendliness and climate resilience might be brought together. Patrick et al. (2025) provide a complementary foundation by mapping global interventions that

link the AFCC framework and climate change, highlighting the limited attention to older adults' resilience in both peer-reviewed and grey literature. However, their review is largely descriptive and global in scope, with limited exploration of how, why, and under what conditions age-friendly initiatives support resilience, particularly within specific national contexts.

Building on this work, this paper adopts a rapid realist review (RRR) methodology to examine how and under what conditions age-friendly interventions support climate resilience across multiple system levels. Exploratory searches indicated a paucity of literature explicitly linking climate resilience to the WHO AFCC framework. The scope was therefore broadened to include age-friendly environments initiatives more generally, while retaining the AFCC framework as the central policy and conceptual reference point.

This paper draws on the Intergovernmental Panel on Climate Change definition of climate resilience as "the capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation" (2014, p. 5). In this paper, climate resilience encompasses adaptation, mitigation, and broader processes of systems change: reducing exposure and vulnerability to climate-related hazards, strengthening capacity to respond and adapt, and shaping environments, systems, and policies to reduce future risks. In the context of aging populations, this includes maintaining or strengthening older adults' safety, inclusion, participation, and capacity to adapt as climate hazards intensify.

The study is grounded in the Canadian context to enable closer examination of how these issues are reflected in municipal age-friendly policy and planning, while drawing on the international literature to identify broader mechanisms and lessons. The guiding research question was: how, why, and under what conditions do age-friendly communities initiatives support climate resilience for older adults, and how is climate resilience reflected in Canadian age-friendly policy and planning?

To address this question, the study comprised two complementary components: (a) a rapid realist review of the international academic literature examining how, why, and under what conditions age-friendly initiatives support climate resilience for older adults; and (b) a jurisdictional scan of 92 Canadian municipal seniors strategies and age-friendly action plans to examine how climate resilience is incorporated into local policy and planning.

By bringing these components together, the study identifies mechanisms through which age-friendly initiatives may contribute to climate resilience, highlights gaps in Canadian municipal policy and planning, and informs the development of a revised AFCC framework that more explicitly embeds climate resilience across its domains.

2. Methods

This paper follows Saul et al.'s (2013) protocol for rapid realist reviews (RRRs), comprising six steps: (1) clarifying the review question and scope, (2) identifying relevant studies, (3) extracting and synthesizing data, (4) engaging stakeholders, (5) validating results, and (6) disseminating findings. Realist reviews provide explanatory analyses of how and why interventions work, for whom, and under what conditions,

drawing on context-mechanism-outcome configurations to unpack complex interventions (Pawson et al., 2005; Jagosh et al., 2015). The RRR approach retains these core realist principles while offering a more time-sensitive and feasible methodology for researchers and policymakers (Saul et al., 2013). It has therefore been increasingly used in health and social care research to generate timely evidence for policy and practice decision-making (Sixsmith et al., 2023).

2.1 Theoretical Framework Guiding the Review Process

The theoretical framework guiding this review is adapted from Bronfenbrenner's socio-ecological systems theory (1977; 1994). Sixsmith et al. (2023) demonstrated the value of this framework for rapid realist reviews of age-friendly ecosystems. The socio-ecological model conceptualizes interactions between individuals and their environments across nano-, micro-, meso-, exo-, macro-, and chronosystems. Given this review's focus on programs and policy, the nanosystem, which encompasses individual biological and personal characteristics, and the chronosystem, which considers change over time, are not examined explicitly. The microsystem encompasses individuals' immediate environments and relationships; the mesosystem captures interactions between these settings; the exosystem encompasses wider social, organizational, and community systems that indirectly shape individual experiences; and the macrosystem reflects broader societal values, structures, cultures, and policies.

For this review, the model is adapted to align with the context-mechanism-outcome (CMO) formulation used in realist inquiry. Contexts are understood as conditions operating across socio-ecological levels; mechanisms as the facilitators and

barriers through which age-friendly community interventions operate; and outcomes as their effects on older adults' climate resilience. For example, an older adult's experience during an extreme heat event may be shaped by immediate social relationships and living environments at the microsystem level, connections between family, community, and service networks at the mesosystem level, local infrastructure and municipal services at the exosystem level, and broader public health policies, planning approaches, and societal responses to climate risk at the macrosystem level. Age-friendly interventions may operate across these systems, although this review focuses primarily on the exosystem and macrosystem.

2.2 Eligibility Criteria

2.2.1 Literature Review. To ensure the relevance of included literature, predefined inclusion and exclusion criteria were applied. Publications from 2007 to 2025 were eligible for inclusion. The lower date limit reflects the publication of the WHO Age-friendly Cities and Communities (AFCC) Framework in 2007, which marked a significant expansion of age-friendly community initiatives internationally. Haq and Gutman's (2014) work on climate gerontology subsequently drew greater attention to the relationship between population aging and climate change within gerontological scholarship. Only English-language publications were included. Both peer-reviewed and grey literature were eligible where they addressed all three core concepts: older adults, climate resilience, and age-friendly communities or interventions.

Studies were eligible for inclusion where populations were identified as older adults, with a minimum age threshold of 55 years permitted to accommodate variation in definitions of older adulthood across geographic and population contexts. However, the majority of included studies focused on adults aged 60 years and above, with only a minority including younger age groups. The broader eligibility threshold reflects definitions used in several Canadian municipal seniors strategies, including those of the City of Vancouver and City of Richmond, and recognises that chronological age may not fully capture experiences of accelerated ageing among populations exposed to cumulative disadvantage, including people who have experienced homelessness (Canham & Henwood, 2025). Age-friendly communities and interventions were defined as programs, policies, or initiatives operating primarily at the local or community level that seek to promote older adults' well-being, participation, or inclusion. Climate resilience was defined in accordance with the definition provided in the Introduction.

The literature search was conducted globally rather than being restricted to Canada. This broader scope reflected the limited Canadian-specific evidence base and enabled the review to identify mechanisms and approaches from international age-friendly and climate-resilience initiatives that may be relevant to the Canadian context.

Exclusion criteria included publications produced before 2007, non-English-language publications, review articles, news articles and blogs, and publications that did not address all three core concepts. Reference lists of relevant review articles were also searched to identify additional potentially eligible sources.

2.2.3 Jurisdiction Scan. The jurisdictional scan applied the same publication date and language criteria and focused on Canadian age-friendly community strategies, policies, and frameworks. Eligible documents were municipal strategies or policy documents intended to increase age-friendliness, age inclusion, or the well-being of older adults within a community. Only strategies and policies that were active at the time of the scan were included; expired strategies were excluded. All eligible municipal seniors strategies and related policy documents that were publicly available online were included in the analysis.

2.3 Search Strategies and Databases

2.3.1 Literature Search. Global Health, Web of Science, and Scopus were searched for relevant literature. AgeLine was not included because preliminary searches yielded few relevant records. Targeted searches were also conducted in *The Gerontologist*, *Canadian Journal on Aging*, and *Ageing & Society* because of their relevance to aging research and, particularly for the *Canadian Journal on Aging*, the Canadian context.

The search strategy was developed in consultation with a gerontology subject librarian and is presented in Table 1. Search strings followed the Population, Concept, and Context framework and were adapted to the syntax of each database. Google Scholar was used to identify grey literature and additional sources that may not have been captured through database searches. Citation snowballing was also undertaken to identify further relevant studies.

Table 1: Rapid Realist Review Preliminary Literature Search Strategy

Databases	**Web of Science, Scopus, Global Health, Environment Complete**
Journals	Gerontologist, Canadian Journal on Aging, Ageing & Society
Published Dates	2007-2025
Language	English
Geography	Worldwide
Key Words	**Population** seniors OR elderly OR "older persons" OR "older adults" OR gerontolog* OR geriatr* OR aging OR aging OR “aged 55 and older”
	Concept <u>Age-friendly environment</u> “Age friendly cit*” OR “age friendly commun*” OR "age friendly environment*" OR “age-friendly comm*” OR “Age-friendly environment*” OR “Age-inclusive” OR “age inclusive” OR “healthy aging” OR “healthy aging” <u>Climate resilience</u> “Climate resilience” OR “climate change” OR “global warming” OR “extreme weather”
	Context intervention OR policy OR mitigation OR program* OR adaptation OR response OR preparedness

2.3.2 Jurisdiction Scan. The jurisdiction scan was completed through identifying Canadian cities and communities that have made a commitment to age-friendliness through membership in the WHO Global Network for Age-friendly Cities and Communities or in the Network’s provincial or territorial counterparts. After communities with age-friendly commitments were identified, their websites were searched to find relevant policy documents. The naming conventions for these strategies may vary by jurisdiction, but examples include seniors strategy, older persons strategic framework, and age-friendly community action plan. Strategies that were only available in French were excluded. Once

the strategies were identified, they were searched for the following key words: climate, global warming, weather, heat, and emergency.

2.4 Screening and Study Selection

The review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) checklist (Tricco et al. 2018). The initial search identified 85 records. After duplicates were removed, 62 records remained for screening. Two team members (MO and MLF) independently screened the titles and abstracts of published and grey literature identified through the search process. Of these, 30 records underwent full-text review against the predefined eligibility criteria. Sources were included only if all inclusion criteria were met, and disagreements were resolved through discussion between reviewers. Screening and study selection were managed using Covidence. The study selection process is summarized in the PRISMA flow diagram in Figure 2.

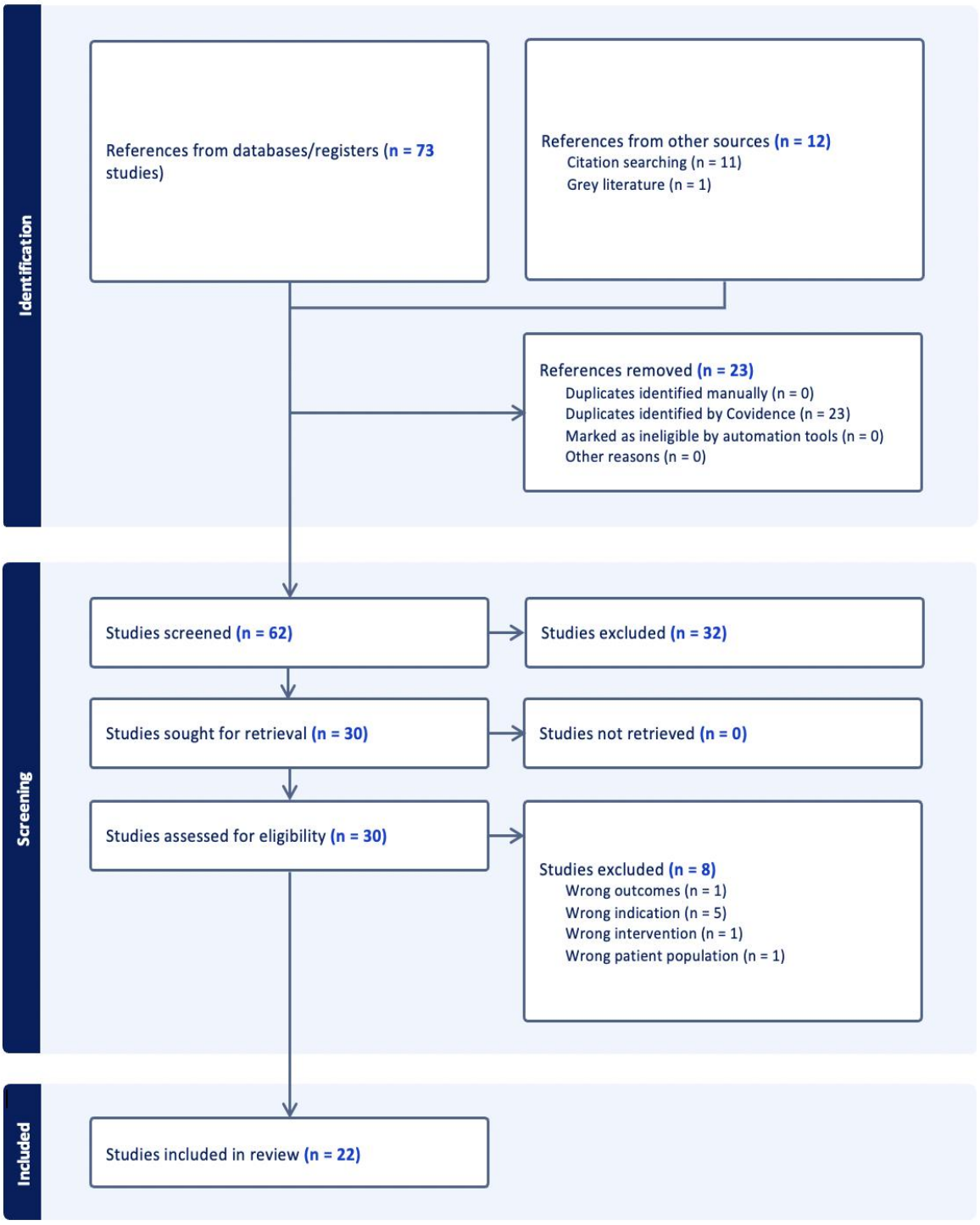


Figure 2. PRISMA-ScR flow diagram of study identification, screening, eligibility, and inclusion.

2.5 Data Extraction, Charting, Analysis, and Synthesis

Data were extracted and charted using a spreadsheet developed to reflect the RRR approach and research question. For the literature review, extracted data included study characteristics, context, key findings, mechanisms and outcomes related to older adults' climate resilience, intervention level, and relevant AFCC domains. For the jurisdictional scan, extracted data included location, publication details, and actions related to climate change, weather, and emergency preparedness.

2.6 Key Informant Interviews

Preliminary findings were discussed with three key informants to provide additional policy and scholarly context for the literature review and jurisdictional scan. Informants included two municipal policymakers involved in seniors planning and one international academic with expertise in the topic area. Municipal interviews focused on the relevance and applicability of findings within the Canadian policy context, while the academic interview helped validate findings and consider their broader international implications. Stakeholder feedback informed interpretation and recommendations for strengthening age-friendly climate resilience.

Key informants participated in semi-structured interviews guided by questions in Supplementary File A. Ethical approval for this component was obtained from the Simon Fraser University Research Ethics Board, and all participants provided informed consent. Notes were taken during and immediately after interviews to capture key points relevant to the review. As municipal informants spoke in their professional capacities but not on behalf of their municipalities, findings are reported in aggregate to protect confidentiality.

3. Findings

Twenty-two sources were included in the RRR, representing a geographically diverse but uneven evidence base. The literature comprised empirical studies involving older adults, alongside policy analyses, observational research, and conceptual contributions for which participant age thresholds were not applicable. While definitions of older adulthood varied across studies, the review primarily concerned populations aged 60 years and above, with some studies including younger age groups where relevant to aging-related experiences and outcomes.

Sources examined contexts in Canada (Krawchenko et al., 2016; Rapaport et al., 2015), the USA (Kaldes, 2022; Rao et al., 2024; Shen et al., 2023; Shih et al., 2018; Thompson et al., 2025), the UK (Woolrych et al., 2023; Zaninotto et al., 2025), Australia (Appleby et al., 2017; Wilson et al., 2021), Portugal (Samora-Arvela et al., 2025), Hong Kong (Kwan & Tam, 2021; Peng & Maing, 2021), Kenya and Ghana (Muhonja et al., 2024), China (Zhang et al., 2025), and several multinational settings (Dikken et al., 2023; Dikken et al., 2025; Van Hoof et al., 2021; van Hoof et al., 2024; Van Hoof et al., 2025; Yang et al., 2021). The evidence base was weighted toward Western contexts, with Latin America, Africa, and the Middle East particularly underrepresented. Table 2 summarises the characteristics of the included sources, including publication type, geographic setting, and study design.

Table 2. Descriptive Data of Studies included in the RRR

Author	Year	Publication Type	Journal	Region	Study Design
Appleby et al.	2017	Journal Article	Australian Social Work	Australia	Content analysis of local government documents
Dikken et al. (2025); Van Hoof et al. (2024); Dikken et al. (2023)	2025	Journal Article	Renewable and Sustainable Energy Reviews	Poland, North Macedonia, Romania, the Netherlands and Israel	Survey
Kaldes	2022	Editorial	Generations	USA	Essay
Krawchenko et al. (2016) and Rapaport et al (2015)	2016	Journal Article	Journal of Rural Studies	Canada (Nova Scotia)	Observational case study, multi-methods approach
Kwan & Tam	2021	Journal Article	Sustainability	Hong Kong	Qualitative study
Muhonja et al.	2024	Book chapter	Sustainable Aging	Kenya and Ghana	Conceptual chapter
Peng and Maing	2021	Journal Article	Cities	Hong Kong	Observational study, using field measurements and observations
Rao et al.	2024	Journal Article	International Journal of Disaster Risk Science	USA (Ohio)	Comparative multi-case study
Samora-Arvela, et al.	2025	Journal Article	Cities & Health	Portugal (Lisbon)	Case study using Delphi survey
Shen et al.	2023	Journal Article	Sustainability	USA (Hawaii)	Observational case study, mapping census data and climate projections
Thompson, et al.	2025	Journal Article	Activities, Adaptation & Aging	USA	Cross-sectional secondary data analysis

Author	Year	Publication Type	Journal	Region	Study Design
Van Hoof et al. (2025); Van Hoof et al. (2021)	2025	Journal Article	Building and Environment	Multinational	Theoretical review
Woolrych et al.	2023	Grey literature report	N/A	UK	Multimethod, including stakeholder events and dialogue workshops
Wilson et al	2021	Journal Article	Australasian Journal on Ageing	Australia	Focus groups
Yang et al.	2021	Journal Article	Sustainable Cities and Society	Europe	Observational study using multilevel logistic regression analysis
Zaninotto, et al.	2025	Journal Article	PLOS Climate	UK	Multiple methods, including cognitive testing and expert panel reviews
Zhang et al.	2025	Journal Article	Sustainability	China (Shenyang)	Field experiments
Shih	2018	Journal Article	Rand Health Quarterly	USA	Semi-structured interviews

None of the included sources explicitly engaged with Indigenous Elders' knowledge or practices related to environmental sustainability and climate resilience. This represents an important gap, particularly given the relevance of Indigenous knowledge systems to aging, place, environmental stewardship, and climate adaptation, as well as the disproportionate climate-related risks experienced by many Indigenous communities.

The included evidence comprised one grey literature report (Woolrych et al., 2023), one editorial (Kaldes, 2022), one book chapter (Muhonja et al., 2024), and two theoretical discussions or critiques of the AFCC framework (van Hoof et al., 2021; van Hoof et al., 2025); the remaining sources were peer-reviewed empirical studies. All included sources were published between 2015 and 2025, indicating that explicit attention to the intersection of aging, age-friendly communities, and climate resilience is relatively recent.

Across the included literature, climate resilience was shaped by interacting contextual conditions and mechanisms operating at individual, community, planning, and policy levels. Key mechanisms included social connectedness, emergency preparedness, land-use and urban planning, age-friendly design, access to information and services, cross-sectoral collaboration, and the inclusion of older adults in climate-related decision-making. These mechanisms produced outcomes related to adaptation, preparedness, mobility, social participation, sustainable aging, and broader climate resilience. Table 3 summarizes the main findings of the review using the context-mechanism-outcome structure, alongside intervention level and relevant AFCC domains.

Table 3. Literature Review Results with Context, Mechanism, and Outcomes

Author	Year	Main findings	Context	Mechanism	Outcome	Level of intervention	AFCC domain(s)
Appleby et al.	2017	Varying levels of action to address climate adaptation in different plans. Best practices include the Cool Shade Program and the Linking Neighbours Community Register and Seniors Register. More coordinated action is needed. References to older people in adaptation plans limited.	Climate change broadly, including extreme weather, bushfires, natural disasters and higher food prices.	Local government policy	Climate resilience and adaptation	Local government policy	Multiple domains, not otherwise specified
Dikken et al. (2025); Van Hoof et al. (2024); Dikken et al. (2023)	2025	Four typologies were revealed: inactive people with limited financial resources, active and belief driven people with limited financial resources, inactive believers, and affluent and engaged people. Financial constraints shape climate resilience behaviour. Tailoring policies and interventions to the specific situations of each typology is necessary.	Climate change broadly understood	Government policy tailored to the finances, beliefs, and behaviours of each typology.	Climate resilience	Policy, individual responses	Multiple domains, including outdoor space and buildings
Kaldes	2022	Argues that the field of aging must include climate action in its policy agenda, focusing on health policy, climate justice, emergency preparedness, and volunteerism.	Climate change is broadly understood, with an emphasis on climate justice	Advocacy through research and policy discussions through the American Society on Aging.	Climate resilience	Research and policy	Not specified

Author	Year	Main findings	Context	Mechanism	Outcome	Level of intervention	AFCC domain(s)
Krawchenko et al. (2016) and Rapaport et al (2015)	2016	Community assets important to seniors are impacted by coastal climate change under flood scenarios. Municipal planning is not well adapted to address climate change impacts on seniors. Place and social vulnerability need to be embedded in age-friendly community planning.	Coastal flooding and sea level rise	Community and regional planning. Align land use planning practices with age-friendly community guidelines. Integrate geographical context, social fabric, and hazard risk into strategy development. Require local governments to implement flood plain mapping and zoning.	Climate resilience	Policy	Multiple domains, including transportation
Kwan & Tam	2021	Key dimension for aging in place (AIP) for older adults in Tai O is ability to sustain and continue their work. Local community-based organizations play key support during disasters. More support and resources are needed for mitigation. Older residents may not use available supports due to self-reliance and difficulties in asking for help.	Natural disasters in rural coastal community	Multiple mechanisms, including connecting AFC initiatives with disaster risk reduction. Relocation/resettlement efforts must embrace AIP principles. Further exploration of why older adults may not seek help is needed.	Climate resilience while aging in place	Community supports, individual behaviours	Multiple domains, including housing, health, and social participation
Muhonja et al.	2024	Adaptation occurs at four levels: process, behavioral, structural, and physiological. Details an adaptation mitigation approach, and suggests structural interventions like early warning systems and recovery mechanisms.	Climate change is broadly understood, emphasizing heat waves, floods, and famine	Integrated approach for climate change adaptation involving healthcare, social care, urban planning, and disaster preparedness.	Sustainable aging (as including climate resilience for older adults)	Policy and community	Multiple domains, including health, transportation, and communication

Author	Year	Main findings	Context	Mechanism	Outcome	Level of intervention	AFCC domain(s)
Peng and Maing	2021	The study identifies four influential factors for age-friendly open space design: mean radiant temperature (MRT), air temperature, greenery, and outdoor seating. The study proposes guide points for improving age-friendly design, including well-shaded surroundings, greenery, awareness of thermal conditions, and seating	Hot weather	Design of urban environment and adaptive behaviours of seniors	Climate resilience	Policy	Outdoor spaces and buildings
Rao et al.	2024	78% percent of older adults in the sample reported being prepared for emergencies according to FEMA guidelines. Notable variation in preparedness levels among counties. Lower income county less prepared, and more socially vulnerable.	Emergency preparedness	Focusing interventions on more socially vulnerable, lower income communities. Knowledge translation and communication techniques must understand needs of community and provide tailored evacuation plans, and reliable information on preparedness and response.	Climate resilience (Emergency preparedness)	Policy, individual preparedness	Multiple domains, including communication, health
Samora-Arvela, et al.	2025	Climate mitigation and active mobility infrastructure in Lisbon do not adequately consider needs of older people. Results of Delphi survey recommend separating bike lanes from pedestrian lanes to be more age-friendly	Climate change is broadly understood	Urban planning to promote active mobility for all ages	Climate mitigation	Planning and policy	Transportation

Author	Year	Main findings	Context	Mechanism	Outcome	Level of intervention	AFCC domain(s)
Shen et al.	2023	Without changing land use planning, the number of older adults further than 8 minutes aware from emergency and healthcare service will double by 2050. Relocation and redevelopment strategies significantly mitigate risks. Proposes promoting growth in safer locations with better access to essential services and amenities and current and future elderly residents about climate change risks and access to medical and emergency services.	Sea level rise	Land use planning in less vulnerable zones	Climate resilience for older adult residents	Planning and policy	Transportation, health services, housing
Thompson et al.	2025	Social connections are important to emergency preparedness. Having previously discussed evacuation plans with friend or neighbour associated with higher emergency preparedness. Living alone and having a Hispanic background associated with lower levels of preparedness.	Emergencies, such as extreme weather	Individual emergency preparedness and promoting a collective culture of preparedness. Healthcare providers and community groups can promote age-friendly materials to enhance knowledge of local risks.	Climate resilience (Emergency preparedness)	Individual and community	Social participation, community and healthcare, communication and information
van Hoof et al. (2025); van Hoof et al. (2021)	2025	Explores key questions about older people and sustainable built environments, highlighting physical and financial barriers to sustainable practices, energy poverty, and the importance of empowering older adults as co-creators of sustainable environments.	Climate change broadly understood	Multiple mechanisms, largely through policy targeting equity, financial barriers, and empowerment of older adults as co-creators of sustainable environments	Climate resilience	Policy	Respect and social inclusion

Author	Year	Main findings	Context	Mechanism	Outcome	Level of intervention	AFCC domain(s)
Woolrych et al.	2023	The study identified six key areas: empowering older people towards climate action, mobilizing community and social infrastructure, enhancing mobility and transport for healthy aging, climate resilient housing for aging in place, healthcare and wellbeing for older adults in extreme weather, intergenerational communities. Emphasizes place-based care, with health and social care services being brought closer to older individuals' homes to ensure access during extreme weather events.	Climate change is broadly understood, with a strong emphasis on extreme weather	Link key determinants of healthy aging-in-place (e.g., housing, transport, outdoor spaces) or climate resilience in cross-sectoral policies and initiatives. Emphasizes importance of empowering older people	Climate resilience	Policy, community	Housing, respect and social inclusion, outdoor spaces, health and community services, transportation
Wilson et al	2021	A reliable and relevant app for negotiating external environment during extreme weather and changing environmental conditions could be useful, if it provides accurate, up-to-date transport information, community events, and weather.	Extreme weather	Smartphone application to navigate local environment, to support walking and social engagement	Increased activity and social engagement during extreme weather, supporting climate resilience	Individual	Communication and information
Yang et al.	2021	Cities with a higher proportion of elderly citizens are more likely to adopt climate change adaptation policies, as are cities with a higher GDP and cities national climate adaptation policy.	Climate change broadly understood	Municipal climate adaptation policies, which focus on inclusion and participation of vulnerable groups.	Climate resilience	Policy	Multiple domains, not otherwise specified

Author	Year	Main findings	Context	Mechanism	Outcome	Level of intervention	AFCC domain(s)
Zaninotto, et al.	2025	ClimateMind50+ questionnaire tailored to older adults (50+) to ensure their perspectives, concerns, and adaptive capacities are captured. Applications of questionnaire can inform policies by identifying areas of concern, knowledge gaps, preparedness challenges, and engagement with climate action.	Climate change broadly understood	Using ClimateMind50+ questionnaire to amplify needs of older adults in climate policy	Climate resilience	Policy and research	Not specified
Zhang et al.	2025	Sustainable urban design influences health outcomes through both direct physiological pathways and indirect psychological mediation. Females exhibit higher environmental sensitivity than males.	Cold climate and weather	Built environment interventions, including vegetation belts, covered rest areas and windbreak elements.	Climate resilience	Community planning	Outdoor spaces and public buildings, transportation
Shih	2018	Most age-friendly communities and senior villages do not place a high priority on promoting disaster preparedness. Staff in senior villages do not have feel they have time or expertise to place more emphasis on preparedness, and did not feel a demand from seniors to provide more preparedness initiatives. Health department programming not necessarily tailored to older adults.	Natural disasters	Multiple mechanisms at different levels, including partnerships between cross sectoral partnerships and addressing resource constraints. Registries of isolated seniors, and other methods to reach older adults in emergencies, are incorporated into preparedness planning.	Climate resilience (Emergency preparedness)	Conceptual (linking the AFCC framework to climate resilience); policy (health department actions); community (emergency preparedness programming); and individual (personal preparedness actions).	Multiple domains, including communication, health and social participation

3.1 Jurisdictional scan

A total of 92 municipal seniors strategies across eight Canadian provinces were identified and analyzed (Supplementary File B). Ontario (n=42) and British Columbia (n=32) accounted for the largest share of included strategies, while no eligible municipal seniors strategies were identified online for Nova Scotia or Prince Edward Island. All 92 strategies drew on the WHO Age-friendly Cities and Communities (AFCC) Framework or a locally adapted version of it. Table 4 summarizes the distribution of included strategies by province and the number explicitly addressing climate change.

Table 4. Count of Seniors Strategies Included in Analysis by Province

Province	Count of Seniors Strategies Included in Analysis	Count of Seniors Strategies that Discussed Climate Change
Ontario	42	5
British Columbia	32	5
Alberta	7	0
Saskatchewan	5	0
New Brunswick	2	1
Quebec	2	0
Manitoba	1	0
Newfoundland and Labrador	1	0

Climate change was largely absent from municipal seniors strategies. Of the 92 strategies reviewed, 81 did not explicitly discuss climate change, while only 11 did so, and in several cases only briefly. Five of these 11 strategies addressed climate change indirectly by linking the seniors strategy to climate-related actions contained in other municipal plans. Strategies that explicitly referenced climate change were found only in

British Columbia, Ontario, and New Brunswick. Table 5 summarizes the climate-related actions identified across these strategies.

Table 5. Climate Change in Canadian Municipal Seniors Strategies

Action	Strategies
Links seniors strategy to climate-related actions in other strategies	● **City of Brantford, ON** ● **Township of Middlesex Centre, ON** ● **County of Brant, ON** ● **City of Richmond Hill, ON** ● **City of Kelowna, BC**
Extreme weather check-ins	● **Town of Caledon, ON** ("advocate for increased preventative, remedial and emergency health-check programs designed to mitigate the impacts of extreme weather, loneliness, and social isolation" (p. 27)) ● **Fredericton, NB** ("promote informal systems of home checks by neighbours, particularly during power outages and extreme weather conditions" (p.4); "expand and sustain Neighbourhood Watch to include looking out for isolated seniors, including during inclement weather" (p.4))
Raise awareness of heat preparedness resources	● **City of Surrey, BC** (raise awareness of emergency program, notifications and heat preparedness resources)
Evaluate accessibility of City communication methods and platforms during emergencies	● **City of Richmond, BC** ("evaluation of accessibility of City communication methods and platforms to improve ways to connect with and support potentially isolated seniors, their families and caregivers during public health or weather emergencies." (p.49))
Accessible extreme weather response sites (e.g. cooling spaces)	● **City of New Westminster, BC**
Supports for emergencies and climate change impacts	● **City of Vancouver, BC** ("Supports are in place to prepare for emergencies and climate change impacts" (p.14) listed as strategic objective under domain 6 "Older persons in Vancouver… are supported by programs and services that enable health and wellbeing" (p.14))

Where climate change was addressed, actions were generally narrow and practical rather than integrated across the full AFCC framework. These included extreme-weather check-ins, heat-preparedness communication, accessible emergency communication,

extreme-weather response sites, and broad commitments to supporting older adults during emergencies and climate-related impacts. New Westminster was the only municipality to explicitly connect climate-related action to the outdoor spaces and buildings domain through accessible extreme-weather response sites. This is particularly notable given that only 62.6% of older adults in Canada, and 31.4% in British Columbia, have household air conditioning (Quick & Tjepkema, 2023). Three strategies also specifically targeted socially isolated older adults through check-in programs or improved emergency communication.

Although explicit references to climate change were uncommon, related concerns appeared more frequently through weather and emergency preparedness. Sixteen strategies included weather-related actions and 27 addressed emergency preparedness, suggesting that climate-relevant activities are often present without being framed explicitly as climate resilience.

Weather-related actions were concentrated in British Columbia, Ontario, and New Brunswick and focused primarily on mobility and access. Common actions included snow and ice removal, weather protection at bus stops, sidewalk and trail maintenance, and improving the visibility of accessible parking during inclement weather. Greater Sudbury was the only municipality to identify increasing shade in parks and greenspaces, while Simcoe County was the only strategy to explicitly connect weather conditions with social participation through weather-appropriate recreation. Table 6 summarizes these weather-related actions.

Table 6. Weather in Canadian Municipal Seniors Strategies

Action	Strategies
Weather-appropriate recreation	● **Simcoe County, ON** ("promote indoor walking clubs for periods of poor weather" (p.37))
Sidewalk and trail maintenance during inclement weather	● **Town of Olds, AB** ● **District of Mackenzie, BC** ● **Fredericton, NB**
Weather protection at bus stops	● **District of Lantzville, BC** ● **City of Colwood, BC** ● **Village of Burns Lake, BC** ● **City of Rossland, BC** ● **City of New Westminster, BC** ● **City of Greater Sudbury, ON**
Snow removal	● **Town of Caledon, ON** ("Implement snow and ice removal programs" (p.30)) ● **Town of Northeastern Manitoulin & the Islands, ON** (implement neighbourly programs like Snow Angels and assess snow removal needs) ● **Town of Golden, BC** ("Snow removal of roads and parking areas is prompt" (p.172) ● **City of Pitt Meadows, BC** ("Educate residents and business owners on City snow removal bylaws and enforce regulations" (p.13) and reinstate snow angels program) ● **Town of Kirkland Lake, ON** (search for ways to improve snow removal, including exploring bylaw changes)
Increasing shade in parks and greenspaces	● **City of Greater Sudbury, ON**
Evaluate City communication methods to connect with seniors during public health and weather emergencies	● **City of Richmond, BC** ("evaluation of accessibility of City communication methods and platforms to improve ways to connect with and support potentially isolated seniors, their families and caregivers during public health or weather emergencies" p.49)
Require vertical signposts to demarcate accessible parking to increase visibility during inclement weather	● **Town of Gibsons, BC ("**Enforce the bylaw to require vertical signpost to demarcate accessible parking instead of painting symbol on road surface. Vertical sign will increase visibility during inclement weather" (p.14))
Emergency check-ins (extreme weather)	● **Town of Caledon, ON** ● **Fredericton, NB**

Emergency preparedness was more prominent than either climate change or weather. Strategies addressing emergency preparedness were identified in British Columbia, Saskatchewan, Ontario, and New Brunswick, with British Columbia most strongly represented. Actions included developing or reviewing emergency plans through an age-friendly lens, raising awareness through workshops and public information, establishing check-in mechanisms, improving emergency communication, and developing targeted resources for older adults. Some strategies also moved beyond individual preparedness to address institutional capacity. For example, Saskatoon called for mandatory age-friendly education for police, firefighters, and other emergency responders, while several municipalities proposed senior-specific emergency protocols, registries of vulnerable residents, or accessible evacuation and shelter arrangements. Table 7 provides an overview of these actions.

Table 7. Emergency Preparedness in Canadian Municipal Seniors Strategies

Action	Strategies
Links seniors strategy to emergency-preparedness-related actions in other strategies	• **City of Beaumont, AB**
Emergency protocol or strategy	• **City of Maple Ridge, BC** ("Establish a seniors' emergency preparedness protocol including mapping location of vulnerable residents; Develop evacuation procedures; Sheltering protocol; meeting medical needs" (pp.38-39)) • **City of Pitt Meadows, BC** ("Establish a seniors' emergency preparedness protocol" (p.25)). • **City of Port Moody, BC** ("Develop a senior-specific emergency preparedness strategy for use in disaster response planning. Use the World Health Organization document 'Older People in Emergencies: Considerations for Action and Policy Development' as a guide." (p.40)) • **Village of Canal Flats, BC** ("Apply an Age-Friendly lens when updating the Village's Emergency Response Plan" (p. 8)) • **City of Montreal West, QC** ("Establish a plan of action to reach seniors in times of emergency: seek to identify isolated or vulnerable seniors; create mechanisms for communicating with them, particularly in times of emergency; collaborate with existing Emergency Preparedness programs" (p.13)) • **District of Mackenzie, BC** ("Review and update emergency preparedness plans to address the needs of people with disabilities specifically. This should include accessible emergency shelters, clear evacuation routes, and accessible emergency communication systems for all residents." (p.23)) • **City of Fredericton, NB** ("Take a careful and thorough look at emergency preparedness at a city-wide level; Develop a registry of vulnerable seniors who would be in need of assistance in an emergency" (p.4))
Emergency check-ins	• **Town of Caledon, ON** • **City of Fredericton, NB**
Creation of emergency preparedness workbook for seniors	• **City of Peterborough, ON**
Awareness-raising (workshops)	• **Township of Black River-Matheson, ON** • **City of Burlington, ON** • **Saskatoon, SK** • **Town of Northeastern Manitoulin & the Islands,**

Action	Strategies
	ON ● **Richmond Hill, ON** ● **Simcoe County, ON**
Awareness-raising (general)	● **City of Elliot Lake, ON** ("Increase awareness and knowledge of Elliot Lake's Emergency Plan" (p.10)) ● **City of Edmonton, AB** ("Seniors and senior organizations are informed about fire safety and personal emergency preparedness (p.43)" ● **City of Maple Ridge, BC** ("Offer education to vulnerable populations regarding importance of emergency preparedness" p.38) ● **City of Pitt Meadows, BC** (Offer education to vulnerable populations regarding importance of emergency preparedness" p.25) ● **City of Victoria, BC** ("Promote Emergency Preparedness program training for seniors" (p.7)) ● **City of Surrey, BC** (raising awareness of emergency preparedness app and heat season preparedness) ● **City of Saanich, BC** ("Improve promotion of emergency preparedness training and volunteer opportunities with the Emergency Program" (p.23))
Education for first responders	● **Saskatoon, SK** ("Implement mandatory age-friendly education for police, firefighters and other emergency responders" (p. 24))
Volunteer opportunities	● **City of Saanich** ("Enhance the awareness of meaningful volunteer opportunities such as the Emergency Program through communication and partnership" (p. 21))
Communication	● **Riverview, NB** (test emergency alerts system) ● **Town of Gibsons, BC** (creation and editing of website pages dedicated to emergency preparedness) ● **City of Richmond, BC** ("evaluation of accessibility of City communication methods and platforms to improve ways to connect with and support potentially isolated seniors, their families and caregivers during public health or weather emergencies" (p.49))
Extreme weather response sites	● **City of New Westminster, BC** ("explore establishment of an accessible extreme weather response site" (p.21))
General	● **City of Vancouver, BC** ("Supports are in place to prepare for emergencies and climate change impacts" (p.14))

In sum, the jurisdictional scan suggests that Canadian municipal seniors strategies rarely conceptualize climate resilience as an integrated component of age-friendly planning. Climate-related concerns are more often addressed indirectly through discrete actions related to emergency preparedness, weather, transportation, communication, or social isolation. This fragmentation indicates an important opportunity to more explicitly embed climate resilience across AFCC domains rather than treating it as a separate or episodic concern.

3.2 Context-Mechanism-Outcome Synthesis

The literature identified interacting contextual conditions and mechanisms operating across individual, community, institutional, and policy levels. Consistent with the socio-ecological framework guiding this review, climate resilience was not produced by any single intervention but by the interaction between older adults' circumstances, social and physical environments, and broader planning and policy systems.

3.2.1 Context: How does climate change interact with socio-ecological systems for older adults?

Most included studies considered climate change broadly, encompassing extreme weather, bushfires, natural disasters, and food insecurity. Three focused specifically on extreme heat or cold weather (Peng & Maing, 2021; Wilson et al., 2021; Zhang et al., 2025), three on emergency preparedness and natural disasters (Rao et al., 2024; Shih et al., 2018; Thompson et al., 2025), and three examined aging in place in rural or coastal communities facing sea-level rise or increasing climate-related hazards (Krawchenko et al., 2016; Kwan & Tam, 2021; Shen et al., 2023).

At the individual and immediate social level, adaptive capacity is shaped by health, behaviour, socioeconomic circumstances, and access to support. Muhonja et al. (2024) conceptualize climate adaptation as involving behavioural, physiological, process, and structural dimensions. Older adults may face reduced physiological or mobility-related capacity to adapt during emergencies, while socioeconomic disadvantage can further constrain preparedness. Rao et al. (2024), for example, found lower emergency preparedness among older adults in lower-income counties, while Thompson et al. (2025) identified disparities associated with ethnicity and living arrangements. Energy poverty similarly constrains older adults' ability to respond to changing environmental conditions (van Hoof et al., 2021; 2025).

Beliefs and behaviours also shape responses to available support. Kwan and Tam (2021) found that some older adults in rural Hong Kong did not access disaster-related resources because of strong norms of self-reliance, illustrating how cultural and personal factors can influence whether formal supports are used.

Social connectedness is another important contextual condition. Older adults who had discussed evacuation plans with friends or neighbours reported greater emergency preparedness, while living alone was associated with lower preparedness (Thompson et al., 2025). Community organizations can therefore provide important support during climate-related events (Appleby et al., 2017; Kwan & Tam, 2021). Resilience is also shaped by local infrastructure and planning, including land use (Shen et al., 2023), active transportation (Samora-Arvela et al., 2025), and access to green space and rest areas (Peng & Maing, 2021; Woolrych et al., 2023; Zhang et al., 2025).

Place further conditions both exposure and available responses. Rural and coastal communities may face distinctive hazards and constraints in accessing services and infrastructure. However, only two included studies focused specifically on rural populations (Krawchenko et al., 2016; Kwan & Tam, 2021), limiting conclusions about what works across rural, suburban, and urban contexts.

At the broader policy level, municipal capacity and national policy environments also shape climate resilience. Yang et al. (2021) found that European cities with larger older populations, higher GDPs, and national climate adaptation policies were more likely to adopt municipal climate adaptation policies. Equally important is how age-friendly planning itself is conceptualized. Scholars have argued that climate resilience remains insufficiently integrated into age-friendly policy and practice (Krawchenko et al., 2016; Dabelko-Schoeny, 2024; Patrick et al., 2025). This finding was reinforced by the jurisdictional scan: although all included Canadian seniors strategies drew on the AFCC framework, climate change was rarely incorporated explicitly.

3.2.2 Mechanisms: How do age-friendly interventions support climate resilience?

As relatively few included studies formally evaluated interventions, the mechanisms identified here should be interpreted as promising rather than definitive explanations of what works.

Individual and interpersonal mechanisms. Information, preparedness, and tailored support can strengthen older adults' capacity to respond to climate-related hazards. Wilson et al. (2021) identified the potential of a smartphone application providing weather, transportation, and community information to support mobility and social

engagement during extreme weather. Similarly, 11 Canadian seniors strategies promoted workshops, educational resources, or awareness of existing emergency programs. These interventions aim to strengthen individual knowledge and preparedness and are comparatively feasible to implement, although their effectiveness depends on accessibility and whether digital, language, cognitive, and other barriers are addressed.

Tailoring interventions to differences among older adults is also important. Dikken et al. (2023; 2025) and van Hoof et al. (2024) demonstrate substantial variation in older adults' financial resources, climate beliefs, and behaviours, suggesting that uniform approaches are unlikely to be effective across populations. Zaninotto et al.'s (2025) ClimateMind50+ similarly provides a mechanism for identifying differences in adaptive capacity, concerns, and engagement with climate change, enabling interventions to respond more closely to older adults' circumstances.

Social relationships can further support preparedness and resilience. Neighbour check-ins, informal support networks, and discussions of evacuation plans can reduce isolation and provide assistance during emergencies (Thompson et al., 2025; Woolrych et al., 2023). Several Canadian seniors strategies similarly promoted neighbour-based check-ins or other mechanisms for reaching isolated older adults.

Community and institutional mechanisms. The literature identified several ways in which local environments, services, and organizations can create enabling conditions for climate resilience. Urban greening, shaded spaces, vegetation, rest areas, and other climate-responsive design features can reduce exposure to extreme temperatures while supporting mobility and social participation (Peng & Maing, 2021; Woolrych et al., 2023;

Zhang et al., 2025). Canadian seniors strategies similarly identified actions such as snow removal, sidewalk maintenance, weather protection at transit stops, and increased shade in public spaces.

Transportation and land-use planning can also reduce vulnerability. Separated pedestrian and cycling infrastructure can support safe mobility (Samora-Arvela et al., 2025), while climate-sensitive land-use planning can reduce exposure to hazards such as sea-level rise and improve access to emergency and healthcare services (Krawchenko et al., 2016; Shen et al., 2023). Climate-resilient housing and access to effective heating and cooling similarly support aging in place under changing environmental conditions.

Community and healthcare organizations also provide important institutional mechanisms. Tailored emergency-preparedness programs can ensure that older adults receive appropriate information and resources (Shih et al., 2018), while collaboration between municipalities, healthcare providers, and community organizations can strengthen coordination during climate-related events (Kwan & Tam, 2021; Rao et al., 2024; Woolrych et al., 2023). Such approaches are likely to be particularly effective where strong community relationships and trust already exist or are actively cultivated.

Communication is a cross-cutting mechanism. Age-friendly emergency communications, weather information, voluntary registries of vulnerable residents, and targeted outreach can improve both preparedness and institutional response (Appleby et al., 2017; Wilson et al., 2019; Woolrych et al., 2023). However, these mechanisms depend on addressing digital exclusion, language barriers, cognitive impairment, and other factors that may limit access to conventional communication systems.

Structural and policy mechanisms. At the broader policy level, climate resilience depends on integrating age-friendly planning with climate adaptation rather than treating them as separate policy agendas. Krawchenko et al. (2016) identify limited attention to place-based climate vulnerability within the AFCC framework, while Patrick et al. (2025) similarly found weak integration between healthy aging and climate policy.

The jurisdictional scan provides evidence of this fragmentation. All 92 Canadian seniors strategies drew on the AFCC framework, yet only 11 explicitly referenced climate change. Many climate-relevant actions instead appeared indirectly through emergency preparedness, transportation, communication, or weather-related initiatives. This suggests that municipalities may already undertake actions that contribute to climate resilience without conceptualizing them as part of an integrated climate-resilient age-friendly agenda.

Older adults' participation is another important mechanism. The literature frequently positions older adults as vulnerable to climate change, but several studies emphasize their potential role as active contributors to resilience (Patrick et al., 2025; Woolrych et al., 2023). Intergenerational exchange, volunteering, co-production, and involvement in planning can mobilize older adults' knowledge and capabilities while challenging ageist assumptions about vulnerability and dependency. Yet these approaches were rarely evident in the Canadian seniors strategies reviewed.

3.2.3 Outcomes: What outcomes are associated with age-friendly interventions that support climate resilience?

Few age-friendly interventions have been formally evaluated for their effects on climate resilience, limiting definitive conclusions about outcomes. Nevertheless, the evidence suggests that climate-resilient age-friendly initiatives can contribute to several interconnected outcomes across the AFCC domains.

Built-environment and transportation interventions can support mobility, safety, health, and continued participation during extreme weather. Measures such as snow and ice removal, shaded infrastructure, accessible transit facilities, and climate-responsive public spaces can reduce environmental exposure while supporting aging in place.

Social and institutional interventions may strengthen preparedness and adaptive capacity. Informal support networks, neighbour check-ins, volunteer programs, and community organizations can reduce isolation and strengthen social connections during emergencies. Similarly, accessible communication systems, voluntary registries, and coordinated outreach can improve the ability of municipalities and service providers to reach older adults during climate-related events.

On the whole, these findings suggest that climate resilience is not confined to a single AFCC domain, but emerges through interactions across housing, transportation, outdoor environments, social participation, communication, health and community services, and broader systems of inclusion. This supports conceptualizing climate resilience as a cross-cutting component of the AFCC framework. Table 8 synthesizes

initiatives identified in the literature and Canadian seniors strategies across the eight domains, highlighting areas of alignment and key policy gaps.

Table 8. Initiatives in the Literature and Seniors Strategies Supporting Climate Resilience by AFCC Domain

AFCC Domain	Initiatives in the Literature	Initiatives in Seniors Strategies
Outdoor spaces and buildings	● Urban greening and access to green space (Woolrych et al., 2023; Zhang et al., 2025) ● Wayfinding to support people with mobility, cognitive, and sensory disabilities during extreme weather (Woolrych et al., 2023)	● Accessible extreme weather response sites (New Westminster, BC) ● Increasing shade and green spaces (City of Greater Sudbury, ON)
Transportation	● Age-friendly active transportation infrastructure, including separated pedestrian and biking lanes (Samora-Arvela et al., 2025) ● Shaded bus stops and resting points (Woolrych et al., 2023; Appleby et al., 2017) ● Climate-resilient transportation services to facilitate access to essential services (Woolrych et al., 2023)	● Weather protection at bus stops (District of Lantzville, BC; City of Colwood, BC; Village of Burns Lake, BC; City of Rossland, BC; City of New Westminster, BC; City of Greater Sudbury, ON) ● Sidewalk and trail maintenance for inclement weather (Town of Olds, AB; District of Mackenzie, BC; Fredericton, NB) ● Snow removal (Town of Caledon, ON; Town of Northeastern Manitoulin & the Islands, ON; Town of Golden, BC; City of Pitt Meadows, BC; Town of Kirkland Lake, ON)
Housing	● Land use planning considers climate risks like sea level rise and wildfires (Krawchenko et al., 2016; Shen et al., 2023) ● Energy-efficient housing equipped with cooling and heating (Woolrych et al., 2023) ● Senior living villages promote emergency preparedness for residents (Shih et al., 2018)	Not explicitly outlined in seniors strategies.
Community and healthcare	● Tailored emergency preparedness programs for older adults (Shih et al., 2018) ● Cross-sectoral collaboration (Woolrych et al., 2023; Appleby et al., 2017; Kwan & Tam, 2021) ● Civil aid officers, volunteers, and community organizations supporting preparedness and evacuation (Kwan & Tam, 2021)	● Age-friendly education for first responders (Saskatoon, SK)

AFCC Domain	Initiatives in the Literature	Initiatives in Seniors Strategies
Social participation	● Fostering intergenerational community and collaboration (Woolrych et al., 2023) ● Fostering "people helping people" initiatives (Woolrych et al., 2023)	● Extreme weather check-ins (Fredericton, NB; Caledon, ON) ● Promotion of weather appropriate recreation (Simcoe County, ON)
Respect and social inclusion	● Older adults as active agents (Woolrych et al., 2023), not victims (Patrick et al., 2025) ● Older adults as change makers (Stakeholder interview)	Not explicitly discussed.
Civic participation and employment	● Fostering volunteerism to support climate resilience (Kaldes, 2022) ● Older adults as change makers (Stakeholder interview)	● Promotion of Emergency Program volunteer opportunities (City of Saanich, BC)
Communication and information	● Apps to support navigation during weather emergencies (Wilson et al., 2021) ● Voluntary registries of vulnerable populations and older adults for emergency communications (Appleby et al., 2017) ● Creation of age-friendly guides about health during extreme weather (Woolrych et al., 2023)	● Evaluation of accessibility of City communication methods for emergencies (City of Richmond, BC) ● Emergency notifications system (City of Surrey, BC; Riverview, NB) ● Creation of age-friendly emergency preparedness workbook (City of Peterborough, ON) ● Awareness raising workshops (City of Elliot Lake, ON; City of Edmonton, AB; City of Maple Ridge, BC; City of Pitt Meadows, BC; City of Victoria, BC; City of Surrey, BC; City of Saanich, BC)

3.3 Key Informant Validation and Policy Context

The three key informants (one international expert in the area of climate adaptation alongside two municipal policy makers) broadly validated the findings of the literature review and jurisdictional scan while providing additional insight into their policy implications. The international expert indicated that the findings were consistent with the wider literature and highlighted the apparent absence of previous reviews examining how municipal seniors strategies incorporate climate change. They also emphasized the importance of positioning older adults as active agents rather than solely as populations vulnerable to climate impacts.

Municipal policy makers provided further insight into why climate resilience may be weakly represented in seniors strategies. The organizational location of seniors planning within municipal government can shape the priorities and actions included in a strategy. Both informants also emphasized efforts to avoid duplication between municipal departments: where climate adaptation is addressed in another strategy or department, it may not appear in the seniors strategy even when age-specific considerations could strengthen implementation. Competing priorities, including affordability, food security, and digital literacy, further influence what can feasibly be incorporated into municipal seniors plans.

At the same time, both policy makers confirmed the continued importance of the AFCC framework as a shared reference point for municipal planning, funding, and collaboration. They suggested that explicitly incorporating climate resilience into the framework could strengthen its practical value and support the development of

implementation resources and policy tools. Public engagement was also identified as important: in one municipality, strong community support for climate action directly influenced its inclusion in the seniors strategy. These observations reinforce the review finding that older adults should be understood not only as vulnerable to climate change, but also as active participants in shaping more resilient communities.

4. Discussion

This review demonstrates that climate resilience remains weakly and inconsistently integrated into age-friendly community planning. Although the literature identifies multiple ways in which age-friendly initiatives can strengthen resilience, the Canadian jurisdictional scan found that climate change is rarely addressed explicitly in municipal seniors strategies. Climate-relevant actions are more commonly framed through weather, emergency preparedness, transportation, communication, or social isolation rather than as part of an integrated climate-resilience agenda. This disconnect between research and municipal policy suggests that climate resilience is often present implicitly but remains fragmented across age-friendly planning.

4.1 Climate resilience remains fragmented within age-friendly policy

The comparison between the literature and Canadian seniors strategies reveals important gaps in how climate resilience is translated into municipal policy. While strategies include actions such as weather-protected bus stops, snow and sidewalk maintenance, emergency communication, and check-in programs, they place considerably less emphasis on climate-resilient housing, land-use planning, energy efficiency, inclusive environmental design, and cross-sectoral collaboration. Particularly limited is attention to

the AFCC domains of respect and social inclusion and civic participation, despite growing recognition that older adults can contribute actively to climate adaptation and community resilience.

The finding that only 11 strategies explicitly referenced climate change, compared with 16 addressing weather and 27 addressing emergency preparedness, illustrates this fragmentation. Weather and emergency planning are increasingly inseparable from climate change, and failing to connect them risks treating intensifying hazards as isolated events rather than long-term planning challenges. This is particularly important as Canadian communities face multiple and overlapping threats, including extreme heat, wildfire smoke, flooding, storms, and cold-weather events.

The scan also suggests that some apparent policy gaps may reflect municipal organizational structures rather than an absence of climate action altogether. Key informants noted that climate adaptation may sit within other municipal departments and therefore be omitted from seniors strategies to avoid duplication. Nevertheless, separating climate planning from seniors planning risks overlooking age-specific vulnerabilities, capacities, and priorities. Climate resilience therefore requires stronger cross-departmental and cross-sectoral integration rather than simply the addition of isolated actions to seniors strategies.

4.2 Moving from individual preparedness to systemic resilience

A prominent pattern across municipal strategies was an emphasis on interventions that seek to change individual knowledge or behaviour, particularly through emergency preparedness workshops, information campaigns, and educational resources. These

actions have value, but their reach is inherently constrained by individuals' ability to access, understand, and act on information.

Chater and Loewenstein's (2023) distinction between individual-level "i-frame" interventions and systems-level "s-frame" interventions is useful for interpreting this finding. Climate resilience cannot rely primarily on older adults modifying their own behaviour. More systemic approaches alter the environments, policies, and institutions that shape risk. Examples identified in this review include applying an age-friendly lens to emergency response plans, improving accessible evacuation and shelter systems, integrating climate risk into land-use planning, strengthening public transportation infrastructure, and ensuring access to climate-resilient housing.

This systems perspective is especially relevant to aging in place. Climate change increasingly acts as a form of environmental press, altering the fit between older adults and the places in which they live. Extreme heat, smoke, snow, flooding, and disrupted transportation can make everyday activities such as obtaining groceries, attending medical appointments, maintaining social connections, or remaining safely at home more difficult. Climate resilience should therefore be understood as integral to age-friendly environments and aging in place, rather than as an additional or separate policy concern.

4.3 Older adults as active agents in climate resilience

A second major finding is the need to move beyond representations of older adults primarily as vulnerable recipients of climate interventions. Although older adults can face heightened risks during climate-related events, vulnerability does not preclude agency. The literature and key informants emphasized the potential for older adults to contribute

knowledge, experience, social connections, volunteer labour, and leadership to community resilience.

This perspective is particularly relevant to the AFCC domains of respect and social inclusion and civic participation and employment. Yet few Canadian seniors strategies explicitly positioned older adults as contributors to climate action. Intergenerational approaches were similarly absent from the climate-related actions identified in the scan, despite evidence that relationships among neighbours and across generations can strengthen preparedness, social capital, and collective adaptation.

Recognizing older adults as change-makers shifts climate-resilience planning away from a deficit-based model and toward co-production and collective action. It also reinforces the importance of involving older adults directly in the design of climate-related strategies, programs, and infrastructure.

4.4 Toward a climate-resilient AFCC framework

Given the continued influence of the WHO AFCC framework on municipal seniors planning, its limited explicit attention to climate change has important policy consequences. All Canadian seniors strategies included in this review drew on the AFCC framework or an adaptation of it, demonstrating its ongoing role in shaping how age-friendly priorities are conceptualized and communicated.

Building on calls by Dabelko-Schoeny et al. (2024) and Patrick et al. (2025), this review proposes a complementary climate-resilience framework to be used alongside the existing AFCC framework, rather than replacing it. Climate resilience is conceptualized

as a cross-cutting lens that can be applied across all eight AFCC domains, ensuring that adaptation, mitigation, and older adults' roles as active change-makers are considered within age-friendly planning. Figure 3 illustrates how this climate-resilience lens can sit alongside and strengthen the existing AFCC framework.

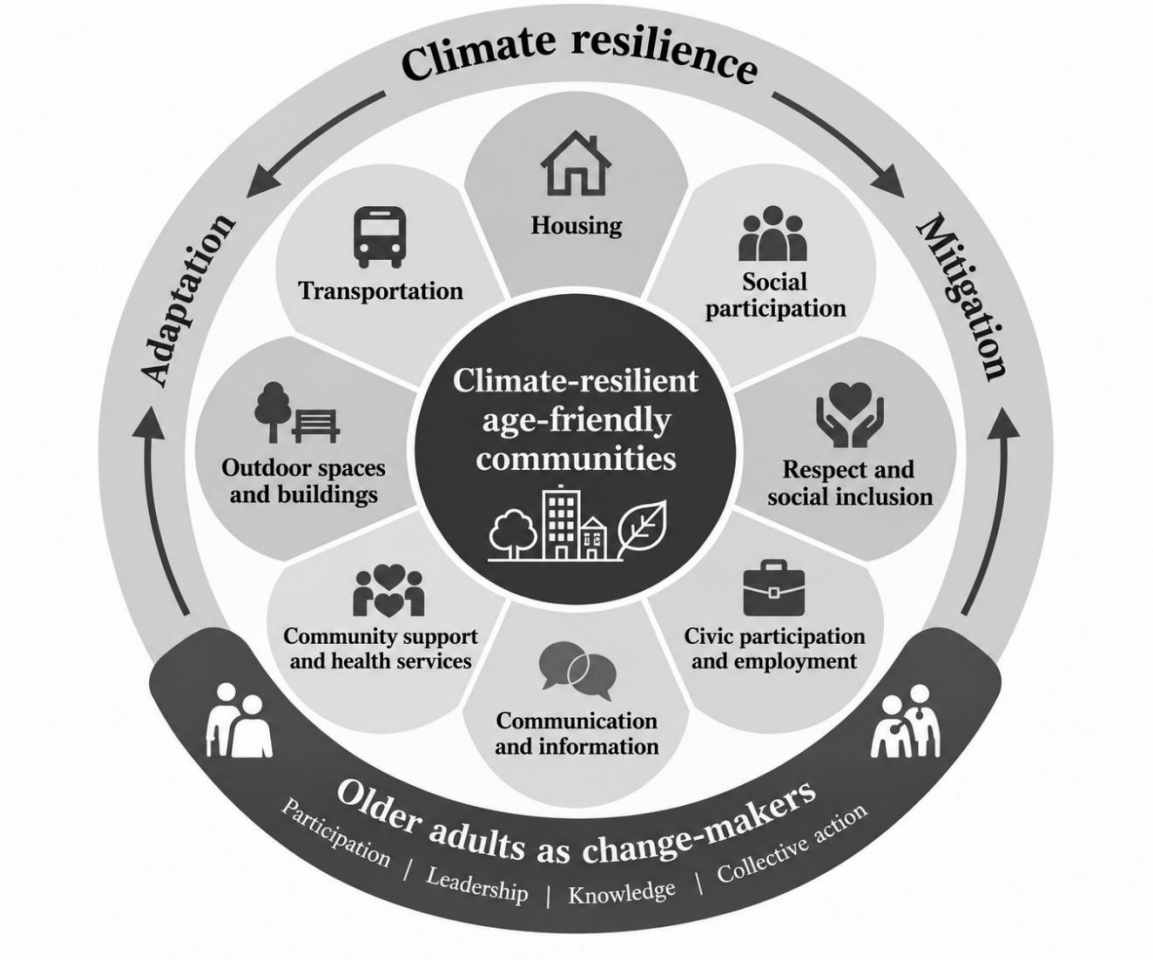


Figure 3. Proposed climate-resilience lens for use alongside the WHO Age-Friendly Cities and Communities (AFCC) framework, integrating adaptation, mitigation, and older adults as active change-makers across the eight AFCC domains.

The proposed framework was refined through consultation with key informants. Feedback led to the explicit inclusion of adaptation, mitigation, and older adults as change-makers, strengthening the conceptual clarity of what climate resilience entails. Municipal policy makers also raised concerns about expanding the scope of age-friendly planning and duplicating work undertaken by other municipal departments. These concerns reinforce the value of positioning the framework as a complementary lens rather than a replacement for the AFCC. Its purpose is not to make seniors planners responsible for climate policy, but to support the systematic consideration of older adults' needs, capacities, and perspectives within climate-related planning and to strengthen cross-departmental and cross-sectoral collaboration.

Used alongside the existing AFCC framework, the climate-resilience lens could also support the development of practical implementation tools, including guidance, indicators, and toolkits. These resources could help municipalities consider how climate resilience intersects with housing, transportation, outdoor spaces, communication, health and community services, social participation, and civic engagement without altering the core structure of the established AFCC framework.

Building on this complementary model, Figure 4 integrates the review findings into a broader context-mechanism-outcome and ecological systems framework. It illustrates how wider demographic and climate conditions interact with policies, programs, social relationships, and individual adaptive capacity, and how interventions across socio-ecological levels can contribute to climate-resilient, age-friendly communities.

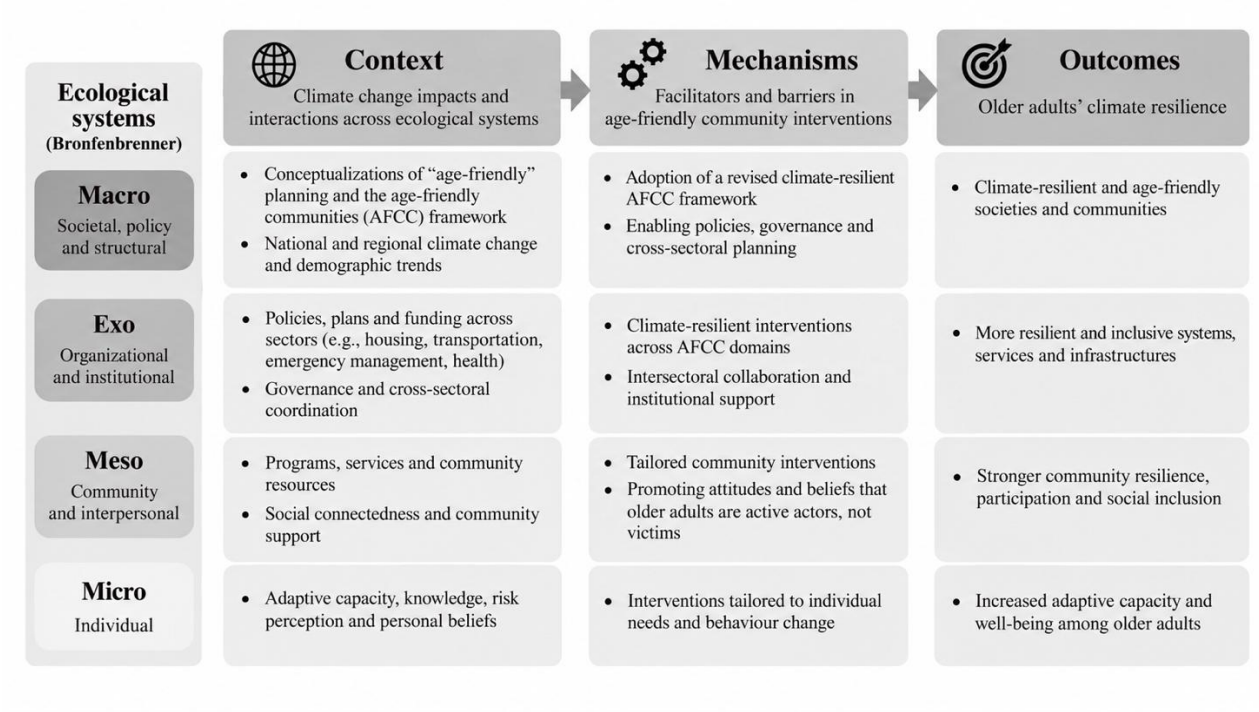


Figure 4. Integrated context-mechanism-outcome and ecological systems framework illustrating pathways to climate resilience among older adults.

4.5 Future Recommendations

The findings suggest that climate resilience should be incorporated into age-friendly planning through a complementary lens used alongside the existing AFCC framework. This would allow adaptation, mitigation, and older adults' roles as active change-makers to be considered systematically across all eight AFCC domains without replacing the established framework. Practical implementation guidance, including toolkits, indicators, and policy resources, could support municipalities in applying this lens consistently while strengthening collaboration across seniors planning, climate adaptation, emergency management, housing, transportation, and public health.

Age-friendly strategies should also move beyond a predominant focus on individual preparedness toward interventions operating across community, institutional, planning, and policy levels. This includes addressing a broader range of regionally relevant climate hazards, such as wildfire smoke, flooding, storms, and cold-weather events, while more explicitly linking longstanding concerns such as snow removal, weather-related transportation, emergency communication, and preparedness to wider climate-resilience planning.

Future research should examine how each AFCC domain can contribute to climate resilience, including which interventions work, for whom, and under what conditions. Research should also extend beyond seniors strategies to consider climate action plans, emergency preparedness strategies, official community plans, and other municipal policies that may support or constrain climate resilience for older adults. Together, these directions can strengthen the integration of climate resilience into age-friendly policy and practice while preserving the strengths and familiarity of the existing AFCC framework.

4.6 Strengths and Limitations

The recommendations above are grounded in a review design that combined explanatory synthesis with direct analysis of municipal policy. A key strength of this study is the use of a rapid realist review to examine not only whether age-friendly interventions support climate resilience, but how, why, and under what conditions they may do so. This makes the approach particularly well suited to generating findings that are relevant to policymakers and practitioners.

The combination of the RRR with a jurisdictional scan of Canadian municipal seniors strategies is another important strength. Bringing together international literature and real-world policy documents enables comparison between the mechanisms identified in research and the extent to which these are reflected in municipal practice. This addresses an important gap in a field where age-friendly planning and climate resilience have often been considered separately. While Patrick et al. (2025) provide an important review of healthy aging interventions incorporating climate action and sustainability, the present study extends this work by examining how age-friendly principles are translated into municipal policy.

Several limitations should also be acknowledged. As with other rapid review approaches, the RRR methodology may trade some comprehensiveness for timeliness (Saul et al., 2013). In addition, both climate resilience and age-friendliness are broad and multidimensional concepts, requiring interpretive decisions during screening and analysis. The review also accommodated variation in how older adulthood was defined across geographic and population contexts. Although some included studies used broader age thresholds, the evidence primarily concerned older adult populations, while policy analyses and conceptual contributions did not involve age-defined participant samples. Although independent screening by two reviewers helped reduce bias, different reviewers or conceptual boundaries may have produced somewhat different inclusion decisions.

The breadth of the review also limited the depth with which individual AFCC domains could be examined. Important issues may therefore fall outside explicitly age-friendly literature even when they are highly relevant to older adults' climate resilience. Housing provides one example: policies governing indoor thermal conditions, energy

efficiency, and access to cooling may substantially affect older adults during extreme heat but may not be framed within age-friendly scholarship. More focused reviews of individual AFCC domains could therefore provide greater specificity regarding what works, for whom, and under what conditions.

The jurisdictional scan also has limitations. Not all municipal seniors strategies were publicly available online, and coverage was uneven across provinces, particularly in the Atlantic and Prairie regions and in relation to English-language documents from Quebec. This matters because Canadian regions face different climate hazards, including coastal flooding, hurricanes, wildfire smoke, extreme heat, and winter storms. Nevertheless, 92 strategies were reviewed across eight provinces, and consistent patterns emerged across the sample, providing a strong basis for identifying the limited explicit integration of climate resilience within municipal seniors planning.

Finally, the scan examined seniors strategies rather than the full municipal policy environment. Climate action plans, emergency preparedness strategies, official community plans, transportation plans, and other policy documents may contain actions relevant to older adults that were not captured here. This limitation was reinforced by key informants, who noted that climate resilience may be addressed by other municipal departments rather than within seniors planning. Future research could therefore examine a smaller number of municipalities in greater depth across multiple policy domains to better understand how age-friendly and climate-resilience actions intersect across local government systems.

5. Concluding Remarks

This comprehensive review highlights the important but underdeveloped intersection between age-friendly environments and climate resilience. By combining a rapid realist review with a jurisdictional scan of Canadian municipal seniors strategies, the study identifies both promising practices and substantial gaps in how climate resilience is currently incorporated into age-friendly planning. Although the WHO AFCC framework provides a strong foundation, climate-related considerations remain inconsistently integrated across its domains. The proposed climate-resilience lens is intended to be used alongside the existing AFCC framework, helping policymakers and practitioners more systematically consider adaptation, mitigation, and the needs, capacities, and contributions of older adults.

The findings also suggest that effective climate resilience requires coordinated action across individual, community, institutional, and policy levels, with greater emphasis on systemic and cross-sectoral approaches. Although grounded in the Canadian context, these findings have broader international relevance as communities respond simultaneously to population aging and intensifying climate risks. More deliberate alignment between age-friendly and climate action agendas may help create communities that are not only supportive of people as they age, but also more resilient, equitable, and responsive to a changing climate.

Declarations

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Author Contributions

Margaret Ovenell (MO) led the study as part of her master's thesis, including study development, data collection, analysis, and preparation of the initial manuscript draft. Mei Lan Fang (MLF) provided supervision and methodological guidance, contributed as a secondary reviewer, and provided substantial theoretical and conceptual input throughout the study. MLF also supported interpretation of the findings and led substantial revisions to prepare the manuscript for publication. Both authors reviewed and approved the final manuscript and agree to be accountable for the work.

Ethics Approval and Consent to Participate

Ethical approval for the stakeholder consultation component of this study was obtained from the Simon Fraser University Research Ethics Board. All participants provided informed consent to participate.

Clinical Trial Number

Not applicable.

Consent for Publication

Not applicable. No identifiable participant information is reported in this manuscript.

Competing Interests

The authors declare that they have no competing interests.

Data Availability

The data generated during the stakeholder consultation are not publicly available due to confidentiality and privacy considerations. All other data analysed in this study were derived from publicly available sources and are cited in the manuscript and supplementary materials.

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Supplementary File A: Interview Questions for Key Informants

Summary Shared with Key Informants

The guiding research question was defined as: how, why, and under what conditions do Canadian age-friendly communities initiatives support climate resilience for older adults? From this guiding theme, there are two complementary components:

a) A search of the academic literature exploring how, why, and under what conditions age-friendly communities initiatives support climate resilience for older adults. This review considers the global literature.

b) A jurisdictional scan of Canadian municipal seniors strategies and action plans for age-friendly communities to determine how climate resilience is incorporated into the frameworks.

22 sources were analyzed from the literature. This review, while exploratory due to limited program evaluations, identified climate resilience interventions for older adults across multiple system levels. At the microsystem level, technology like smartphone apps shows promise for supporting older adults during extreme weather but requires further study. The mesosystem highlights the need to tailor interventions to diverse older adult profiles. Exosystem-level mechanisms focus on adapting community infrastructure and services, such as urban greening, accessible wayfinding, climate-responsive transportation and housing, and targeted emergency preparedness programs. Cross-sector collaboration and effective communication tools also play key roles. At the macrosystem level, prevailing ageist narratives limit recognition of older adults as active agents in resilience.

Of the 92 seniors strategies analyzed, only 11 explicitly discussed climate change. 16 discussed weather and 27 discussed emergency preparedness. While emergency preparedness is more commonly referenced, this focus tends to on awareness building. Discussions of weather-related challenges often remain generalized and do not explicitly link to climate change. While municipal seniors strategies have begun to incorporate climate resilience through actions like weather-protected bus stops, sidewalk maintenance, and emergency communication tools, notable gaps remain. Compared to

the literature, these strategies often lack a proactive focus on climate-resilient housing, land use planning, and energy efficiency. There is also limited attention to inclusive urban design features like wayfinding for people with cognitive and sensory disabilities, and few strategies recognize older adults as active agents in resilience efforts. Additionally, domains like respect and social inclusion, and cross-sectoral public health collaboration, are underdeveloped in municipal plans, despite being emphasized in academic research as critical to effective climate adaptation for older adults. The actions of very few strategies consider the relationships seniors have with others. Only one strategy explicitly mentions caregivers in relation to climate-related actions, while two strategies promote extreme weather check-ins by neighbours (Fredericton, NB and Caledon, ON).

All municipalities used the AFCC framework to guide their seniors strategy. Given the influence of the AFCC framework, its lack of attention to climate resilience is revealing and concerning. I argue that climate resilience should be added as a cross-cutting concept embedded within all existing domains, as illustrated in the figure below. This modified framework considers how each domain of the AFCC framework can support or hinder climate resilience among older adults.

Preamble to Interview

Thank you for participating. The purpose of this interview is to discuss preliminary findings from my capstone project and to gather your expert feedback.

Your insights will help validate and deepen my understanding of this work, ensure relevance to Canadian municipal policy and international contexts, and identify any gaps or limitations.

The interview will take about 45 minutes, and your responses will be confidential and used to inform recommendations.

Please feel free to to skip any questions. Share as much or as little as you like.

Interview Guide for Researchers

1. Based on your expertise, how well do the literature findings reflect the current state of research on age-friendly communities and climate resilience?
    a. Are there key studies, theories, or perspectives that must not be overlooked?
    b. Are you aware of any similar research looking at applications of the AFCC framework?

2. In what ways do you see this research supporting or enhancing your work, or the field more broadly?
    a. Probe: What aspects of this project are particularly useful for enhancing this area in research?

3. This research focuses heavily on seniors strategies. Where you are based, do local bodies or councils take comparable actions?

4. This capstone proposes adding climate resilience as a cross-cutting domain in the AFCC framework. From a literature and conceptual perspective, how do you view this recommendation?

5. What implications for practice and policy you see arising from this research?

Interview Guide for Municipal Policy Makers

1. How do my findings about the integration, or lack thereof, of climate resilience in municipal seniors strategies align with your experience working in seniors' policy at a municipality?
    a. Probe: In general, are these findings aligned with your understandings of age-friendly communities, the climate crisis, and seniors strategies?
2. This research found limited examples of seniors strategies that consider climate resilience explicitly. Why do you think that is?
    a. Follow up: What are the major barriers to integrating a climate resilience lens into seniors strategies?
3. I propose amending the AFCC framework to include climate resilience as a cross-cutting ninth domain. Based on your experience, do you agree with this proposal? How might this change affect your work?

4. Based on your knowledge and experience, are there any ways that this proposed modified AFCC framework could be strengthened?

5. How could this research support you to enhance your work?

6. What implications do you see for practice and policy?

Supplementary File B: List of Municipal Seniors Strategies Analyzed

Municipality	Province	Year Launched
City of Edmonton	AB	2014
City of Beaumont	AB	2021
Town of Innisfail	AB	2024
Town of Okotoks	AB	2024
Town of Banff	AB	2024
Town of Olds	AB	2022
City of Lethbridge	AB	2021
City of Duncan	BC	2012
City of Langford	BC	2020
City of Maple Ridge	BC	2016
City of Port Moody	BC	2020
City of Quesnel	BC	2018
City of Saanich	BC	2017
City of Surrey	BC	2023
City of Vancouver	BC	2025
City of Victoria	BC	2020
District of Kent	BC	2013
District of Kitimat	BC	2018
District of Sechelt	BC	2017
District of Sooke	BC	2013
Town of Lake Cowichan	BC	2015
Town of Oliver	BC	2021
Town of Smithers	BC	2016
Township of Langley	BC	2014
Village of Canal Flats	BC	2021
Village of Harrison Hot Springs	BC	2015
Village of Warfield	BC	2019
District of Lantzville	BC	2020
Town of Gibsons	BC	2013
City of Abbotsford	BC	2021
City of Colwood	BC	2016
City of Kelowna	BC	2016
City of New Westminster	BC	2017
City of Pitt Meadows	BC	2016
City of Richmond	BC	2022

Municipality	Province	Year Launched
City of Rossland	BC	2018
District of Mackenzie	BC	2022
Town of Golden	BC	2014
Village of Burns Lake	BC	2013
Winnipeg	MB	2014
Riverview	NB	2023
Fredericton	NB	2014
St. John's	NFLD	2022
Town of Ajax	ON	2017
Township of Black River-Matheson	ON	2022
County of Brant	ON	2021
City of Brantford	ON	2025
City of Burlington	ON	2017
Municipality of Chatham-Kent	ON	2015
City of Dryden	ON	2022
Dufferin County	ON	2019
Regional Municipality of Durham	ON	2017
Elgin St. Thomas	ON	2017
City of Elliot Lake	ON	2017
Town of Espanola	ON	2024
Town of Gananoque	ON	2022
County of Grey	ON	2022
City of Hamilton	ON	2021
City of Kitchener	ON	2016
Township of Leeds & The Thousand Islands	ON	2018
Town of Midland	ON	2020
Niagara Region	ON	2015
Town of Northeastern Manitoulin & the Islands	ON	2016
City of Orillia	ON	2022
City of Oshawa	ON	2019
Town of Penetanguishene	ON	2022
City and County of Peterborough, Curve Lake and Hiawatha First Nations	ON	2023
Municipality of Port Hope	ON	2016
Municipality of Red Lake	ON	2024
City of Richmond Hill	ON	2023
City of Temiskaming Shores	ON	2021

Municipality	Province	Year Launched
City of Thunder Bay	ON	2022
City of Toronto	ON	2018
City of Vaughan	ON	2022
Municipality of Wawa	ON	2025
Town of Wasaga Beach	ON	2016
York Region	ON	2018
Simcoe County	ON	2023
Township of Tiny	ON	2017
Municipality of St.-Charles	ON	2017
Town of Caledon	ON	2021
Town of Kirkland Lake	ON	2018
Township of Middlesex Centre	ON	2022
Township of South Glengarry	ON	2016
City of Greater Sudbury	ON	2018
Montreal	QC	2023
Montreal West	QC	2020
Humbolt	SK	2019
Kipling	SK	2024
Moosomin	SK	2021
Saskatoon	SK	2016
Rosetown	SK	2022