Biophilic Design

Bio + philia -> love for life

PARKASSOCIATI

Indice

01 Intro

What is biophilia?

Tendency to be attracted to all that is alive and vital (Fromm - 1964)

Empirical experience of deep communion with nature (Wilson - 1984)

The inborn affinity human beings have for other forms of life (Cambrigde)

The sundry denotations which have evolved from within the fields of biology and psychology, and been adapted to the fields of neuroscience, endocrinology, architecture and beyond, all relate back to the desire for a (re)connection with nature and natural systems.

Biophilia is also an emotion. It represents the strong feeling of communion with Nature from which descends a psychophysical well-being for human beings.

What is biophilic design?

Biophilia refers to the innate human connection to nature and living systems. With the progress of civilization, people's lifestyles have changed, resulting in a greater amount of time spent indoors, especially in developed countries. According to scientific data, individuals tend to spend about 85-90% of their day (or 19-21 hours) inside, engaging in activities such as work, studying, socializing, and entertainment (Godish 2001).

To incorporate nature into our built environment and foster a deeper connection between humans and their surroundings, designers have introduced the concept of biophilic design. Recent research has confirmed the positive impact of such design on health, bolstering empirical evidence for the connection between humans and nature and emphasizing its importance in design research and practice. This design approach can be implemented through the use of natural finishes, indoor plants, and references to nature or its symmetry, which promote greater interaction with nature. Nowadays, biophilic design is increasingly recognized as a crucial aspect of interior design for modern workplaces, offices, hospitals, and commercial buildings, with a focus on improving the well-being of staff.

Biophilic design is not just about aesthetics, as it can lead to tangible benefits supported by scientific research. Stress and anxiety are pervasive issues in many workplaces that can negatively affect employee performance and overall business success. Studies have shown that exposure to nature can lead to greater psychological restoration and improved attention spans, as measured by factors such as heart rate, blood pressure, and cortisol levels. Nature-inspired spaces have also been found to enhance creativity and mental energy, possibly due to the Attention Restoration Theory. This theory suggests that engaging with nature can activate a different part of the brain than what is typically used for short periods of focus, offering a chance for mental rejuvenation.

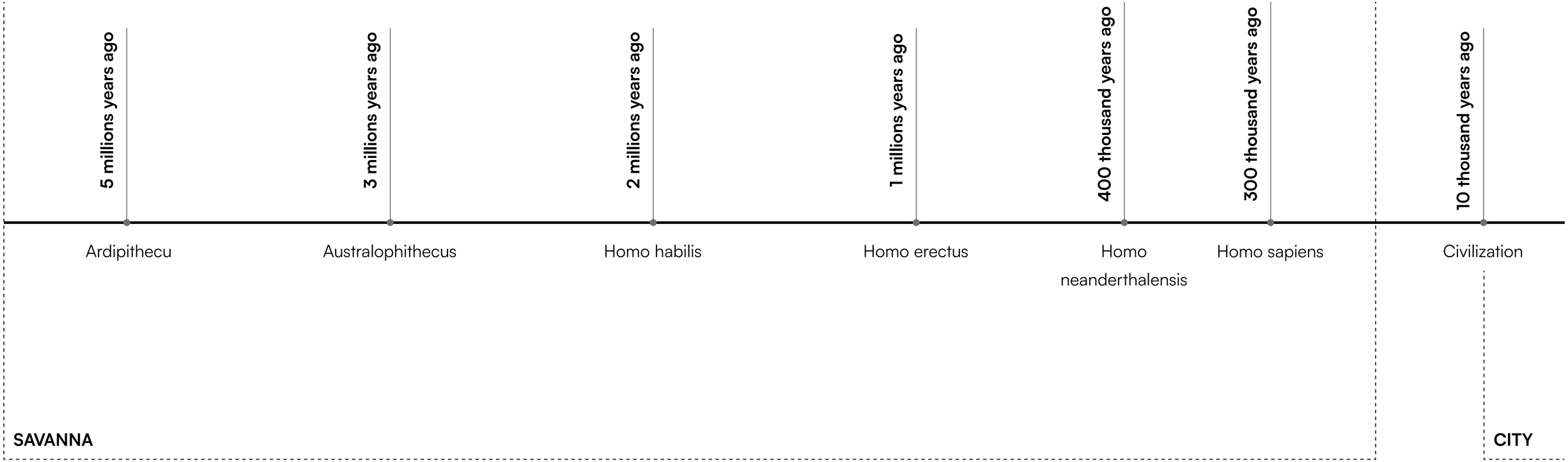
It is believed that biophilia has a genetically determined and evolutionarily adaptive nature. This means that it is inherent in our genes, which have developed over the hundreds of thousands of years that humans have spent in the savannah.

History of biophilic design

The presence of natural elements in historical structures and locations suggests that biophilic design is not a new concept, but rather a codification of history, human intuition, and neural sciences that demonstrate the importance of our connection with nature for maintaining a healthy and vibrant urban existence. Prior to and after the Industrial Revolution, humans lived mostly in rural areas, surrounded by nature. With the growth of urban populations in the 19th century, health and sanitation concerns such as fire hazards and dysentery became a significant issue, and public parks were created to improve health and reduce urban stress.

Over the past ten years, there has been a notable increase in the amount of research and practical application exploring the connections between neuroscience and architecture. This intersection has led to a growing understanding of the benefits of incorporating biophilia into the design of buildings and structures. As a result, even green building standards have begun to recognize the importance of biophilic design, particularly for its ability to enhance indoor environmental quality and create a deeper sense of connection to place.

The idea that human beings have an innate connection with nature is, therefore, undeniable:



02

Biophilic principles

Biophilic design principles

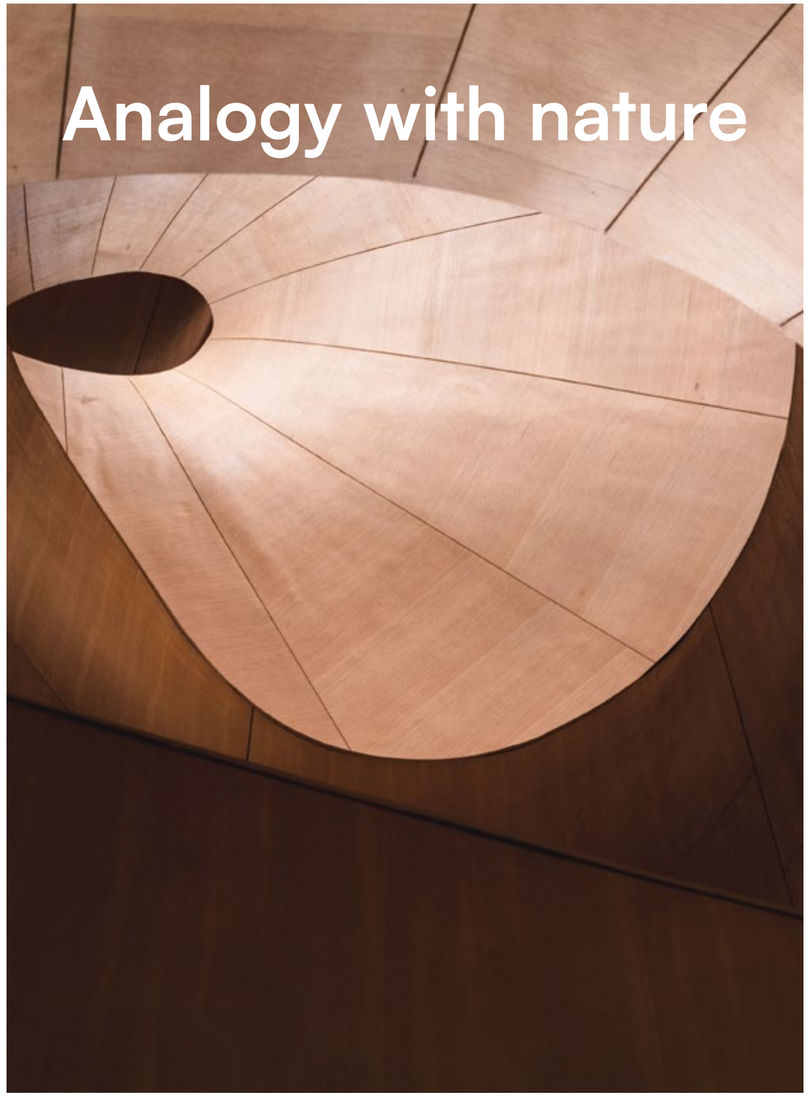
Biophilic design aims to promote human health and environmental well-being by utilizing people's natural connection with nature and establishing a balance within the built environment. The three main categories of biophilic design are nature in the space, natural analogues, and nature of the space, which serve as a guide for integrating a variety of strategies that can engage our senses and evoke natural elements within an artificial setting.

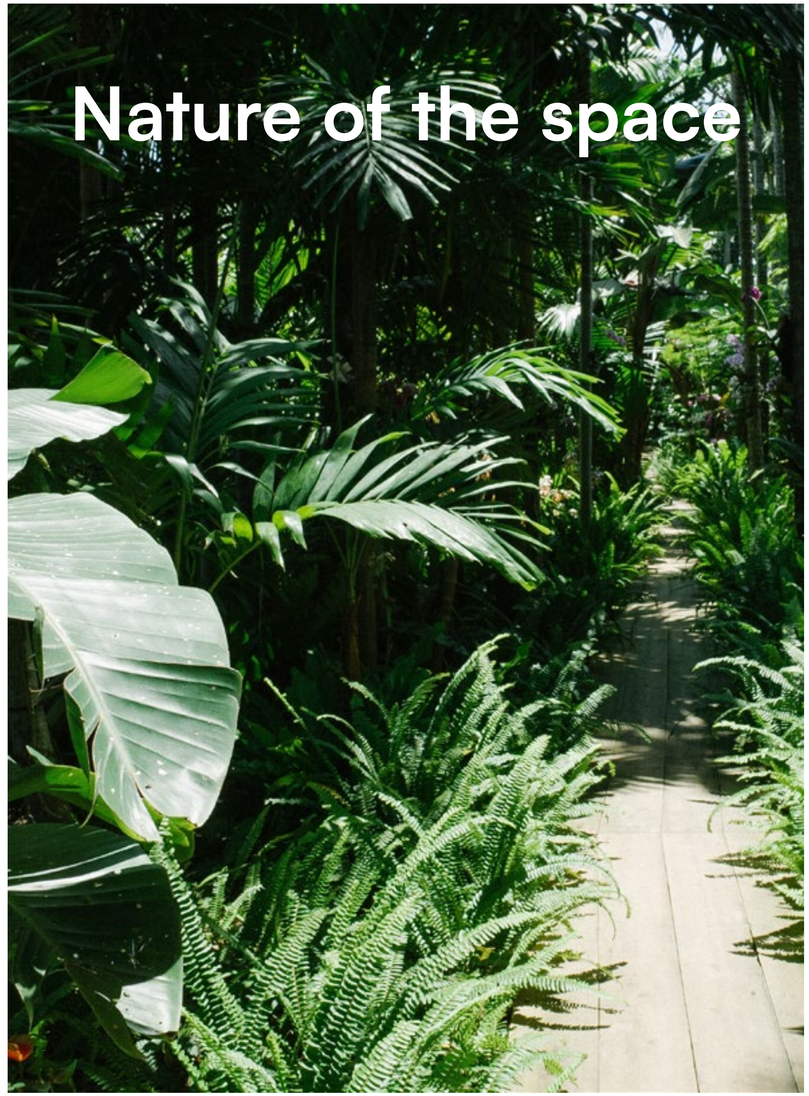
- Nature in the space pertains to the immediate existence of nature, which frequently involves multi-sensory encounters. These experiences may include visual, haptic, olfactory, or other situations where the natural components are easy perceived.
- Natural analogues involve the use of non-natural materials or modified materials that imitate patterns and shapes found in nature. These imitations serve as indirect methods to reflect nature. These principles can be applied separately or in combination to establish a connection with nature in an unnatural environment. The crux of biophilic design is to incorporate these imitations in a way that seems natural.
- The Nature of the Space refers to imitating or taking inspiration from the spatial arrangements found in nature, with the aim of recreating the sensations evoked by natural spaces, such as feelings of safety, intrigue, possibility, or risk.

“...Biophilia is not a single instinct but a complex of learning rules that can be teased apart and analyzed individually. The feelings molded by the learning rules fall along several emotional spectra: from attraction to aversion, from awe to indifference, from peacefulness to fear-driven anxiety.”
Edward O. Wilson, 1993

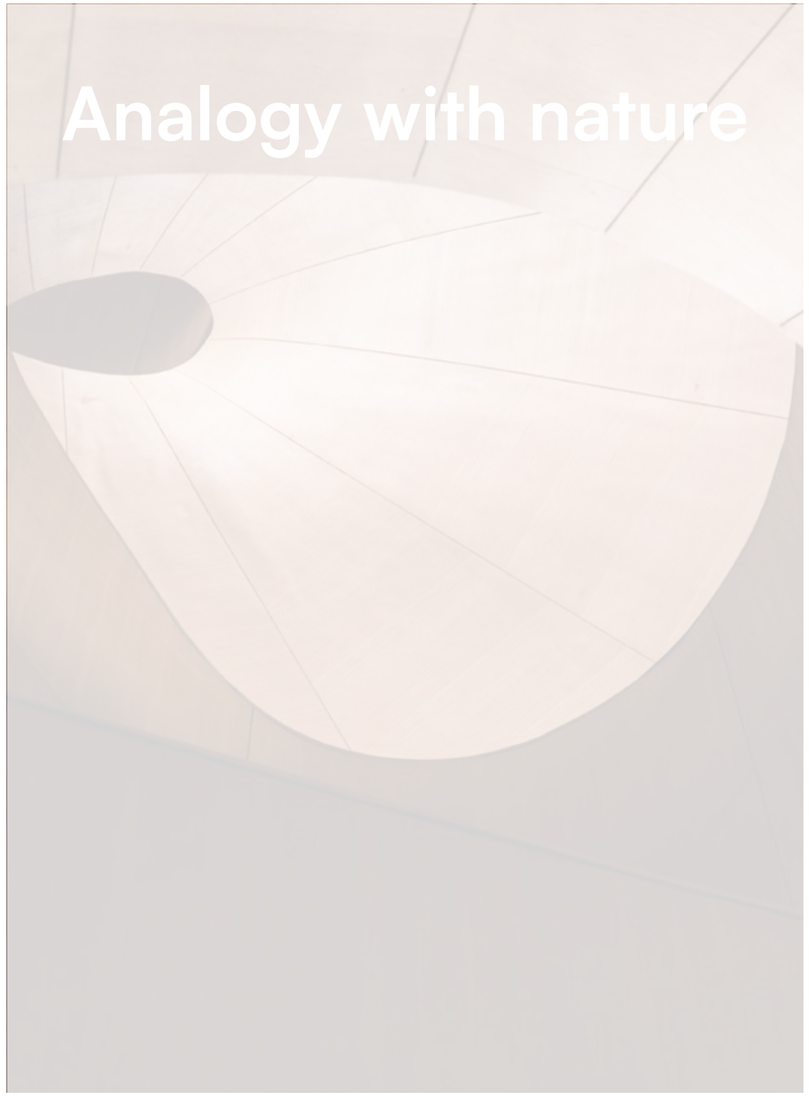
How can we incorporate biophilic principles within our built environment?


Nature in space


Analogy with nature


Nature of the space


Nature in space


Analogy with nature

Nature of the space

The concept of Nature in the Space pertains to the tangible, corporeal, and transitory existence of nature within a particular environment or location. This encompasses flora, fauna, bodies of water, as well as winds, noises, fragrances, and other natural components. Some examples include indoor plants, gardens, birdhouses, butterfly habitats, aquatic displays, fountains, outdoor gardens, and green walls or roofs.

Visual connection with nature

Non-visual connection with nature

Non-rhythmic sensory stimuli

Variation of temperature and air flow

Presence of water

Diffused and dynamic light

Relationship with natural systems

Visual connection with nature

The Attention Restoration Theory, proposed by Kaplan in 1995, suggests that prolonged focused attention can lead to mental fatigue. Conversely, observing a natural environment diffuses our attention and creates a sense of relaxation, ultimately refreshing our ability to focus.

Non-visual connection with nature

Non-rhythmic sensory stimuli

Variation of temperature and air flow

Presence of water

Diffused and dynamic light

Relationship with natural systems

Visual connection with nature

An architectural layout that enables a connection with nature

Incorporating glass windows that establish a strong connection between the interior and exterior spaces.

Choice of colorful plants that attract attention.

Trees of 1st size

Ginko biloba

Fagus sylvatica

Carpinus betulus biloba

Trees of 2nd size

Liquidambar styraciflua

Fagus sylvatica

Small trees / large shrubs

Acer monspessulanum

Acer palmatum

Cercidiphyllum japonicum

Sorbus aucuparia

Parrotia persica

Climbers

Ampelopsis quinquefolia

Hydrangea petiolaris

Ampelopsis brevipedunculata

Grasses

Imperata cylindrica

Pennisetum alopecuroides

Miscanthus gracillimus

Alllium schubertii

Flower that looks like a firework

Aristolochia elegans

Flower that looks like a large velvet handkerchief

Belamcanda chinensis

The bud is a curl with a particular shape

Callicarpa bodinieri

The berries are lilac like candy

Campanula ‘Pink Octopus’

The flower looks like an octopus

Cardiospermum halicacabum

The seed looks like a lantern

Chasmanthium latifolium

Fluorescences look like minnows

Clematis hybrida

Flowers with crazy colors

Cornus florida

Uniquely shaped flowers

Cornus kousa

Cascading flowers

Campanula ‘Pink Octopus’

Petals are like cones

Cotinus coggygria

Its flowering looks just like a fog bank

Visual connection with nature

Non-visual connection with nature

Intentional and positive associations with nature and living systems can be evoked through auditory, tactile, olfactory, or taste stimuli. Recent neuroscience studies have shown that the parts of our brain responsible for processing sensory information are interconnected, and the more senses we engage, the stronger the resulting sensation will be. Therefore, in design, it is important to equally consider all senses without favoring one over the others.

Non-rhythmic sensory stimuli

Variation of temperature and air flow

Presence of water

Diffused and dynamic light

Relationship with natural systems

Non-visual connection with nature

Presence of leaves with different textures
- Leaves
- Flowers
- Fruits

Presence of edible plants.
- Leaves
- Flowers
- Fruits
- Roots

Presence of scented and heady plants
- Leaves
- Flowers
- Fruits
- Bark

Choice of plants with berries to attract birds - Sound of the soil of the land - Noise of the leaves.
- Chirping
- Gravel
- Hiss

Hearing

Birds

Viburnum opulus

Viburnum lantana

Ligustrum vulgare

Rosa canina

Sorbus domestica

Leaves

Malus sylvestris

Pyrus pyraster

Prunus avium

Phyllostachys

Taste

Leaves

Mentha piperita

Oxalis xalisa

Levisticum officinale

Rheum officinale

Fruits

Cornus kousa

Arbutus unedo

Roots

Glycyrrhiza glabra

Helianthus tuberosus

Taste

Flowers

Tropaeolum majus

Rosmarinum officinalis

Rosa officinalis

Abutilon

Viola odorata

Borago officinalis

Smell

Leaves

Rosa mosqueta

Pelargonium tomentosum

Escallonia illinita

Geranium cantabrigiense

Fruits

Morus platanoides

Cydonia oblonga

Poncirus trifoliata

Smell

Flowers

Lonicera fragrantissima

Rosa banksiae

Chionanthus praecox

Sarconccocca confusa

Bark

Trachelospermum jasminoides

Escallonia illinita

Santalum album

Liquidambar styraciflua

Touch

Pelargonium tomentosum

Alchemilla mollis

Ligustrum vulgare

Hibiscus moscheutos

Visual connection with nature

Non-visual connection with nature

Non-rhythmic sensory stimuli

The relationship with nature can be stochastic and fleeting, and although it can be analyzed statistically, it cannot be accurately predicted. Spaces with non-repetitive sensory stimuli are experienced with all senses, including the unconscious level. Various studies, such as the one conducted by Ulrich in 1979, have shown that exposure to natural environments can lead to improved physical conditions, such as reduced blood pressure, muscle tension, and heart rate.

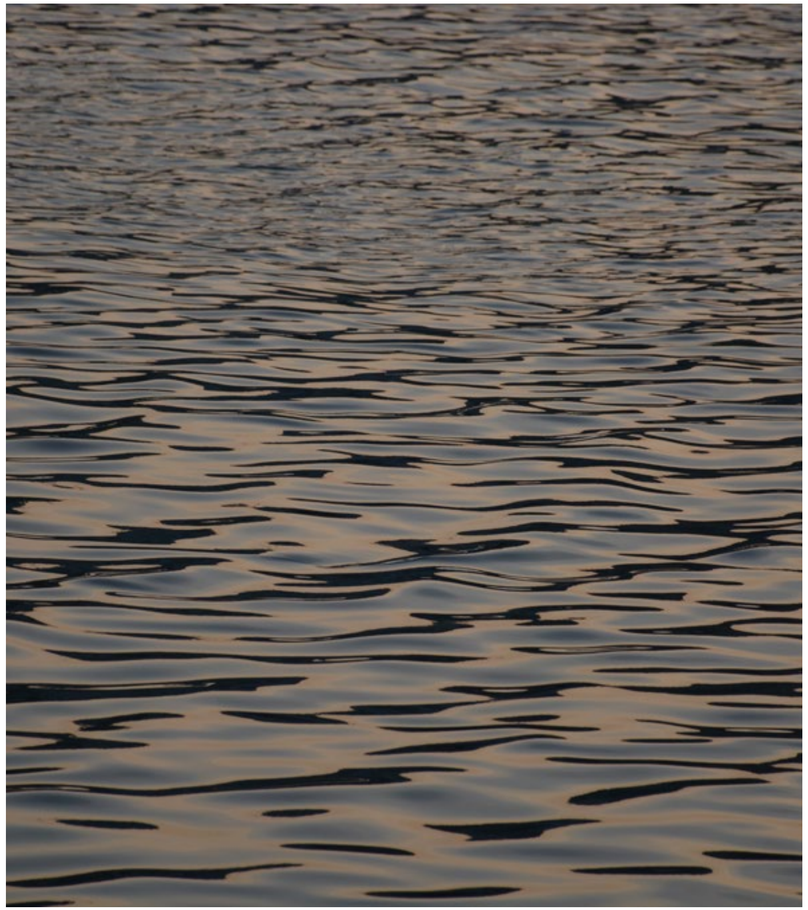
Variation of temperature and air flow

Presence of water

Diffused and dynamic light

Relationship with natural systems

Non-rhythmic sensory stimuli



Introduction of moving water

Study of lights and shadows

Large windows that guarantee the variation of the light

Visual connection with nature

Non-visual connection with nature

Non-rhythmic sensory stimuli

Variation of temperature and air flow

Mimicking natural environments, small variations in air temperature, humidity, airflow over the skin, and surface temperature can create a positive impact on human well-being. Trees, for instance, can decrease temperature through their foliage and the transpiration effect of their leaves. Additionally, according to NASA research, certain tree species have the potential to purify the air by filtering pollutants and emitting high levels of oxygen, leading to an improvement in indoor air quality.

Presence of water

Diffused and dynamic light

Relationship with natural systems

Variation of temperature and air flow

Shadow: trees with wide canopies

Acer platanoides

Acer platanoides

Gleditsia triacanthos

Platanus acerifolia

Ulmus pumila

Populus tremuloides

Variation of temperature and air flow

Air: plants able to purify the air from pollutants

Hedera helix

Epipremnum aureum

Spathiphyllum

Dracaena trifasciata

Philodendron cordatum

Dracaena marginata

Aloe vera

Aglaonema modestum

Visual connection with nature

Non-visual connection with nature

Non-rhythmic sensory stimuli

Variation of temperature and air flow

Presence of water

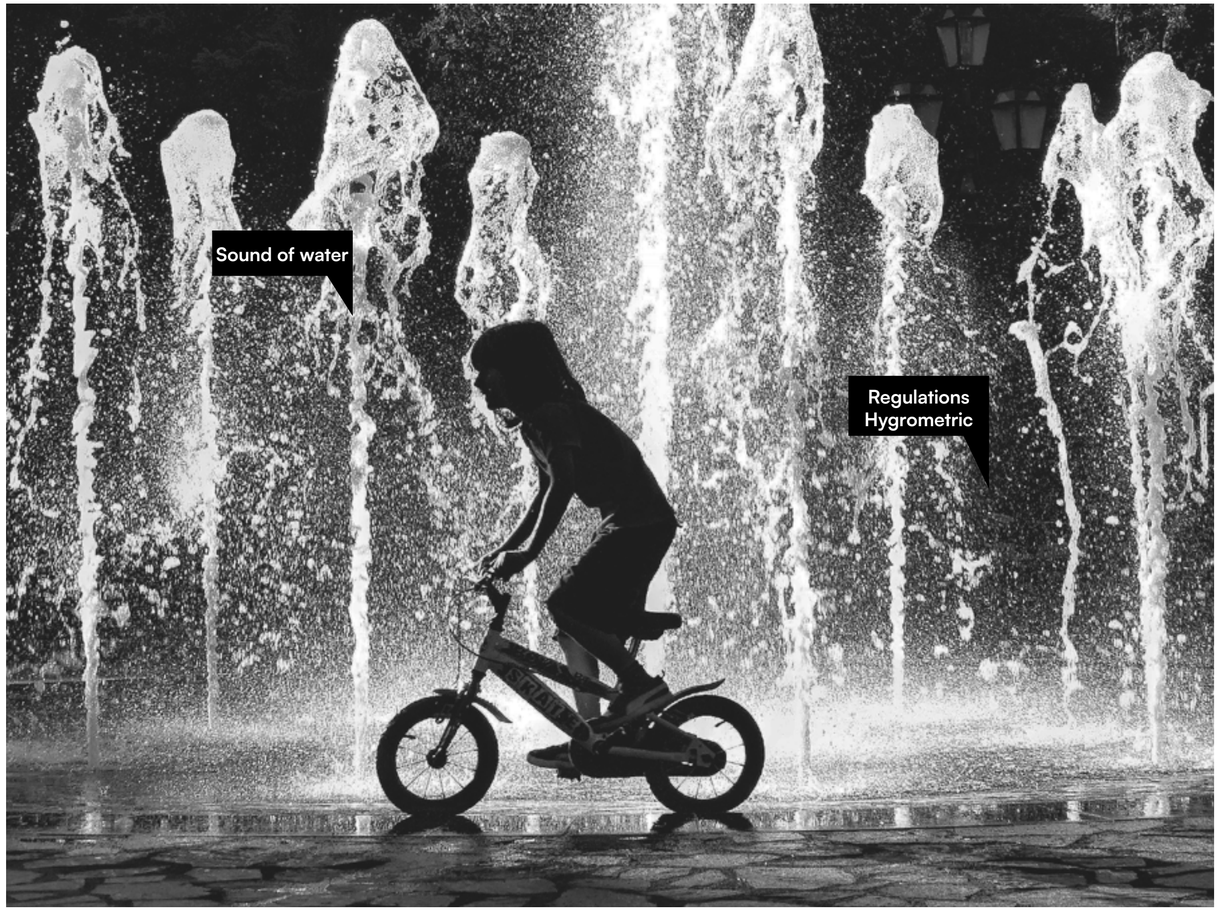
A state that elevates the perception of a location by incorporating visual, auditory, and tactile elements of water. Water is known to be associated with feelings of aesthetic enjoyment, relaxation, and positive emotions, based on evolutionary psychology research. This connection can be attributed to water's historical significance in our survival as a species. Consequently, the inclusion of water features in masterplans is crucial to promoting well-being.

Diffused and dynamic light

Relationship with natural systems

Presence of water

Linear trend



Usable openings

Visual connection with nature

Non-visual connection with nature

Non-rhythmic sensory stimuli

Variation of temperature and air flow

Presence of water

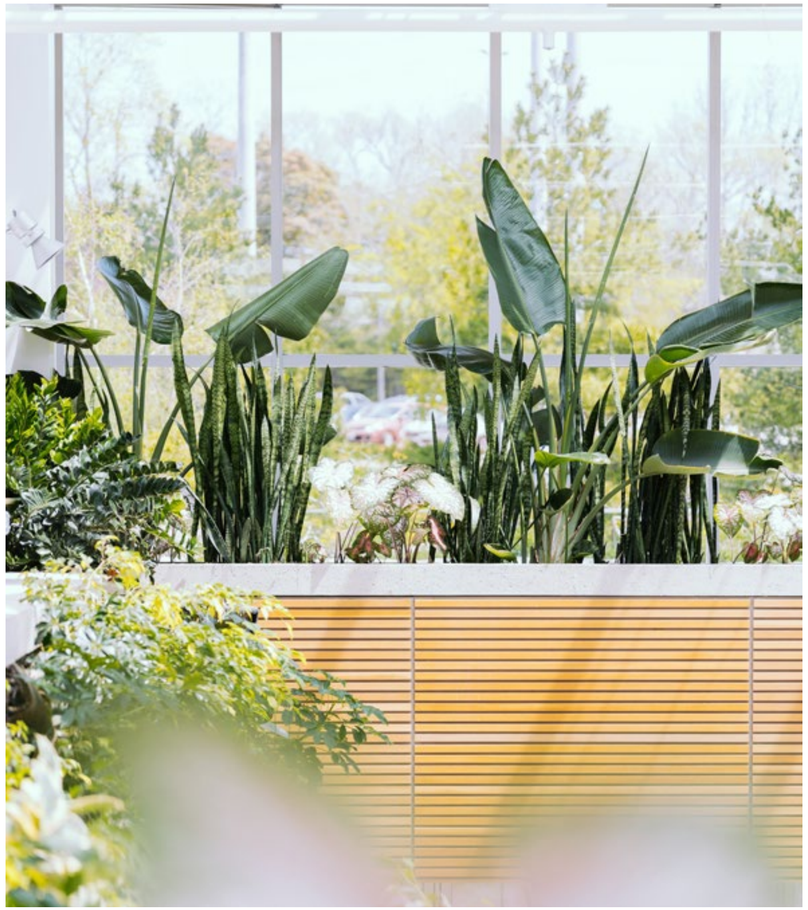
Diffused and dynamic light

To create natural conditions, utilize the varying intensities of light and shadow that change throughout the day. The stronger the connection between humans and natural elements, the greater the sense of well-being. Therefore, it is crucial to be conscious of the passing hours of the day and replace a steady artificial light with the presence of natural light, which shifts throughout the day.

Relationship with natural systems

Diffused and dynamic light

Architectural plan arrangement that allows good natural lighting.



Presence of deciduous plants in front of the windows that allow a right ratio of light and shadow within the spaces.

Large glasses that guarantee the variation of the light.

Visual connection with nature

Non-visual connection with nature

Non-rhythmic sensory stimuli

Variation of temperature and air flow

Presence of water

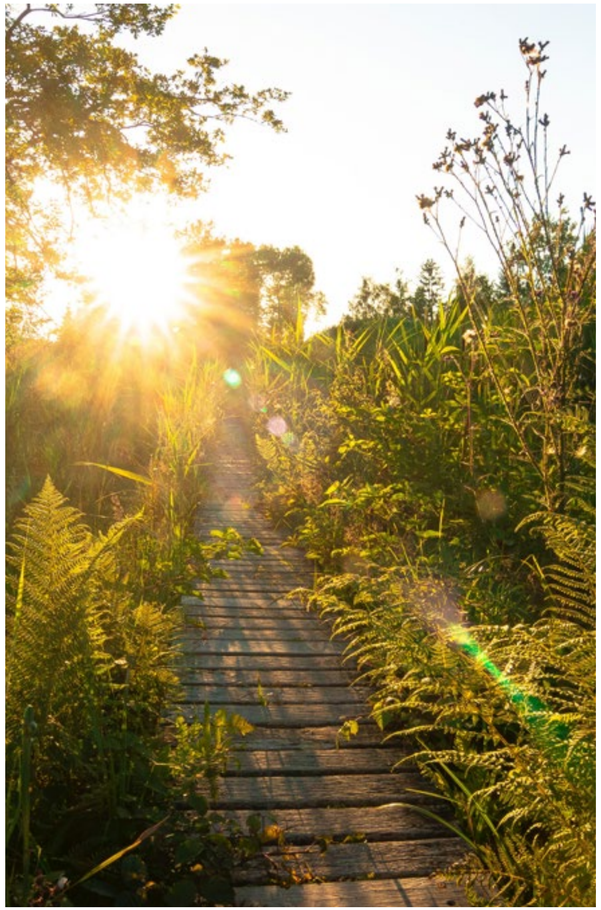
Diffused and dynamic light

Relationship with natural systems

To promote a healthy ecosystem, it is important to be mindful of natural processes, such as seasonal and temporal changes. Humans are a part of nature and, like other creatures on Earth, are integrated within its system. In this sense, being immersed in a healthy and self-sufficient natural environment that allows a good connection with natural systems makes us humans more aware of the seasonality and life cycles in which we are a part of.

Relationship with natural systems

Spring



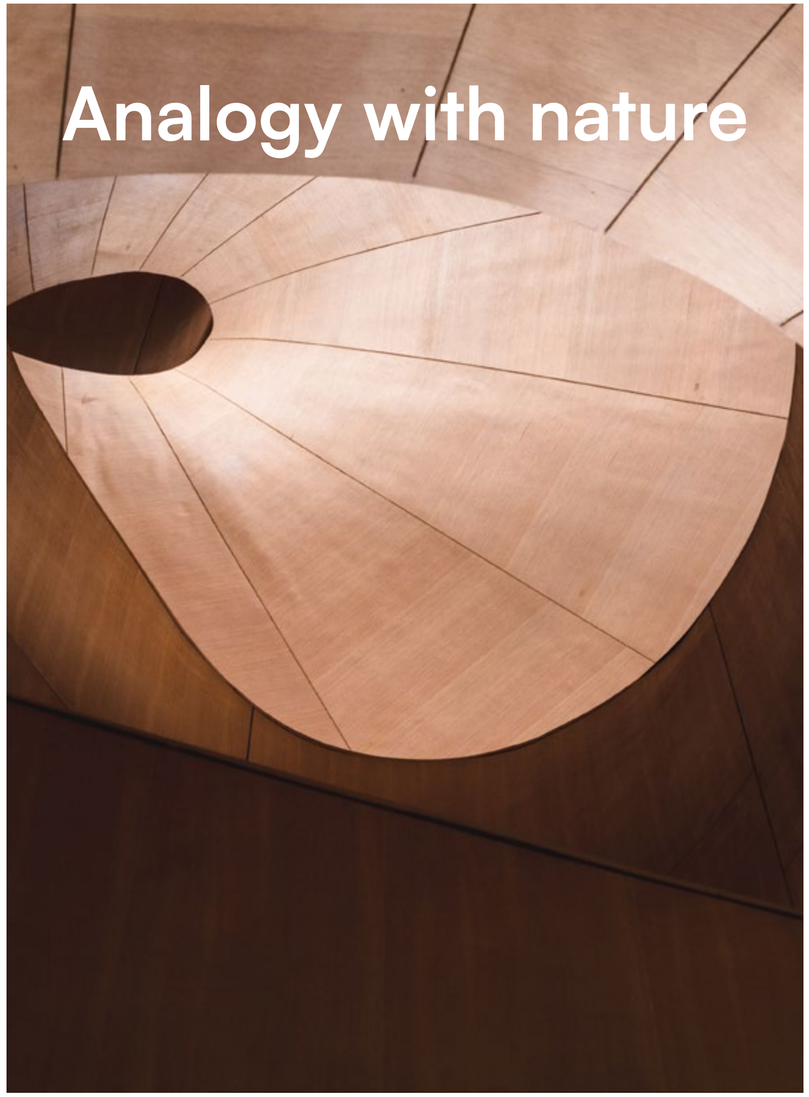
Summer

Autumn

Winter

Nature in space

Analogy with nature



Nature of the space

The concept of analogy with nature pertains to the use of organic, non-living, and indirect references to nature. Elements such as objects, materials, colors, shapes, sequences, and patterns that are found in nature can be incorporated into the built environment as artwork, ornamentation, furniture, décor, and textiles, offering an indirect link to nature. Although these elements are tangible, they only serve as an approximation of their natural form.

Biomorphic shapes and patterns

Natural materials

Biomorphic shapes and patterns

Symbolic references to arrangements of shapes, patterns or colors occurring in nature. Color also plays a fundamental role in the perception of space.

Natural materials

Warm and bright colors, with a high degree of luminosity, create a centrifugal action, directing the observer’s attention outwards, towards the surrounding space.

Softer environments, colder colors and lower lighting levels produce a centripetal action. Such environments favor an orientation towards the inner world in the observer and increase the ability to encourage introspection and improve concentration.

Biomorphic shapes and patterns

Color also plays a fundamental role in the perception of space.

Yellow:

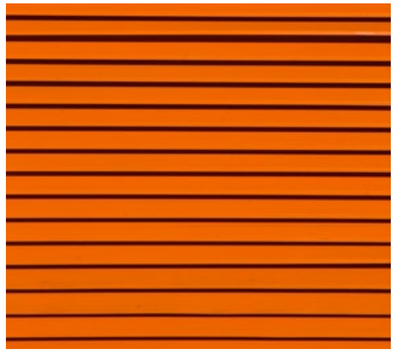
Exciting, stimulating, if very saturated can result irritating.

Purple:

Insecurity, magic, disturbing, hesitation, pain

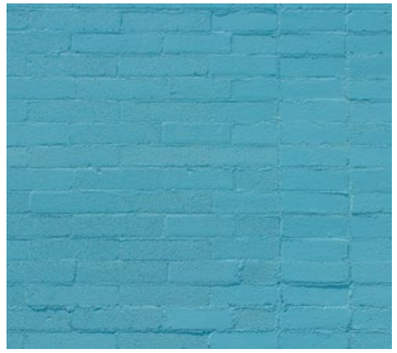
Green:

Freshness, softness, calm, relaxation



Orange:

Associated with a stimulating effect, warmth, brightness. Increase activism and movement

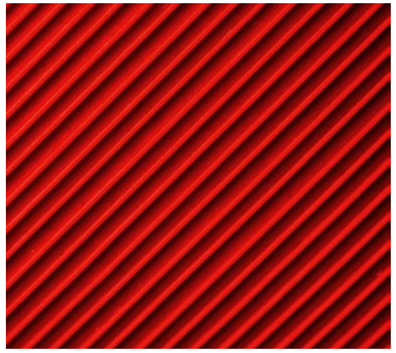


Light blue:

Encouraging, tranquility, coldness, distance (increases the perception of the size of spaces), dreamy atmosphere, celestial, exaltation of height

White:

Emotionally neutral, empty, vital, aseptic, clean, lively. Candor



Red:

Solemnity, passion, aggressiveness, power makes rooms seem smaller.

Blue:

When applied to large surfaces, tends to be cold, dismal. In its lighter shades it is perceived as fresh, masculine, distant.

Black:

Abstractness, extraneousness, greatly exaggerates the perception of depth of spaces, fullness, heaviness

Biomorphic shapes and patterns

Natural materials

Materials and elements of nature which, through minimal processing, reflect the local ecology and geology.

Natural materials

Wood

Hay

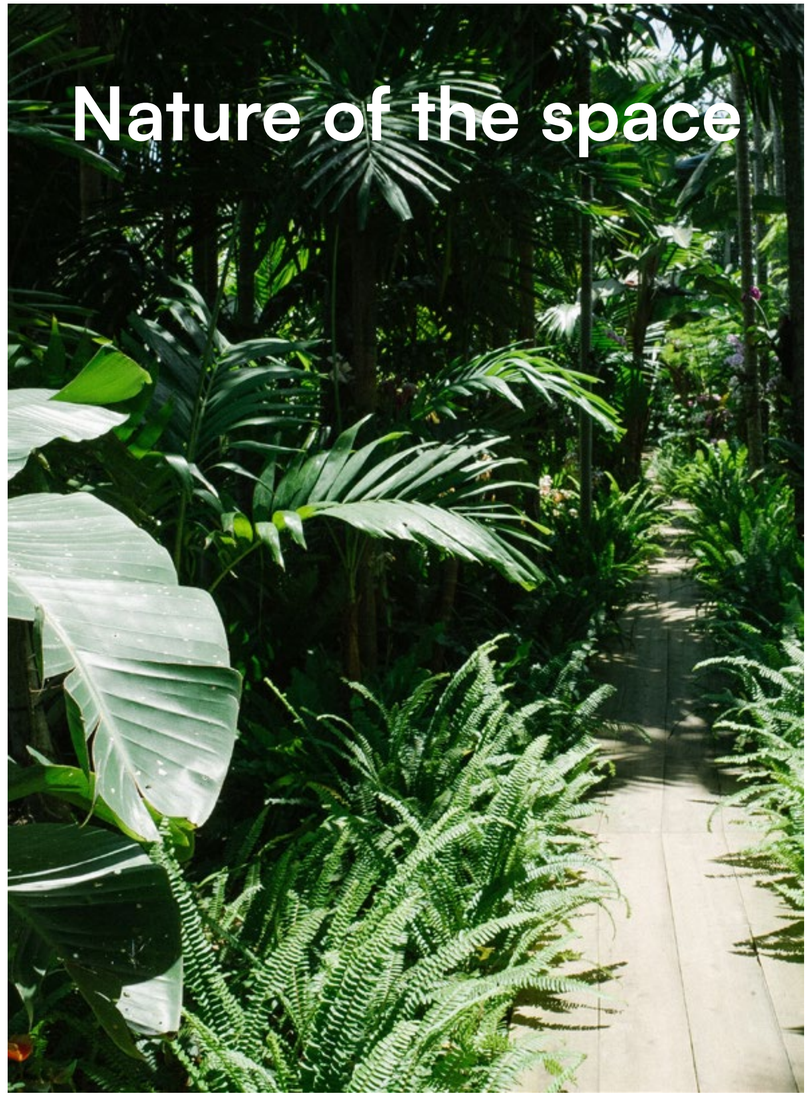
Raw earth

Bamboo

Cardboard

Nature in space

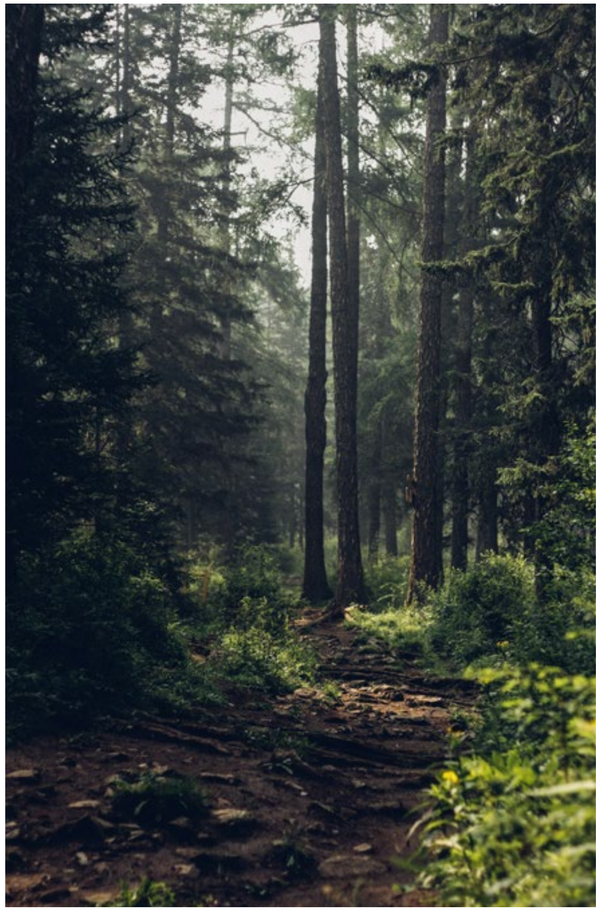
Analogy with nature


Nature of the space

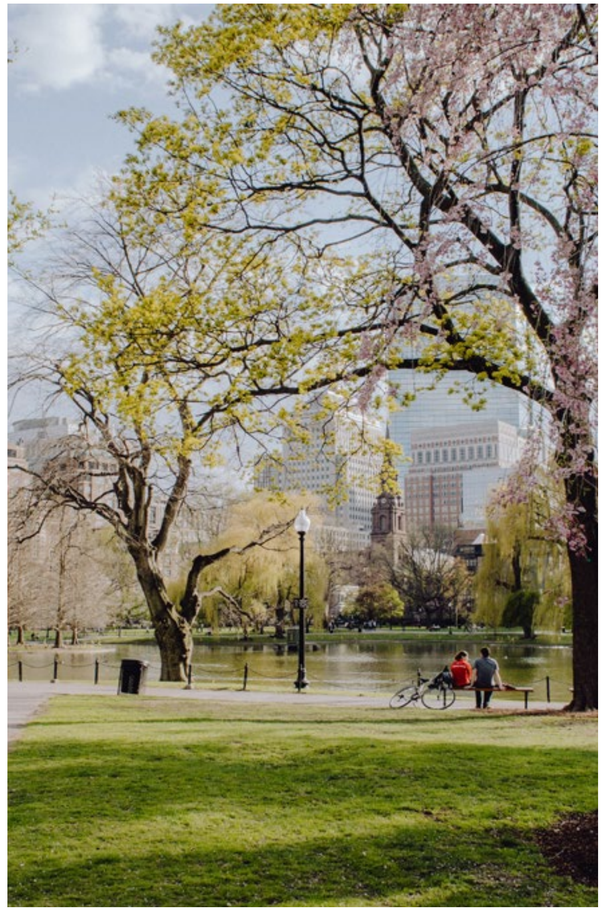
The concept of Nature in the Space concerns itself with the arrangement of physical space in a manner that mimics or takes inspiration from natural landscapes. This involves our primal and acquired inclination to explore our surroundings beyond what is immediately visible to us, our fascination with the slightly dangerous or unknown; obscured views and revelatory moments; even the fear-inducing aspects that can be incorporated with the presence of a familiar and trusted element.

Nature of the space

In a wide open space without any center of interest, there is a lack of a focal point that draws our attention. We are left with a sense of emptiness, where there is nothing to capture our gaze or engage our interest.



A space that is too deep can cause confusion and fearr, as the view is blocked and there is no way to see beyond. The lack of a clear path or focal point can create a sense of disorientation, and the feeling of being lost being overwhelming.



A space that strikes a good balance between open areas and areas filled with trees creates a specific atmosphere. The trees partially obstruct the view, allowing glimpses of the vast open spaces in the background. The arrangement of the trees is intentionally designed to draw the observer's attention towards exploring the environment, creating a sense of focus and direction.

The environmental preference model, introduced by Kaplan and Kaplan in 1989, is an evolutionary theory that builds on the idea the assumption of the capacity for appreciating aesthetics to facilitate the selection of appropriate habitats that are conducive to survival and adaptation.

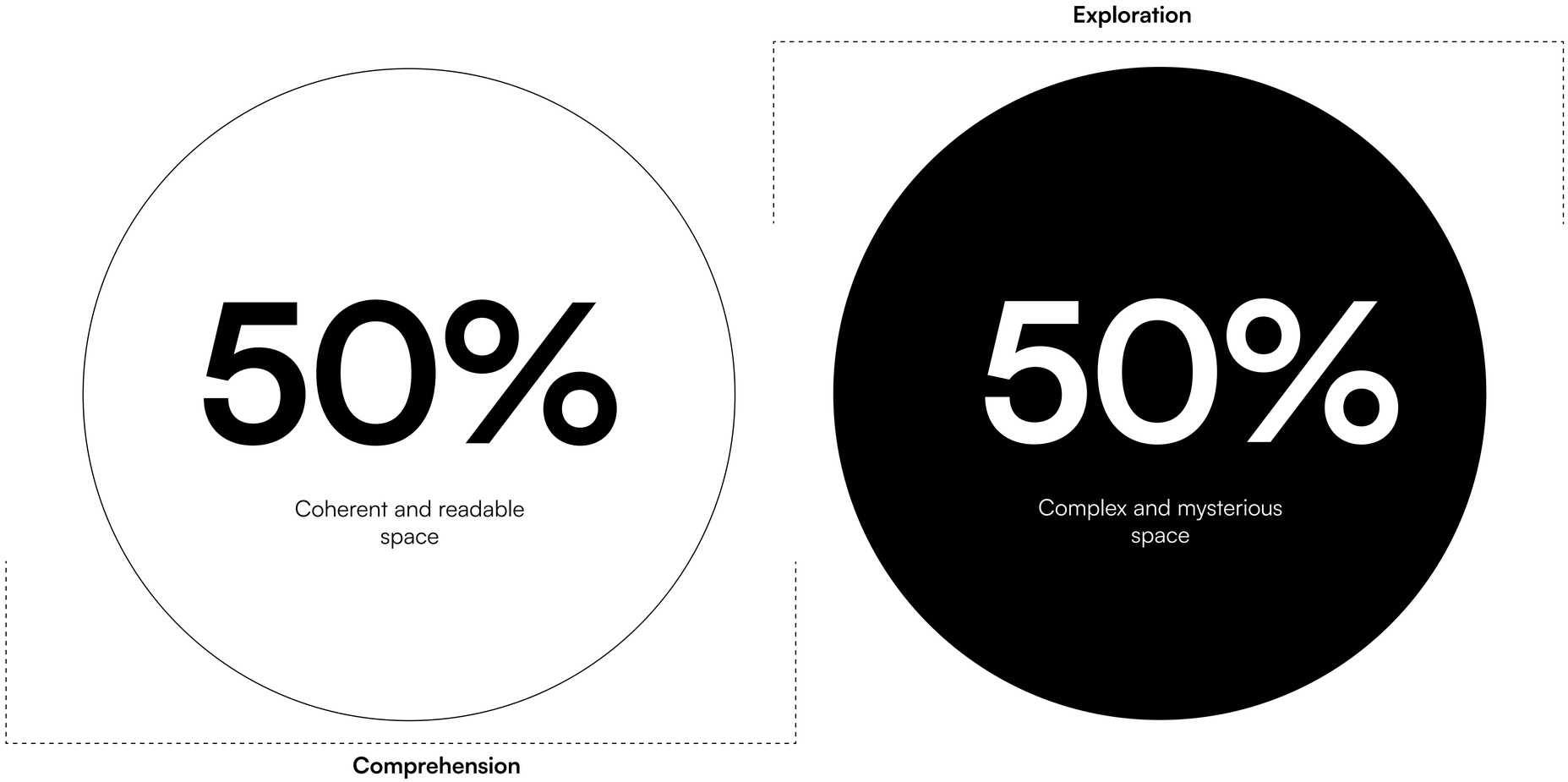
Environmental preference model Kaplan and Kaplan 1989

The Kaplan and Kaplan model (1989) proposes a method for forecasting individuals' inclination towards one environment as compared to another. Their theory suggests that this inclination is a remnant of our past evolution as hunter-gatherers. People have a natural tendency to be drawn to environments that they can easily comprehend and that are expected to offer them relevant information such as food sources and orientation (like cognitive maps). Human environmental preferences in the modern world are not seen as frivolous liking for the appearance of one environment over another, rather it is:

- "...intimately tied to basic concerns. We see preference as an expression of underlying human needs. Preference can be expected to be greater for settings in which an organism is likely to be harmed or rendered ineffective. Thus humans, like other animals, are far more likely to prefer a setting in which they can function effectively.
- Aesthetic reactions thus reflect neither a causal nor a trivial aspect of the human makeup. Rather they appear to constitute a guide to human behavior that is both ancient and far-reaching. Underlying such reactions is an assessment of the environment in terms of its compatibility with human needs and purposes. Thus, aesthetic reaction is an indication of an environment where human functioning is more likely to occur" (Kaplan and Kaplan, 1989, p.10)

The notion that seeking and processing relevant information is crucial for human well-being is central to this perspective. While most animals are inclined to move towards objects or places that offer immediate physiological benefits, such as food, shelter, and refuge, humans have a direct need for information. This is due to our evolved cognitive mechanisms that enable us to bridge the gap between our desires and our actions, such as mapping out the environment or devising plans to achieve our goals efficiently. The availability of essential information for performing vital human activities varies across different environments.

To be attractive, a space must simultaneously be:



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Benefits

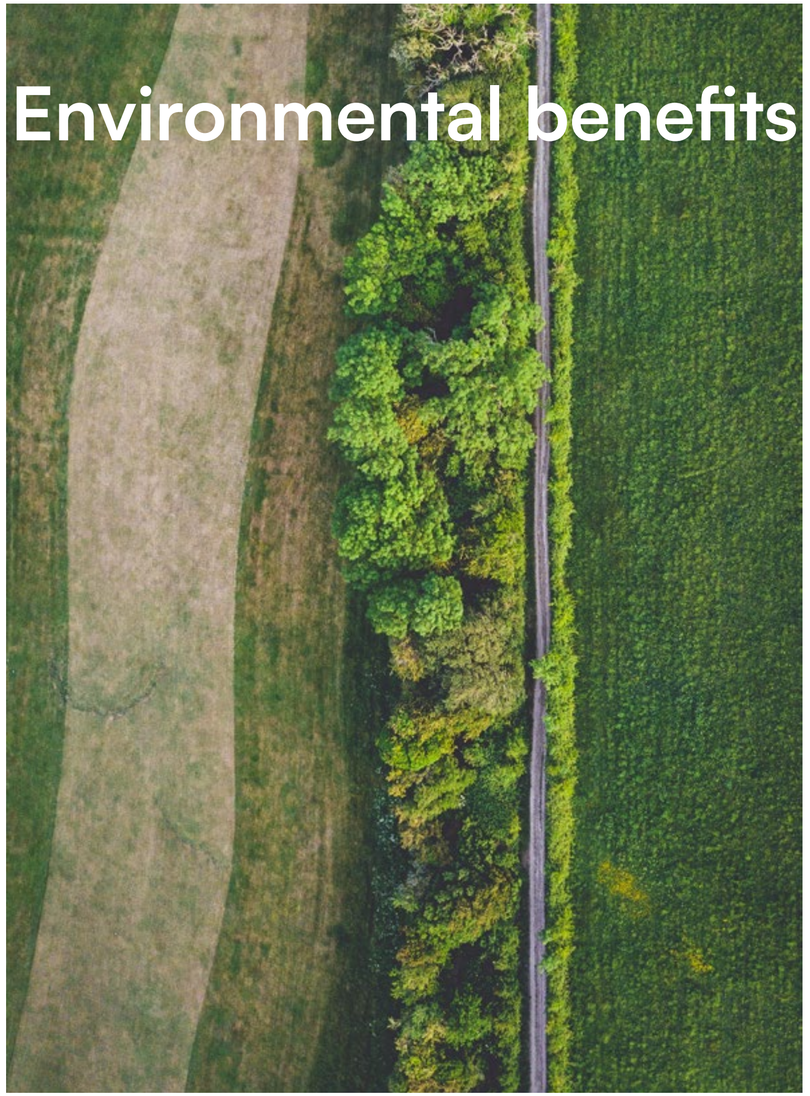
Benefits of using biophilic design

The concept of biophilic goes beyond just being a philosophical or design approach, as research has shown that exposure to natural environments can have significant positive effects on cognitive function, physical health, and psychological well-being. Biophilic design is thus not just an aesthetic choice, but a way to create spaces that support the health and well-being of their occupants. Therefore some of the numerous benefits are:

- Visual connection with nature can lower blood pressure and heart rate, improve mental engagement, and attentiveness, and positively impact attitude and overall happiness. This is linked to lower incidence of depression, heart disease, and diabetes.
- Optimized thermal and airflow variability (i.e., the subtle shift in air temperature and humidity, such as a cool breeze) can positively impact one's ability to concentrate in a space. This is linked to enhanced productivity.
- The presence of water can increase feelings of tranquility which also lowers the heart rate and blood pressure. Additionally, it aids in memory restoration, enhanced perception, and psychological responsiveness. Researchers have also discovered that materials have a direct impact on stress levels. In particular, wood that shows its grain has been known to relax the autonomic nervous system.
- The sustainability aspect of biophilic design is crucial for living buildings and environments. Providing green spaces, water features, abundant plants and natural materials creates a host of benefits, including helping to reduce a development's carbon footprint and regulating the temperature of buildings.

Biophilic design has the potential to improve human well-being and the environment, making it an important consideration in architectural and interior design.


Human benefits


Environmental benefits


Human benefits

Environmental benefits

Improvement of the indoor air

Stress reduction

Improved cognitive function

Health benefits

Increased productivity

Improvement of the indoor air

Incorporating plant life into the design of indoor spaces is a crucial aspect of biophilic design as it serves multiple purposes. Firstly, plants help in oxygenating and filtering out some of the harmful chemicals that are often present in cleaning products used in indoor spaces, thereby improving indoor air quality.

Stress reduction

Improved cognitive function

Health benefits

Increased productivity

Improvement of the indoor air

1 * The World Green Building Council. Health, Wellbeing & Productivity in Offices. https://ukgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2017/09/05152806/Health20Wellbeing20and20Productivity20in20Offices20-20The20next20chapter20for20green20building20Full20Report_0.pdf

2.* Gubb, C., Blanusa, T., Griffiths, A., & Pfrang, C. (2022). Potted plants can remove the pollutant nitrogen dioxide indoors. Air Quality, Atmosphere & Health, 15(3), 479—490. https://doi.org/10.1007/s11869-022-01171-6

Improvement of the indoor air

Recommended indoor air purifying ornamental potted plants

Epipremnum aureum

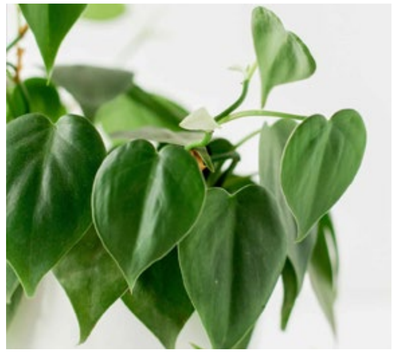
Xylene, benzene, formaldehyde, trichloroethylene

Phoenix roebelenii

Formaldehyd, xylene

Spathiphyllum spp

Benzene, carbon monoxide, formaldehyde, trichloroethylene, xylene, acetone



Philodendron scandes

Formaldehyde

Chlorophytum comosum

Formaldehyde, xylene

Chrysanthemum morifolium

Ammonia, benzene, formaldehyde, xylene

Ficus elastic

Xylene, benzene, formaldehyde, trichloroethylene

Nephrolepis exaltata

Formaldehyde and xylene

Dracaena deremensis

Xylene, trichloroethylene, formaldehyde

Sansevieria trifasciata

Formaldehyde, trichloroethylene, benzene, xylene

Aloe vera

Formaldehyde

Anthurium andraeanum

Formaldehyde, ammonia, xylene, toluene

Improvement of the indoor air

Stress reduction

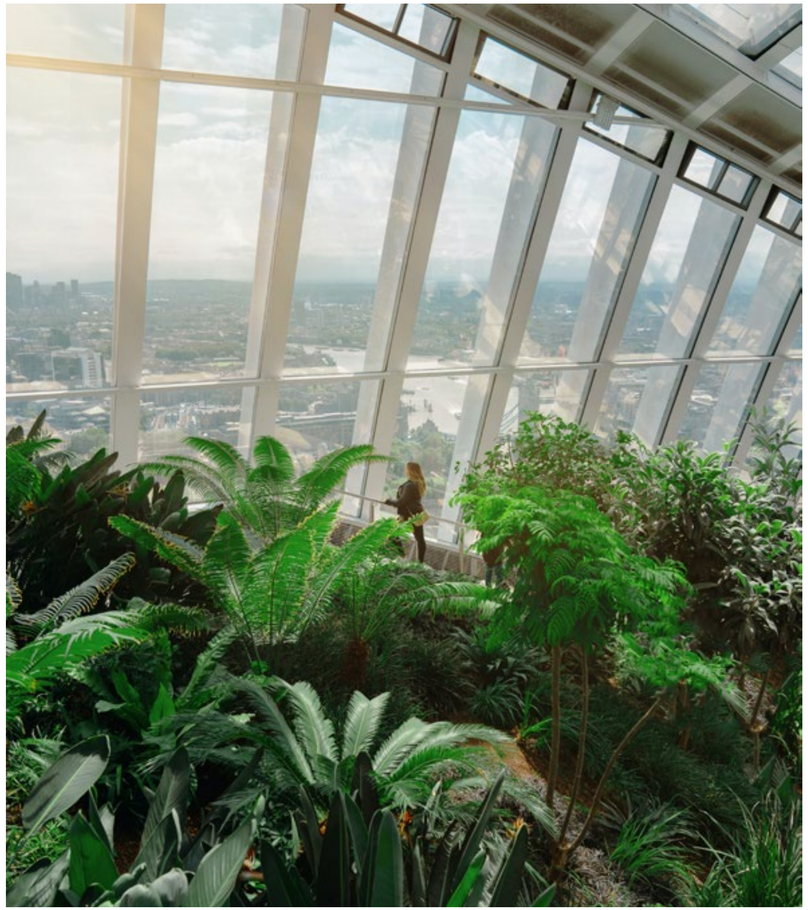
Incorporating natural elements such as plants, water, and natural light into indoor environments can help reduce stress. Research has shown that even the sight of nature can help lower stress levels.

Improved cognitive function

Health benefits

Increased productivity

Stress reduction



A study conducted by the University of Technology in Sydney found that access to nature, such as through views of nature or outdoor spaces, can increase employee satisfaction by up to 15%.

The addition of natural sounds, such as the sound of running water or bird songs, to indoor spaces can have a calming effect and help to lower stress levels. This is because exposure to these sounds can evoke positive emotions and create a sense of connection to nature.

Using natural materials such as wood, stone, and other natural textures can create a calming and soothing environment that can help reduce stress providing a sense of comfort and warmth.

Improvement of the indoor air

Stress reduction

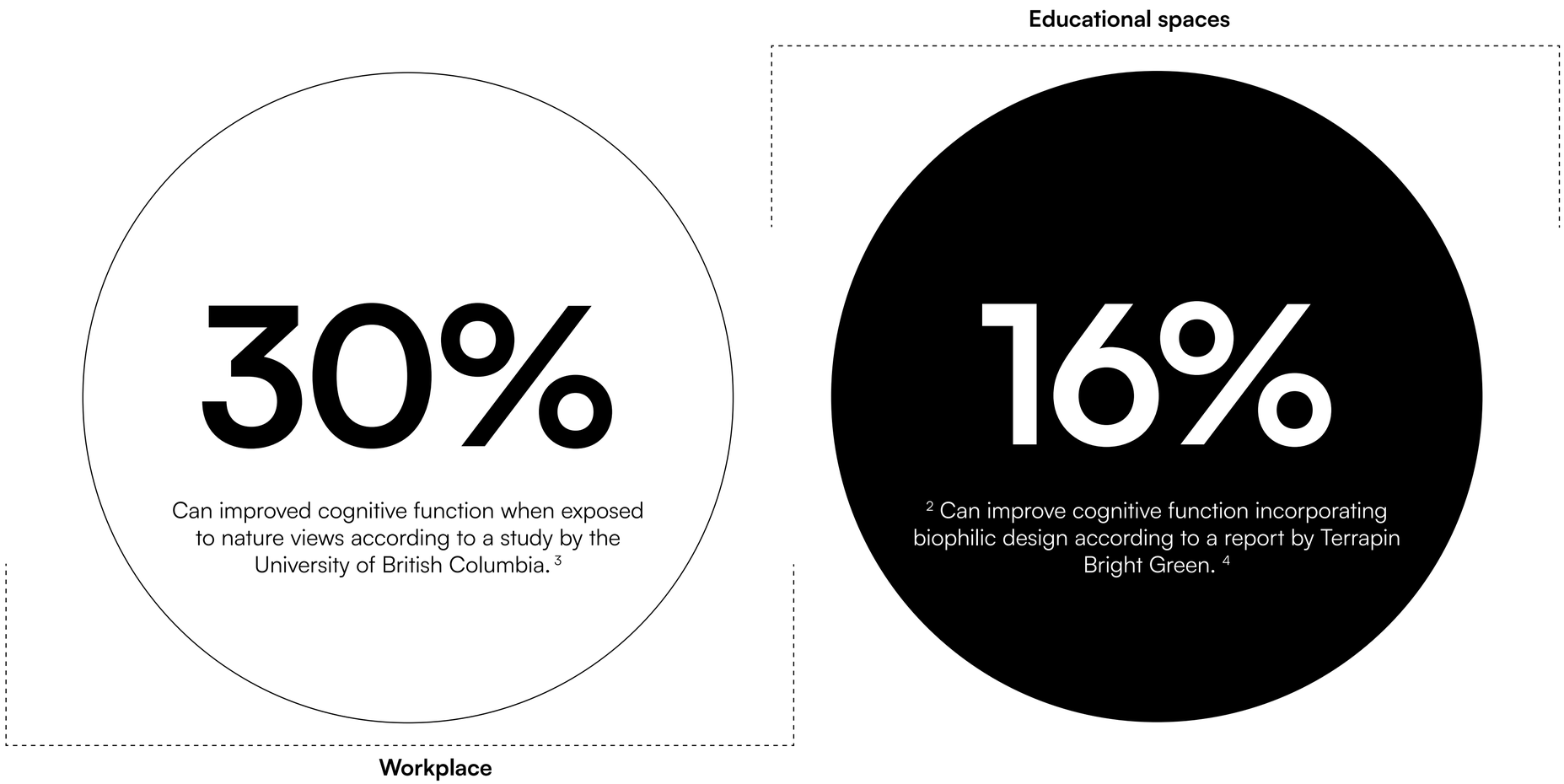
Improved cognitive function

Biophilic design can contribute to better cognitive function by improving air quality, providing views of nature, incorporating natural light, reducing stress, and promoting restoration. Studies have shown that biophilic design can have a significant impact on cognitive function, particularly in work and educational settings.

Health benefits

Increased productivity

Improvement of the indoor air



31 * Berman, M. G., Jonides, J., & Kaplan, S. (2008). The Cognitive Benefits of Interacting With Nature. Psychological Science, 19(12), 1207–1212. https://doi.org/10.1111/j.1467-9280.2008.02225.x

4 * The economics of biophilia. (2013, April). Terrapinbrightgreen. From https://www.terrapinbrightgreen.com/wp-content/uploads/2012/06/Economics-of-Biophilia_Terrapin_2015p.pdf

Improvement of the indoor air

Stress reduction

Improved cognitive function

Health benefits

Biophilic design can contribute to overall well-being by promoting relaxation, restoration, and a sense of connection to nature. This approach has the potential to positively impact health outcomes, as it can reduce stress levels, improve cognitive function, and support mental and physical health.

Increased productivity

Biophilic design can promote better mental health by reducing symptoms of anxiety and depression. A study by the University of Michigan found that spending time in nature can reduce symptoms of depression and improve memory.

Health benefits

10%

Can reduce sickness absenteeism in employees working in biophilic office space according to a study conducted by the University of Oregon. [5]

15%

Can increase physical activity levels. [6]

12%

Can lower the risk of premature death for women who lives in homes surrounded by green spaces according to a study by Harvard T.H. Chan School of Public Health. [7]

5 * Elzeyadi, I. (2011). Daylighting-Bias and Biophilia: Quantifying the Impacts of Daylighting on Occupants Health.

6 * Ryan, C. J., Browning, W. D., Clancy, J. P., Andrews, S., & Kallianpurkar, N. B. (2014). Biophilic Design Patterns: Emerging Nature-Based Parameters for Health and Well-Being in the Built Environment. https://earthwise.education/wp-content/uploads/2019/10/Biophilicdesign-patterns.pdf

7 * Exposure to Greenness and Mortality in a Nationwide Prospective Cohort Study of Women," Peter James, Jaime E. Hart, Rachel F. Banay, Francine Laden, Environmental Health Perspectives, online April 14, 2016, doi: 101289/ehp.1510363

Health benefits

According to a report by Terrapin Bright Green

Heathcare spaces

22%

Reduction in the need for pain medication. [8]

21%

Reduction in the length of stay. [9]

38%

Reduction in the need for postoperative pain medication. [10]

8 9 10* The economics of biophilia. (2013, April). Terrapinbrightgreen. From https://www.terrapinbrightgreen.com/wp-content/uploads/2012/06/Economics-of-Biophilia_Terrapin_2015p.pdf

Improvement of the indoor air

Stress reduction

Improved cognitive function

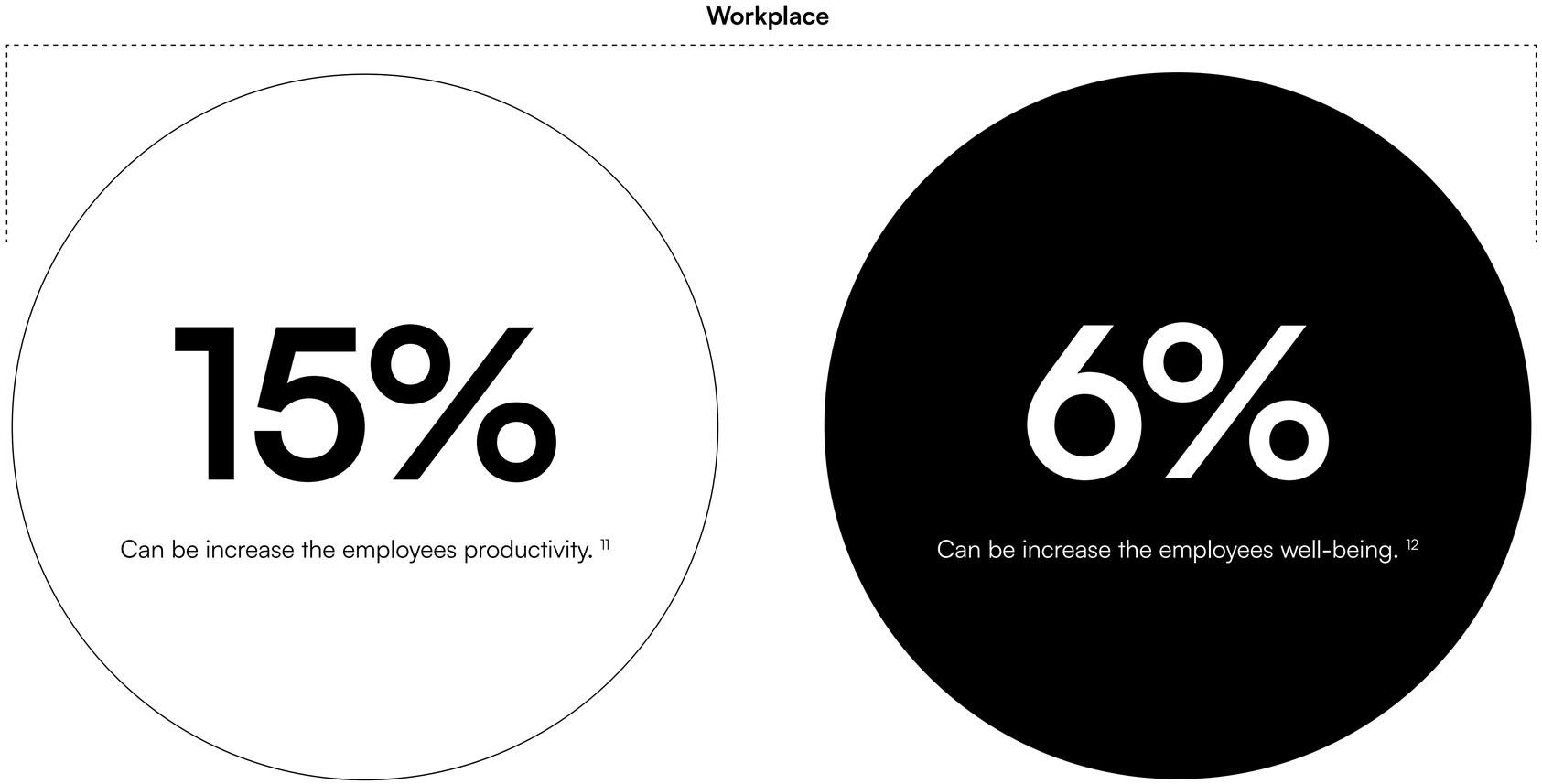
Health benefits

Increased productivity

Research has shown that biophilic design can improve productivity and creativity in work environments. A study published in the Journal of Sustainable Real Estate found that employees in offices with natural elements, such as plants and water features, reported higher levels of job satisfaction, creativity, and productivity compared to those in offices without such features.

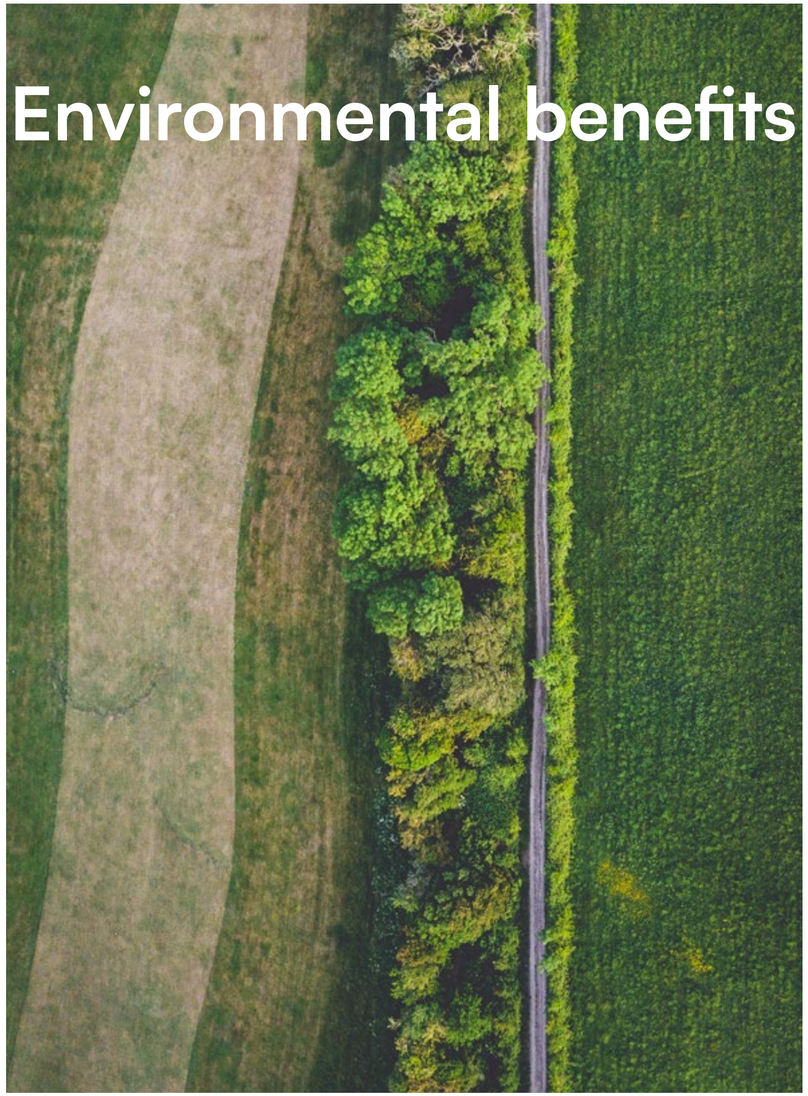
Increased productivity

According to a report by Terrapin Bright Green



11 12* The economics of biophilia. (2013, April). Terrapinbrightgreen. From https://www.terrapinbrightgreen.com/wp-content/uploads/2012/06/Economics-of-Biophilia_Terrapin_2015p.pdf

Human benefits


Environmental benefits

Improved air quality

Biophilic design elements such as indoor plants, green walls, green façade and green roofs can help remove pollutants from the air and improve indoor air quality. Helping to reduce the risk of respiratory issues and allergies.

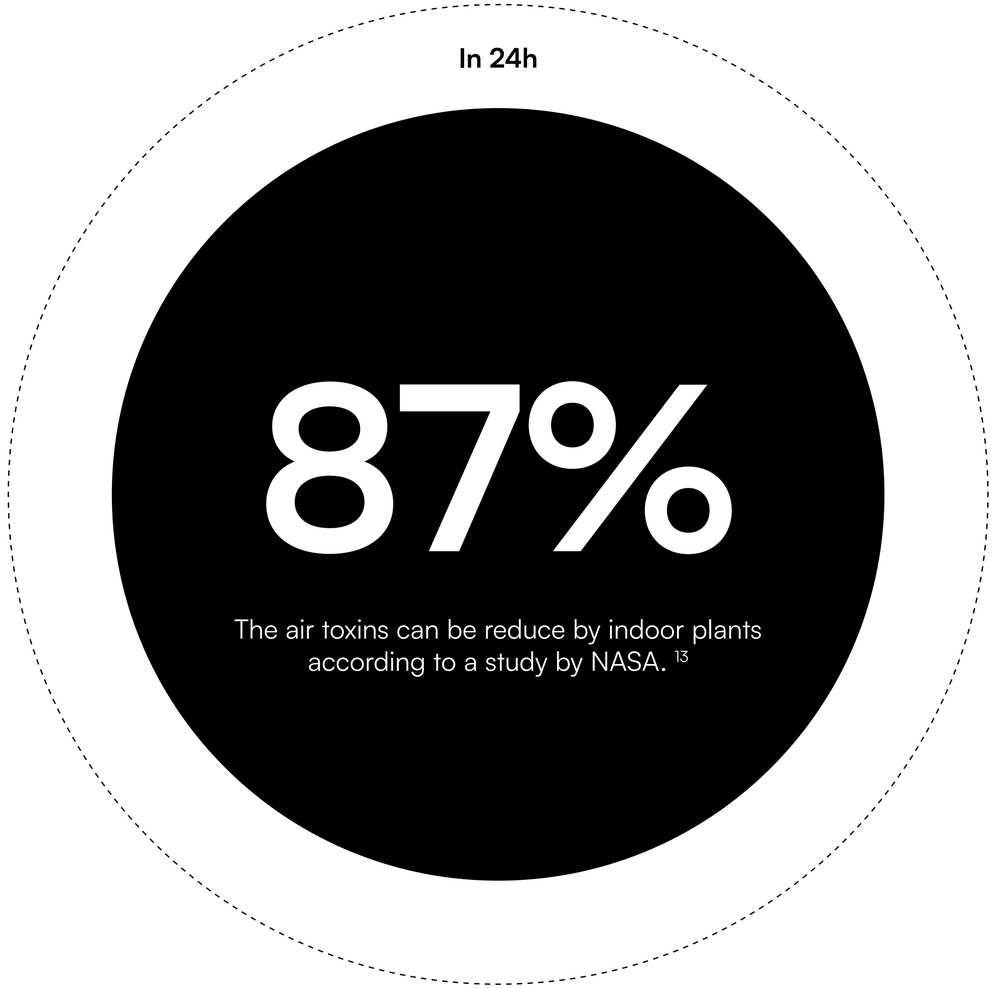
Reduced energy use

Increased biodiversity

Reduced urban heat island effect

Water conservation

Improved air quality



13 * A Study of Interior Landscape Plants for Indoor Air Pollution Abatement: An Interim Report. (1989). https://ntrs.nasa.gov/api/citations/19930073077/downloads/19930073077.pdf

Improved air quality

Reduced energy use

Biophilic design can help reduce energy use by maximizing natural light and ventilation, and by using natural shading and insulation. This can help reduce the environmental impact of buildings and lower energy costs for occupants.

Increased biodiversity

Reduced urban heat island effect

Water conservation

Reduced energy use

20%

Can reduce energy use compared to conventional buildings, according to research by Terrapin Bright Green. [14]

8%

Can reduce the amount of energy needed to cool a building acoording to a study by the University of Melbourne. [15]

14* The economics of biophilia. (2013, April). Terrapinbrightgreen. From https://www.terrapinbrightgreen.com/wp-content/uploads/2012/06/Economics-of-Biophilia_Terrapin_2015p.pdf

15* Hunter, A. M., Williams, N. S., Rayner, J., Aye, L., Hes, D., & Livesley, S. J. (2014). Quantifying the thermal performance of green façades: A critical review. Ecological Engineering, 63, 102–113. https://doi.org/10.1016/j.ecoleng.2013.12.021

Improved air quality

Reduced energy use

Increased biodiversity

By incorporating elements of nature into the built environment biophilic design can help create habitats for plants and animals and promote biodiversity in urban and suburban areas. By supporting local ecosystems, biophilic design can also help mitigate the negative impacts of urbanization on biodiversity and the environment.

Reduced urban heat island effect

Water conservation

Increased biodiversity

A study conducted by the University of Sheffield found that the introduction of green roofs and walls in urban areas can lead to an increase in the number and diversity of wildlife, such as birds, insects, and other animals. Biophilic design, with its emphasis on incorporating natural elements into the built environment, can serve as a means of attracting a variety of animals, including pollinators like butterflies, bees, and birds. In particular, green roofs and walls provide habitat for a range of invertebrates, which in turn can attract larger predators such as birds.

Incorporating water features like ponds or fountains in can offer a habitat for aquatic animals, whereas bird feeders or nesting boxes can stimulate bird populations to flourish. However, the particular kinds of animals that are attracted to a biophilic design would rely on the local ecology and the specific design features that are implemented in the space.

Improved air quality

Reduced energy use

Increased biodiversity

Reduced urban heat island effect

Biophilic urban design goes beyond the incorporation of nature into the spaces between our buildings; it is about including nature into the very design of our buildings through direct greenery, patterning, places of sanctuary and prospect plus the use of organic forms and materials.

Water conservation

Reduced energy use

2°C

Can reduce the effect urban heat island by using green façade.[16]

5-10%

Energy consumption can be reduce by using green façade by improving air quality, and generating thermal comfort.[17]

16 17* Sheweka, S., & Mohamed, N. S. (2012). Green Facades as a New Sustainable Approach Towards Climate Change. Energy Procedia, 18, 507—520. https://doi.org/10.1016/j.egypro.2012.05.062

Improved air quality

Reduced energy use

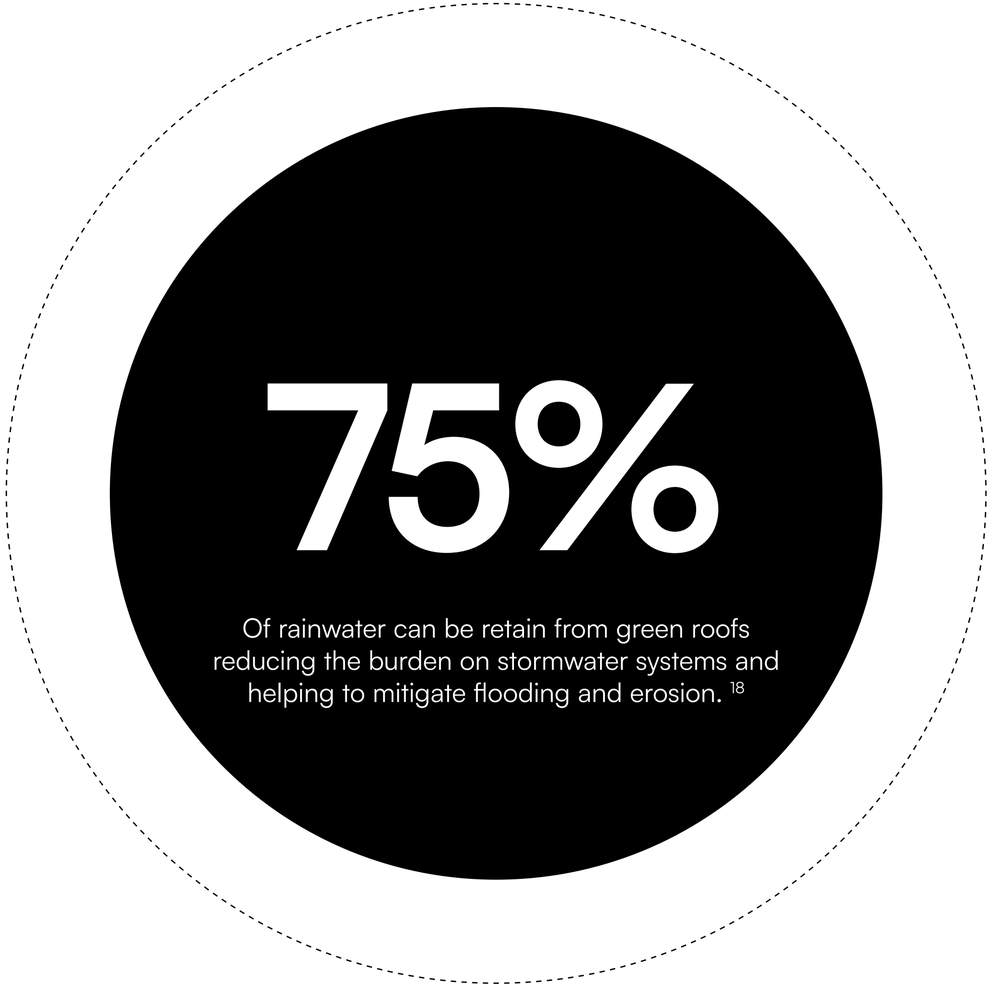
Increased biodiversity

Reduced urban heat island effect

Water conservation

Conscious architectural design can ensure the application of various water conservation measures. The landscape surrounding a building is equally important from a water conservation point of view. It is best to use native grasses and plants that need less water and also enrich the local ecosystem.

Water conservation

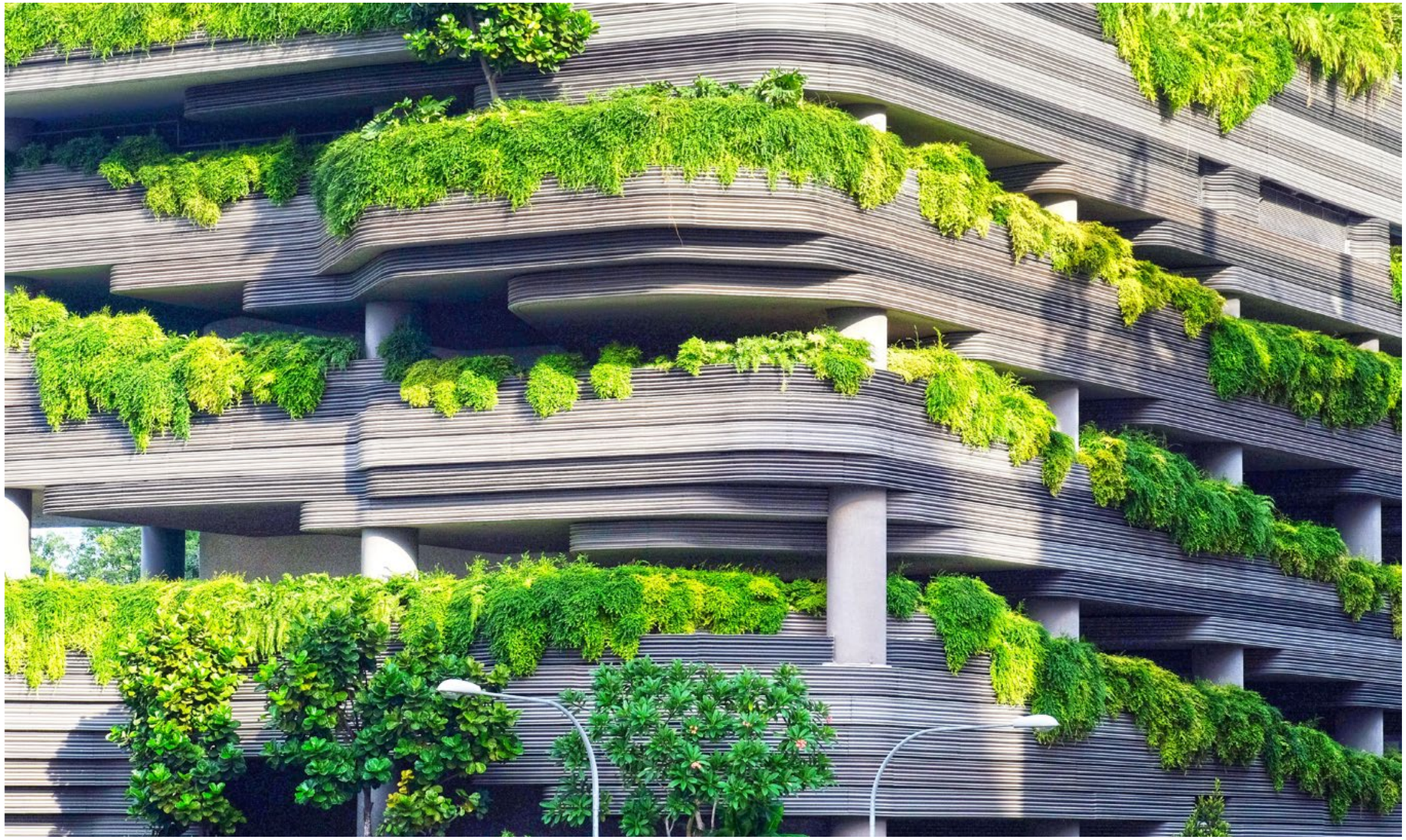


18 * Liu, L., Sun, L., Hu, B. X., & Riley, W. J. (2020). Modeling Green Roof Potential to Mitigate Urban Flooding in a Chinese City. Water, 12(8), 2082. https://doi.org/10.3390/w12082082

04

Biophilic Design

Biophilic design



To create a vibrant, sustainable, and restorative environment, it is important to develop an interdisciplinary strategy early on in a project. This will ensure that cost-effective opportunities are not missed before they are fully explored. While biophilia is a critical component of this strategy, it is just one piece of the puzzle. A comprehensive approach that considers various aspects such as sustainability, aesthetics, functionality, and health is needed to create an optimal environment. By taking a holistic approach to project development and involving all stakeholders in the early stages, the team can identify potential strengths, challenges, and opportunities. This will ultimately lead to improved project satisfaction and cost savings.

From an architectural perspective, incorporating biophilic design patterns can redirect the designer's attention to the connections between people, health, high-performance design, and aesthetics, leading to a more holistic and human-centered design approach.

“The ultimate goal of the architect...is to create a paradise. Every building, every product of architecture...should be a fruit of our endeavour to build an earthly paradise for people.”
Alvar Aalto

More details here:

- Application of biophilic installations for indoor air quality improvement
- Why biophilic design matters
- The Impact of Natural Environments and Biophilic Design as Supportive and Nurturing Spaces on a Residential College Campus
- 14 patterns of biophilic design. Improving Health & Well-Being in the Built Environment
- Biophilic office design: Exploring the impact of a multisensory approach on human well-being
- Biophilic design: Why nature could be a good investment
- Bounty Of Benefits In Buildings Of Biophilic Design
- Biophilic workplace
- Biophilic Interiors: 21 Projects that Blend Architecture with Nature
- Ten modern homes with interiors informed by biophilic design
- A growing trend: enjoy these 10 biophilic furniture designs
- 7 Biophilic Design Ideas You Can Recreate on a Budget
- The importance of biophilia for man and architecture
- What is biophilic architecture and how it works
- The Biophilic Community That Wants To Change How We All Live

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