

Purpose

This Health Technical Advice (HTA) provides general advice on biophilic design and how it can be integrated into healthcare projects.

This HTA is to be read in conjunction with the [Guidelines for sustainability in health care capital works](https://www.vhba.vic.gov.au/sites/default/files/2021-10/Sustainability-guidelines-for-capital-works-VHBA-Revised-October-2021.pdf) <<https://www.vhba.vic.gov.au/sites/default/files/2021-10/Sustainability-guidelines-for-capital-works-VHBA-Revised-October-2021.pdf>> ('the Guidelines') and the [Australasian Health Facility Guidelines](https://healthfacilityguidelines.com.au/) (AusHFG) <<https://healthfacilityguidelines.com.au/>>.

Overview

Biophilic design stems from the biophilia hypothesis and is a proven strategy for achieving healing and restorative environments that benefit and enhance patient, staff, and visitor wellbeing. Successful applications of biophilic design can result in physical, mental, and behavioural benefits and improved health. These outcomes support one of the key principles of the Guidelines, that “hospitals are healing environments”.

It is important to note that biophilic design needs to be considered against other design drivers, functional requirements and other needs of the project.

Importance of biophilic design in health care

What is the biophilia hypothesis?

Biophilia is the inherent human inclination to affiliate with nature that even in the modern world continues to be critical to people’s physical and mental health and wellbeing¹. The word biophilia is a combination of two Greek words: bio, from bios meaning life, and philia meaning love of, and translates as “love of life”.

Why is this important?

Biophilia applied to design is a patient-centric consideration, meaning that the patient (or user) experience is the priority for decision making.

Health care facilities devoid of connection to nature and lacking outdoor amenity for patient and staff use can negatively affect patient recovery. These facilities generally lack positive sensory stimuli, natural light, ventilation, and general connection to nature. The need for health care facilities to have stringent infection control requirements, typically controlled through mechanical ventilation systems, can be at odds with providing restorative and nurturing environments, and appropriate consideration for the facility or project is required.

¹ [Kellert, S. 2015. 'The Practice of Biophilic Design'](https://biophilicdesign.umn.edu/sites/biophilic-net-positive.umn.edu/files/2021-09/2015_Kellert%20_The_Practice_of_Biophilic_Design.pdf), <https://biophilicdesign.umn.edu/sites/biophilic-net-positive.umn.edu/files/2021-09/2015_Kellert%20_The_Practice_of_Biophilic_Design.pdf>

The biophilia hypothesis is linked to Attention Restoration Theory and Stress Recovery Theory, which suggest that some environments are stressful, and others are restorative². The latter can actively help people recover from stress and restore mental and attentional capacity. Additionally, specific studies in the health care field have reported that exposure to nature can reduce stress, lower blood pressure, provide pain relief, improve illness recovery accelerate healing, enhance staff morale and performance, and lead to fewer conflicts between patients and staff³. This further supports the pertinence for biophilia considerations in health care settings, which can be implemented through biophilic design.

What is biophilic design?

Biophilic design is the application of the biophilia hypothesis in the built environment. It seeks to connect design and nature through various strategies, to achieve the physical, mental, and behavioural benefits of exposure to nature. These strategies include using natural elements and processes as design inspiration. Experiences and attributes of biophilic design can be categorised in three broad groups:

1. Direct experience of nature
2. Indirect experience of nature
3. Experience of space and place.

All sensory responses to nature such as touch, sound and visual should be considered in biophilic design as appropriate for the relevant projects. Studies have found that natural stimuli to auditory and olfactory senses have been observed to be highly restorative after psychological stress⁴.

Table 1: Experiences and attributes of Biophilic design by Kellert and Calabrese

Direct experience of nature	Indirect experience of nature	Experience of space and place
Light	Images of nature	Prospect and refuge
Air	Natural materials	Organised complexity
Water	Natural colours	Integration of parts to wholes
Plants	Simulating natural light and air	Transitional spaces
Animals	Naturalistic shapes and forms	Mobility and wayfinding
Weather	Evoking nature	Cultural and ecological attachment to place
Natural landscapes and ecosystems	Information richness	
Fire	Age, change, and the patina of time	
	Natural geometries	
	Biomimicry	

² Kaplan, S, Kaplan, R, 1989, 'The experience of nature', Cambridge University Press

³ [Kellert, S.2015. 'The Practice of Biophilic Design'](https://biophilicdesign.umn.edu/sites/biophilic-net-positive.umn.edu/files/2021-09/2015_Kellert%20_The_Practice_of_Biophilic_Design.pdf), <https://biophilicdesign.umn.edu/sites/biophilic-net-positive.umn.edu/files/2021-09/2015_Kellert%20_The_Practice_of_Biophilic_Design.pdf>

⁴ [Alvarsson, J., 2010. 'Stress Recovery during Exposure to Nature Sound and Environmental Noise'](https://www.researchgate.net/publication/45114524_Stress_Recovery_during_Exposure_to_Nature_Sound_and_Environmental_Noise), <https://www.researchgate.net/publication/45114524_Stress_Recovery_during_Exposure_to_Nature_Sound_and_Environmental_Noise>

Application of biophilic design

Biophilic design principles should be considered early in the design process and are most successful when integrated within the master planning and architecture rather than solely through interior design elements. The following principles should be applied when developing and evaluating masterplan or schematic designs, noting that many of these attributes are already standard architectural considerations or business-as-usual (BAU) requirements under the Guidelines.

Examples of applications suitable for healthcare facilities are listed in Table 2. Biophilic design can be a sustainability initiative for projects for consideration under the 2.5% sustainability budget, where deemed appropriate for the project and supported by the relevant health agency and VHBA sustainability representative. Applications noted as ‘Exceeds BAU’ are examples of initiatives that may be considered under the 2.5% sustainability budget.

It is important to note that appropriateness of the type of biophilic design applications should be assessed against the patient cohort, facility type, and other considerations such as ongoing maintenance requirements.

Table 2: Example applications of biophilic design strategies

Attributes	Example applications
<i>Direct experiences of nature</i>	
Light	<ul style="list-style-type: none"> • Building orientation and window placements • Consideration of floor plate depth for light access • Internal natural light access through full height glass partitions • External windows with views to the outdoors/sky <p><i>Exceeds BAU:</i></p> <ul style="list-style-type: none"> • Additional internal glazing/high level windows that demonstrates a visual connection or natural light benefit for occupants • Reflective materials in strategic locations
Air	<ul style="list-style-type: none"> • Operable windows in appropriate locations/facilities (e.g., aged-care facilities, staff areas, foyer/entry spaces)
Water	<ul style="list-style-type: none"> • Water sensitive urban design integrated with outdoor courtyards/gardens <p><i>Exceeds BAU:</i></p> <ul style="list-style-type: none"> • Water feature, where appropriate and does not pose infection risks • Constructed wetlands
Plants	<ul style="list-style-type: none"> • Abundant indigenous or native vegetation in landscaped areas • Provide habitat corridor links where site is close to conservation areas and natural habitats • Deliver a net biodiversity increase using locally indigenous flora and planting for habitat and enhancing local wildlife <p><i>Exceeds BAU:</i></p> <ul style="list-style-type: none"> • Additional vegetation to enhance indoor areas where appropriate
Weather	<ul style="list-style-type: none"> • Outdoor spaces and gardens

Attributes	Example applications
	<ul style="list-style-type: none"> • Courtyards for staff and patient break out and respite • Sensory and well-being gardens
	<p><i>Exceeds BAU:</i></p> <ul style="list-style-type: none"> • Healing or restorative gardens, only where specialist therapeutic design has been incorporated
Indirect experiences of nature	
Natural materials	<ul style="list-style-type: none"> • The use of natural materials in appropriate locations/facilities (e.g., timber outdoor furniture) • Exposed CLT structure options where appropriate
	<p><i>Exceeds BAU:</i></p> <ul style="list-style-type: none"> • Natural materials used as feature finishes (e.g., timber ceilings in entry foyer)
Natural colours	<ul style="list-style-type: none"> • Use of muted 'earth' tones that are characteristic of soil, rock, and plants • Accent colours indicative of natural flowers and fruit where appropriate
Simulating natural light	<ul style="list-style-type: none"> • Dimmable settings for lighting in appropriate locations (e.g., corridors directly outside ward spaces whilst maintaining staff visibility as required during night times)
	<p><i>Exceeds BAU:</i></p> <ul style="list-style-type: none"> • Circadian rhythm lighting to specific areas to mimic live, outdoor light levels where no views to outdoors is possible and where this will not negatively impact staff alertness.
Naturalistic shapes and forms	<ul style="list-style-type: none"> • Natural shapes or patterns (e.g., leaf motif, fractal patterns, organic forms and patterns)
Evoking nature	<ul style="list-style-type: none"> • Building design concept is abstracted from design principles or characteristics of the natural world • Information rich materials and textures
Experience of space and place	
Prospect and refuge	<ul style="list-style-type: none"> • Creating vistas to the outside • Visual connections to other interior spaces, where other spaces and their functions, and/or movement of people are visible. • Sheltered spaces (e.g., low height ceiling seating area in an atrium, or covered external seating)
Transitional spaces	<ul style="list-style-type: none"> • Clear transitions between different spaces through: <ul style="list-style-type: none"> - Thresholds - Hallways - Courtyards
Mobility and wayfinding	<ul style="list-style-type: none"> • Clear pathways and points of entry and egress

Attributes	Example applications
Cultural and ecological attachment to place	<ul style="list-style-type: none"> • Culturally relevant design through awareness of local landscapes or native flora and fauna • Integration of indigenous connection and appropriate cultural design elements • Abstract design concepts from local ecology and culture • Maximise retention of existing ecological resources, contiguous ecosystems, networks and native vegetation
	<p><i>Exceeds BAU:</i></p> <ul style="list-style-type: none"> • Signage to enhance awareness of cultural or ecological features such as native plants in landscape

Sustainability report inclusion

Where biophilic design is proposed as an initiative, the following information should be included to assist with decision making and costing.

- experience type and attribute (as defined in Table 2)
- applications included in design
- justification of benefit for the project
- benefits for user, including specific cohorts where applicable (e.g. staff, patient cohorts, visitors)
- highlight areas on floor plan noting proposed application/features
- provide example images or renders where possible
- provide cost over and above a BAU approach (e.g. oncost for material selection).

Resources & References

[Alvarsson, J. 2010. 'Stress Recovery during Exposure to Nature Sound and Environmental Noise'. International Journal of Environmental Research and Public Health](https://www.researchgate.net/publication/45114524_Stress_Recovery_during_Exposure_to_Nature_Sound_and_Environmental_Noise)
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[Interface. 2015. '14 Patterns of Biophilic Design'](https://blog.interface.com/en-au/complexity-and-order-biophilic-design/) <https://blog.interface.com/en-au/complexity-and-order-biophilic-design/>

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[Office of the Victorian Government Architect. 'Good Design + Health'](https://www.ovga.vic.gov.au/good-design-health) <https://www.ovga.vic.gov.au/good-design-health>

[Victorian Health Building Authority. 'What is biophilic design'](https://www.vhba.vic.gov.au/what-is-biophilic-design) <https://www.vhba.vic.gov.au/what-is-biophilic-design>

Contact

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