

Biophilic Design for Ageing-in-Place: Charting an Environmental Assessment Framework of Natural Elements in Senior Housing

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Abstract: The physical living environment plays a pivotal role in the success of ageing-in-place. Although various environmental assessment tools have been developed to evaluate residential settings for older adults, many of them prioritise physical safety, accessibility, and risk prevention. However, the psychological, sensory, and emotional perception of the home are also important to overall well-being in later life. Older adults with mobility decline often experience limited contact with the outdoor natural environment, which can lead to sensory deprivation, cognitive fatigue, emotional distress, and reduced quality of life. Drawing upon biophilic design approaches and the specific needs of senior housing, this paper proposes a conceptual framework for evaluating the potential contribution of natural elements to older adults' living environments. The framework organises assessment into three interrelated dimensions: physiological and sensory support, psychological and cognitive restoration, and social and behavioural engagement. Within these dimensions, natural elements are considered in relation to age-responsive criteria, including visibility, accessibility, safety, maintenance burden, sensory suitability, and relevance to daily routines. This framework provides architects, occupational therapists, and researchers with a structured perspective for considering biophilic design in senior housing. The paper identifies key evaluative dimensions and outlines future development towards scoring rules, resident-reported modules, pilot testing, and reliability and validity assessment. Therefore, it positions natural elements as part of the environmental infrastructure of ageing-in-place and highlights their potential role in supporting comfort, emotional resilience, autonomy, and quality of life in later years.

Keywords: biophilic design; ageing-in-place; senior housing; environmental assessment; psychological well-being; restorative environments

1. Introduction

As the global demographic profile shifts towards an increasingly older population, ensuring the suitability of residential environments has become a critical area of interdisciplinary research. The preference for ageing-in-place, defined as remaining in one's own home and community safely and independently, is a primary objective for both older individuals and global public health policies [1]. This preference is closely associated with autonomy, emotional security, continuity of daily routines, and attachment to familiar social and spatial environments. As mobility and physical stamina often decline with the ageing process, indoor environments increasingly become the primary habitat for older adults. Research indicates that most older adults spend 80%–90%



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of their time indoors [2]. Consequently, the quality, layout, and composition of the housing environment have a profound impact not only on their physical health and functional independence but also on their cognitive function, emotional well-being, and overall quality of life.

Existing approaches to assessing and modifying residential environments for older adults have made important contributions to ageing-in-place. Researchers, occupational therapists, and healthcare professionals have developed many environmental assessment tools, such as the Westmead Home Safety Assessment (WeHSA), the Housing Enabler (HE), and the Architectural and Psycho-environmental Retrofitting Assessment Method (APRAM), which have proven highly effective in identifying necessary modifications [3–5]. Such modifications often include installing grab rails, removing trip hazards, or improving bathroom accessibility to cope with mobility decline. These approaches are essential for preventing injury and supporting activities of daily living. However, ageing well encompasses psychological health, emotional resilience, and life satisfaction, extending beyond physical injury or disease. For older adults who live in an environment lacking age-inclusive infrastructure and have limited connection with outdoor green spaces, the risk of sensory deprivation is notably elevated [6]. This physical confinement may intensify disconnection from the natural world, which can trigger feelings of isolation, cognitive fatigue, and psychological distress.

Within this context, biophilic design offers a useful lens for rethinking the environmental quality of senior housing. Biophilic design is grounded in the idea that meaningful connections with nature and natural processes can reduce stress, support recovery, and enhance individual and social well-being [7,8]. In the built environment, these connections may be created through direct exposure to vegetation, daylight, outdoor views, water, and fresh air, as well as through indirect elements such as natural materials, organic forms, biomorphic patterns, natural images, and multisensory cues [9,10]. For older adults, these features could provide low-effort opportunities for attention restoration, stress reduction, orientation, everyday pleasure, and a renewed sense of connection with seasonal and diurnal rhythms. Natural elements in senior housing should be considered more than decorative additions. They function as environmental resources that support psychological resilience and enrich daily experience, especially when regular outdoor nature contact is constrained. Consequently, integrating nature into the housing environment can provide a practical, non-invasive strategy to buffer against the psychological distress of spatial confinement and to support emotional well-being.

Although biophilic design has been widely discussed in architectural theory, environmental psychology, and healthy building practice [11–13], its application to ageing-in-place remains insufficiently translated into assessment frameworks for residential settings. Existing senior housing assessment tools tend to prioritise hazards, accessibility, and physical adaptation [14], while existing biophilic design frameworks and building standards are often developed for general buildings, design guidance, or broad environmental quality assessment [15,16]. Few frameworks specifically consider how indoor natural elements are perceived, accessed, maintained, and used by older adults in everyday domestic life. A senior housing perspective requires attention beyond the presence of natural features, and considerations can also be given to visibility from primary resting areas, sensory accessibility, maintenance burdens, safety implications, and compatibility with age-related physical and cognitive changes [17].

This paper therefore proposes an environmental assessment framework for evaluating biophilic design in senior housing. It aims to clarify the relevance of biophilic design to ageing-in-place, compare the scopes and focuses of existing assessment approaches, and outline key dimensions for evaluating natural elements in residential environments for older adults. By repositioning natural elements as part of the environmental infrastructure of ageing-in-place, it argues for a shift from housing assessment centred primarily on risk prevention towards a broader understanding of housing as a setting for restoration, sensory engagement, and everyday well-being.

2. Biophilic Design Supporting Ageing-in-Place

2.1. Biophilic Design Principles, Methods, and Strategies

Biophilic design approaches have been developed through several classification systems that translate human-nature relationships into architectural principles and design strategies. Kellert et al. [18] conceptualised biophilic design as the deliberate integration of nature and natural processes into the built environment, emphasising that buildings support human health, emotional attachment, and ecological awareness through sustained contact with nature. Kellert and Calabrese later organised biophilic design into three categories: direct experience of nature, indirect experience of nature, and experience of space and place [19]. Direct experience includes actual natural features such as light, air, plants, water, animals, weather, and natural landscapes. Indirect experience includes images of nature, natural materials, natural colours, biomorphic forms, natural geometries, and representations of ecological processes. Experience of space and place refers to spatial qualities such as prospect, refuge, organised complexity, mobility, wayfinding, and cultural or ecological attachment to place.

The 14 Patterns of Biophilic Design proposed by Browning, Ryan, and Clancy offer another widely used typology. These patterns are grouped into Nature in the Space, Natural Analogues, and Nature of the Space [10]. Nature in the Space includes visual connection with nature, non-visual connection with nature, non-rhythmic sensory stimuli, thermal and airflow variability, dynamic and diffuse light, presence of water, and connection with natural systems. Natural Analogues include biomorphic forms and patterns, material connection with nature, and complexity and order. Nature of the Space includes prospect, refuge, mystery, and risk or peril. Compared with Kellert and Calabrese's categories, the 14 Patterns provide a more operational vocabulary for identifying observable design features, such as garden views, daylight variation, indoor plants, water sounds, natural ventilation, timber surfaces, stone textures, botanical images, fractal patterns, and spatial configurations that offer both openness and enclosure.

Zhong et al. further summarised biophilic design research by linking architectural strategies with health, well-being, and sustainability outcomes [20]. Their review indicates that biophilic design as a multi-dimensional approach involves environmental performance, sensory experience, material expression, spatial configuration, and human perception. This broader interpretation is important for senior housing, where the evaluation of natural elements should account for senior residents' capacities, routines, and vulnerabilities. For example, daylight and outdoor views may support orientation and daily rhythm; plants and water may offer living natural contact but require maintenance and safety considerations; natural materials and biomorphic patterns may provide tactile and visual comfort; and prospect-refuge qualities may influence perceived safety, control, and calmness.

These classification systems suggest that biophilic design in senior housing includes both direct natural elements and indirect natural references, as well as the spatial conditions that shape how older adults perceive and use them. However, translating these principles into assessment requires more than listing natural features. It requires tools that can judge their visibility, accessibility, sensory suitability, safety, maintenance burden, and relevance to everyday ageing-in-place.

2.2. Values of Biophilic Design in Senior Housing

Biophilic design provides a theoretical and practical basis for reconsidering the role of natural elements in senior housing. For older adults who spend a large proportion of daily life indoors, the residential environment becomes an important medium through which contact with nature can be maintained. This is particularly relevant when outdoor mobility is constrained by physical decline, chronic illness, fear of falling, extreme weather, or inaccessible neighbourhood environments. In this context, indoor natural elements could provide frequent, low-effort, and familiar forms of nature contact that support ageing-in-place within domestic routines. The value of biophilic design in senior housing can be understood through three interrelated aspects: physiological and sensory support, psychological and cognitive restoration, and social and behavioural engagement.

2.2.1. Physiological and Sensory Support

Natural elements in senior housing can contribute to the bodily experience of comfort, orientation, and environmental stability. The literature on biophilic design and healthy buildings has emphasised that nature contact in built environments can affect physiological responses, including stress-related arousal, comfort perception, and recovery processes [21,22]. Daylight, views to greenery, fresh air, indoor plants, water, and natural materials may influence visual comfort, thermal perception, air quality, acoustic experience, and tactile engagement. For older adults, these sensory qualities are particularly important because ageing is often accompanied by changes in vision, hearing, mobility, sleep patterns, and environmental tolerance. Daylight and outdoor views can help residents remain connected with diurnal and seasonal rhythms [23], while natural ventilation, plants, and material textures can enrich the sensory quality of indoor spaces [20,24]. In senior housing, these effects could be interpreted with attention to age-related sensory needs: natural elements are most supportive when they are visible, legible, safe, and compatible with older adults' physical capacities.

2.2.2. Psychological and Cognitive Restoration

Another value of biophilic design concerns mental health and emotional well-being. Environmental psychology has shown that natural scenes and elements can support stress reduction, attention restoration, and mood regulation [25–27]. For older adults who spend substantial time indoors, prolonged environmental monotony and reduced access to outdoor nature may lead to cognitive fatigue, anxiety, loneliness, and emotional detachment from the living environment. Biophilic features (e.g. visible plants, garden views, and organic patterns) provide soft fascination and gentle sensory stimulation [28]. These experiences require little deliberate effort, yet they may help maintain attention, reduce perceived stress, and support everyday pleasure. Studies on indoor nature exposure

and biophilic indoor environments also suggest potential benefits for psychological comfort, cognitive performance, and subjective well-being [29]. For ageing-in-place, this restorative value is important because emotional resilience and cognitive engagement are closely linked to quality of life.

2.2.3. Social and Behavioural Engagement

The value of biophilic design also extends to daily activities, routines, and social participation. Natural elements could become meaningful parts of domestic life rather than passive environmental features. Caring for indoor plants, sitting near a sunlit window, watching birds from a preferred chair, touching timber handrails or natural fabrics, recognising seasonal changes, or discussing plants and views with visitors all support continuity of routine and personal identity. In later life, such small everyday practices may strengthen place attachment, especially when mobility decline limits outdoor activity and social participation [17]. Research on nature-based interventions, therapeutic landscapes, and biophilic care settings suggests that nature contact can encourage engagement and support well-being in older populations and care environments [30–32]. However, the social and behavioural value of natural elements depends strongly on usability. A plant that cannot be reached, a view that is not visible from a main resting place, or a water feature that creates maintenance burdens may provide limited benefit. Therefore, biophilic design in senior housing should be evaluated by how safely and meaningfully older adults can perceive, interact with, and maintain these elements, and incorporate them into daily lives. The following section reviews existing assessment methods related to biophilic design and senior housing.

3. Existing Tools for Evaluating Biophilic Design and Senior Housing

Environmental assessment tools related to biophilic design and senior housing include foundational biophilic design classifications, biophilic or restorative quality assessment approaches, green and healthy building standards, and ageing-in-place assessment tools. Table 1 summarises key tools for evaluating biophilic design and housing that supports ageing-in-place.

The Biophilic Quality Indexes developed by Berto and Barbiero evaluate the extent to which a building moves from being simply ‘green’ to being restorative, provide a structured approach to assessing its biophilic quality and highlight the distinction between environmental sustainability and human restorative experience [33]. The Biophilic Healing Index proposed by Salingaros focuses on how built environments may support well-being through geometric, sensory, and spatial qualities associated with biophilic healing [34]. More recently, the Biophilic Quality Matrix has been developed as a tool to evaluate the biophilic quality of buildings during the early design stage, and it translates biophilic design principles into an evaluative structure that designers can use before construction or renovation decisions are finalised [35]. Additionally, Zhong et al. proposed an assessment framework for three-dimensional green spaces, linking biophilic design with urban environment, building performance and human perception [15]. These tools share an important contribution in making biophilic design more assessable by transforming general principles into categories, criteria, or indicators.

International green and healthy building standards have increasingly recognised the relationship between environmental quality, nature, and occupant well-being. WELL Building Standard (WELL) places strong emphasis on health-related building performance, including air, light, thermal comfort, materials, sound, mind, and community [36]. Other green building standards such as LEED, BREEAM, and DGNB also address issues including daylight, indoor environmental quality, ecological value, landscape, materials, health, comfort, and sustainable site design [37]. These standards are valuable because they shift building assessment beyond energy performance and acknowledge that environmental quality can affect human health and comfort. However, they are usually designed for broad building types, certification processes, or design-stage compliance. Their nature-related criteria rarely evaluate how older adults perceive, access, maintain, or use natural elements in everyday domestic life.

The development of senior housing assessment tools has been mainly shaped by disciplines such as occupational therapy, gerontology, and architectural design, with the shared goal of preserving older adults’ independence and supporting activities of daily living. Established tools (e.g. WeHSA, HE, and APRAM) focus on mismatches between an individual’s physical capabilities and the spatial demands of the home [3–5]. Their rubrics are therefore oriented towards fall prevention, accessibility, bathroom safety, circulation clearance, lighting adequacy, and functional adaptation. These concerns are essential for ageing-in-place, but natural elements are often considered mainly as potential risks (e.g. plant pots may create trip hazards). Their restorative, sensory, and emotional affordances are generally not evaluated.

Table 1. Comparative analysis of selected tools for evaluating biophilic design and senior housing.

Tools	Framework Organising Logic	Assessment Output	Ageing Relevance	Focus and Principal Distinction from the Proposed Framework
The Practice of Biophilic Design [19]	Three categories (24 types) of experiences: direct experience of nature, indirect experience of nature, and experience of space and place	Conceptual classification and design guidance	None	Foundational taxonomy of biophilic experiences without age-responsive criteria
14 Patterns of Biophilic Design [10]	Three types (14 patterns) of relationships between nature and space: nature in the space, natural analogues, and nature of the space	Pattern-based design guidance	None	Operational vocabulary of features and spatial patterns rather than ageing-in-place outcomes
Biophilic Quality Indexes [33]	Five sections covering building context, interior spaces, visual and non-visual nature contact, and sustainability	Index/percentage-based rating and improvement guidance	None	General building-level restorative quality without consideration of older adults' needs
Biophilic Healing Index [34]	Ten equally weighted geometric, sensory, and natural components rated from 0 to 2	Additive score of potential biophilic and healing quality	None	Emphasises architectural healing attributes without person–environment fit
Biophilic Quality Matrix [35]	A 10 × 10 matrix crossing natural criteria with design interventions and experiential attributes	Design-stage matrix profile combining inventory and qualitative judgement	None	Intended for early design evaluation rather than occupied senior housing
Green Pocket Performance Evaluation Framework [15]	Performance indicators organised around ten sustainability challenges across urban environment, building performance, and human perception	Multi-criteria performance profile and design guidance	None	Focuses on three-dimensional green spaces and sustainability rather than domestic ageing
WELL Building Standard [36]	Health concepts organised through features, preconditions, and optimisations	Compliance, points, and building certification	None	Broad health certification in which nature is one component rather than an ageing-specific focus
Westmead Home Safety Assessment (WeHSA) [3]	Home areas and components divided into hazard categories and detailed hazard descriptors	Room-based hazard checklist and safety recommendations	Relevant	Focuses on fall hazards rather than restorative or positive environmental qualities
Housing Enabler (HE) [4]	Cross-analysis of personal functional limitations and physical environmental barriers	Weighted person–environment accessibility score	Relevant	Measures accessibility mismatch without evaluating positive biophilic contributions
Architectural and Psycho-environmental Retrofitting Assessment Method (APRAM) [5]	Technical inspection and resident perceptions assessed across public-space, building, and dwelling scales	Renovation priorities, social indicators, and integrated retrofit diagnosis	Explicit	Supports renovation decisions but does not specifically assess biophilic quality
Proposed Framework (this paper)	Three potential-contribution dimensions of biophilic design linked with age-responsive criteria.	Conceptual framework; no validated score at the present stage	Explicit	Links the value of biophilic design with older adults' need for contact with nature

The current assessment landscape therefore remains fragmented. Green building standards address environmental quality and sustainability; biophilic tools evaluate the presence or quality of nature-related design; senior housing tools evaluate safety and functional fit. Yet evaluating biophilic design in senior housing requires these perspectives to be brought together. The evaluation of natural elements should therefore consider their visibility, sensory suitability, accessibility, safety, maintenance burden, and relevance to older adults' daily routines. This gap provides the basis for developing a senior-housing-oriented framework for evaluating natural elements in older adults' living environments.

4. An Assessment Framework for Biophilic Design in Senior Housing

To address the identified gap in current assessment tools for senior housing, we propose a conceptual framework for evaluating the potential contribution of biophilic design to senior housing environmental quality

(Figure 1). The framework was developed through a synthesis of the research reviewed in Sections 2 and 3. Sources were selected for their foundational influence on biophilic design, application in building assessment, or direct relevance to supporting ageing-in-place. Foundational biophilic classifications identified established forms of nature experience and design elements; existing assessment tools and building standards indicated how these principles could be translated into criteria; and ageing-in-place literature and housing assessment tools provided age-responsive considerations relating to safety, accessibility, comfort, autonomy, daily routines, and emotional well-being. These inputs were mapped to the three categories of value identified earlier, resulting in three interrelated dimensions: physiological and sensory support, psychological and cognitive restoration, and social and behavioural engagement (Table 2). These dimensions structure the assessment around how natural elements may support the quality of older adults' living environments.

The 'physiological and sensory support' dimension evaluates whether natural elements contribute to bodily comfort, sensory richness, and environmental orientation. Relevant features include daylight, outdoor views, natural ventilation, indoor plants, water, tactile natural materials, natural sounds, mild plant or wood scents, and sunlit resting areas. In senior housing, these elements should be evaluated according to their suitability for age-related sensory and physical changes. For example, daylight may support daily rhythm and orientation, but excessive glare can reduce visual comfort; natural ventilation may improve freshness, but uncontrolled airflow may cause discomfort; tactile materials may enrich sensory experience, but uneven surfaces or loose rugs may create risks. This dimension therefore considers both sensory benefit and age-responsive environmental control.

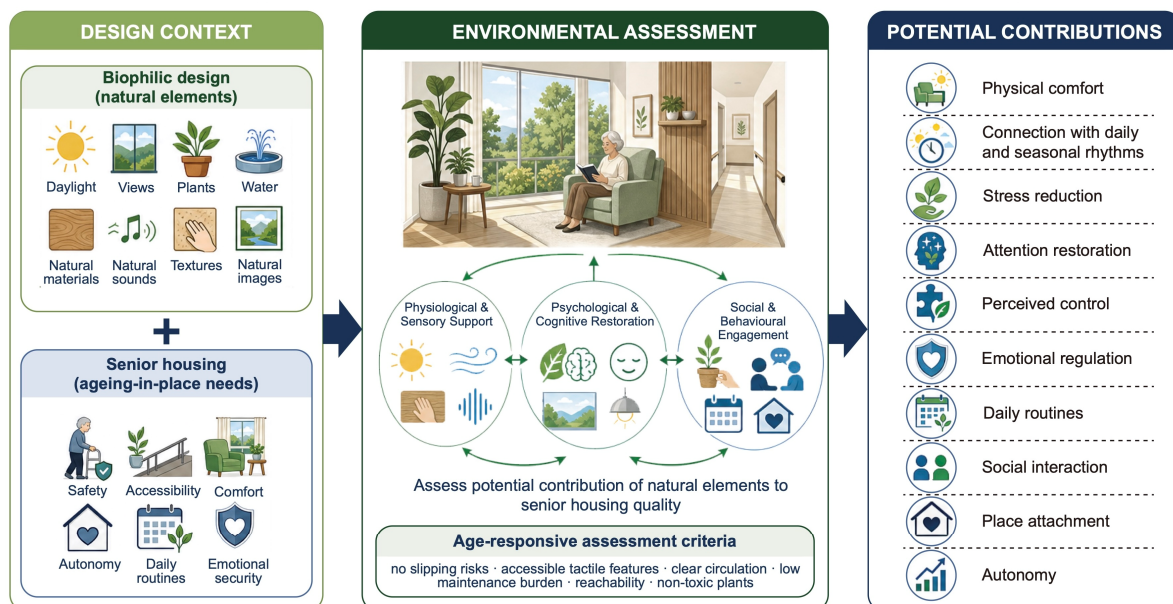


Figure 1. The conceptual framework of natural elements in senior housing.

The 'psychological and cognitive restoration' dimension evaluates whether biophilic design features provide opportunities for stress reduction, attention restoration, emotional regulation, familiarity, and perceived control. Observable features include greenery views, visible sky, healthy indoor plants, natural images, biomorphic forms, organic or fractal patterns, natural colour palettes, water features, and visually calm natural materials. For older adults who spend extended periods indoors, such features may offer low-effort restorative experiences and reduce environmental monotony. Assessment needs to consider whether these features are visible from primary resting areas, their visual complexity remains legible, they avoid glare or confusion, and residents can exercise some choice over their presence or arrangement.

The 'social and behavioural engagement' dimension evaluates whether natural elements support meaningful routines, autonomy, interpersonal interaction, and attachment to place. Biophilic design in senior housing may involve plant care, window-side seating, balcony or garden access, bird or seasonal observation, personalised nature-related objects, and shared green spaces. These features are valuable when they can be safely incorporated into everyday life. Assessment concerns include accessibility, maintenance burden, circulation clearance, plant non-toxicity, seating suitability, and opportunities for conversation or shared activities. A plant, view, or garden becomes more relevant to ageing-in-place when it supports daily practice rather than remaining a passive visual feature.

Table 2. Assessment framework for biophilic design in senior housing.

Dimensions	Biophilic Design Features	Age-Responsive Criteria for Senior Housing	Potential Contribution to Ageing-in-Place
Physiological and sensory support	- daylight - natural ventilation - indoor plants - water features - natural materials - tactile textures - natural sounds	- glare control - avoid excessive noise - avoid irritating odour and allergens - no slipping risks - accessible tactile features	- physical comfort - sensory richness - environmental legibility - connection with daily and seasonal rhythms
Psychological and cognitive restoration	- greenery views - indoor plants - natural images - biomorphic forms - organic or fractal patterns - water features - natural colour	- visibility from primary resting areas - manageable complexity - cognitive legibility - resident choice	- stress reduction - attention restoration - emotional regulation - familiarity - reduced monotony - perceived control
Social and behavioural engagement	- plants for care activities - seating near windows - balcony or garden access - bird or seasonal observation points - shared green spaces	- reachability - clear circulation - non-toxic plants - low maintenance burden - manageable watering or cleaning tasks	- daily routines - autonomy - social interaction - place attachment - personal identity - domestic meaning

Given that the presence of natural elements does not imply they are accessible, suitable, or beneficial for senior residents, we adopted an outcome-oriented framework. The framework therefore evaluates the potential contributions that natural elements may deliver under specific age-responsive conditions. The dimensions are interrelated rather than mutually exclusive, reflecting the multiple pathways through which nature may support ageing-in-place. Some features span more than one dimension and can be evaluated through different criteria. For instance, indoor plants may contribute to restorative experience and plant-care activities, while water elements may provide sensory stimulation and psychological restoration (positive) but also carry safety or maintenance concerns (negative). Such overlaps represent cross-dimensional mapping and highlight the importance of analysing the relationship between biophilic design features, their pathways of influence, and potential contribution to ageing-in-place.

Overall, the three dimensions distinguish the proposed framework from general biophilic assessment tools by explicitly focusing on older adults' life experiences in domestic environments. The framework focuses on the presence of natural elements and how they are perceived, used, maintained, and integrated into daily routines. By embedding age-responsive criteria within each dimension, it connects biophilic design with gerontological housing assessment and provides a basis for evaluating natural elements as environmental resources for ageing-in-place.

5. Future Development: From Perspective to Validated Tool

To develop the proposed framework into a validated assessment tool, future research is suggested to translate the three conceptual dimensions into measurable items and scoring rules. While the present paper positions the framework as a perspective-based proposal, its practical application will require a standardised scoring methodology. A possible approach is to use an item-level ordinal scale to record the presence, quality, accessibility, and age-responsive suitability of biophilic features. For example, natural elements could be evaluated according to whether they are absent, present but limited, accessible and meaningful in daily use, or prominent, safe, and regularly engaged with by senior residents. Dimension-level scores could then be calculated and compared across housing settings. However, the weighting of items and dimensions would need to be determined through expert consultation and empirical testing rather than assumed in advance.

Moreover, the observational framework should be complemented by a resident-reported module. An assessor can document the physical presence and quality of natural elements, but senior residents' experiences are essential for understanding whether these features actually contribute to restoration, comfort, and daily life. A questionnaire or interview section could ask how often residents look at outdoor views, care for plants, sit in sunlit areas, enjoy natural sounds, or feel comforted by natural materials and images. It could also identify burdens, such as difficulty watering plants, fear of tripping over pots, discomfort from glare, or irritation caused by scents or humidity. Such a module would help ensure that the assessment remains person-centred and sensitive to individual capacities, preferences, and routines.

The validation step should proceed in stages. Content validity could be examined through expert review involving researchers in biophilic design, gerontology, occupational therapy, architecture, and environmental psychology. A pilot application in 10–20 households would help test feasibility, clarity of items, assessment time,

and the ability of the framework to distinguish different housing conditions. Inter-rater reliability is required to examine and determine whether different assessors can evaluate the same home consistently, using statistics (e.g. Cohen's kappa or intraclass correlation coefficients) where appropriate. Construct and convergent validity could be explored by comparing framework scores with established measures (e.g. the Perceived Restorativeness Scale or the self-reported stress levels of older adult occupants) [38]. Furthermore, the sensitivity of this assessment tool should be considered, as it may require adaptation and validation before being implemented in different countries, climatic regions, cities, cultural settings, and population groups. Through these steps, the framework could gradually move from a conceptual perspective towards a reliable tool for research and practice in senior housing.

6. Conclusions

As ageing-in-place becomes an increasingly important goal in housing, health, and social care, the residential environment needs to be understood as more than a setting for physical safety and functional adaptation. Existing assessment tools for older adults have made substantial contributions by identifying hazards, accessibility barriers, and person-environment mismatches. However, a home that successfully prevents falls or supports mobility may still fail to provide sensory stimulation, emotional comfort, cognitive restoration, and meaningful connection with everyday life. For older adults who stay indoors, the presence and quality of natural elements can therefore become an important part of environmental support.

This paper has argued that biophilic design offers a valuable perspective for expanding the assessment of senior housing. By drawing on biophilic design theory, existing assessment tools, and the specific needs of ageing-in-place, it proposed a conceptual framework for evaluating natural elements in senior housing through three interrelated dimensions: physiological and sensory support, psychological and cognitive restoration, and social and behavioural engagement. The framework emphasises that natural elements can be evaluated not only by their presence, but also by their visibility, accessibility, safety, maintenance burden, sensory suitability, and relevance to older adults' daily routines.

The proposed framework repositions natural elements as part of the environmental infrastructure of ageing-in-place and identifies how biophilic design can complement existing safety-oriented housing assessments. Future research is suggested to refine the framework into measurable items, develop scoring rules and resident-reported modules, and test its reliability and validity across diverse residential settings. By shifting the focus from risk prevention to active environmental restoration, biophilic design could help transform senior housing into healthy ageing environments that actively support quality of life in later years.

Author Contributions

W.Z.: conceptualisation, methodology, data curation, visualisation, writing—original draft preparation, reviewing and editing, funding acquisition; C.M.: methodology, supervision, writing—original draft preparation, reviewing and editing. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

Use of AI and AI-Assisted Technologies

During the preparation of this work, the authors used Codex to obtain preliminary suggestions for the graphical layout and icons of Figure 1. After using this tool, the authors independently redrew, reviewed, and edited the figure using Adobe Illustrator as needed and took full responsibility for the content of the published article.

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