

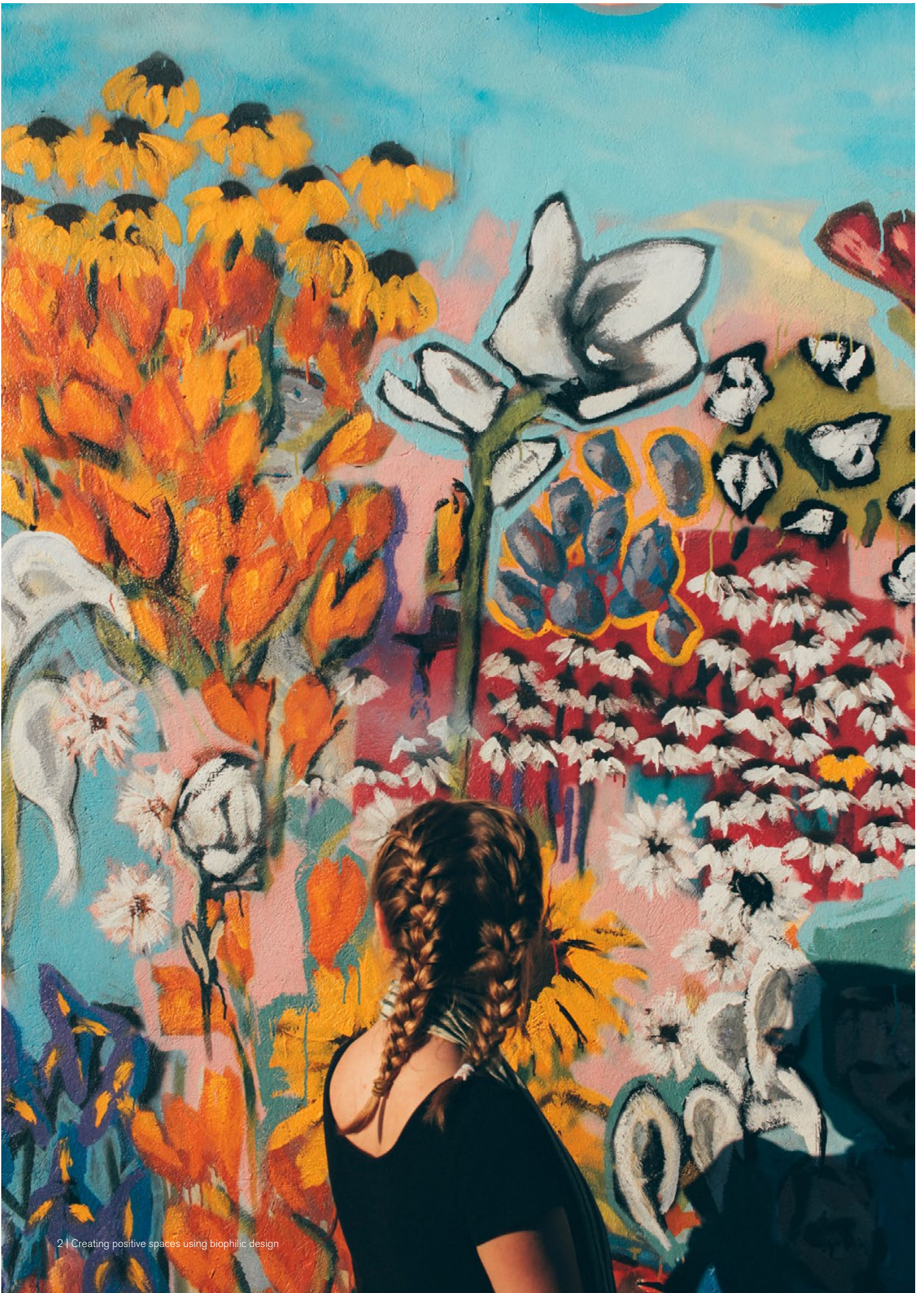


# CREATING POSITIVE SPACES

## USING BIOPHILIC DESIGN

An accessible practitioner's guide to help inspire architects and designers to understand the principles of Biophilic Design and how to implement it at a range of scales and costs.





“

**Biophilic Design is a human centred approach aimed at improving our connection to nature and natural processes in the buildings that we live and work. This improved connection can benefit our wellbeing by reducing stress and improving recuperation – helping to cut costs and improve outcomes in the built environment.**

**More than just a new design trend, Biophilic Design should be seen as a universal design ethos – after all, at some point in our lives we’ve all had positive experiences of nature. So, implementing it isn’t necessarily about spending money, but recognising the many ways that we can connect to nature through the culture and design of the spaces that are so important to us. Through this design guide we hope to inspire creativity, productivity and wellbeing at a range of scales to enhance our connection to nature, for the benefit of all!”**

– OLIVER HEATH, Director of Oliver Heath Design, author of this Design Guide



**OLIVER HEATH**  
DESIGN



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## WHY IS INTERFACE SUPPORTING THIS SUBJECT?

Creating positive spaces where we work, rest and play involves design that incorporates visual appeal, purpose, sustainable elements, and an understanding of human behaviour. Bold thinking is required to strike the balance between reflecting each person's needs whilst adhering to regulatory standards, without compromising on the design aesthetic.

The building industry is increasingly recognising companies who prioritise supporting the wellbeing of their people. Certification systems like the **WELL Building Standard™** are gaining traction and the increasing interest in them demonstrates that the creation of positive spaces requires further investigation.

To capture insights from industry and thought leaders, Interface have co-authored a series of papers to explore the value of human-centred design, understand how nature can inspire the creation of positive spaces and examine the future of sustainable buildings.

# Interface®

## A GUIDE TO IMPLEMENTING BIOPHILIC DESIGN – WHAT'S IN IT FOR YOU?

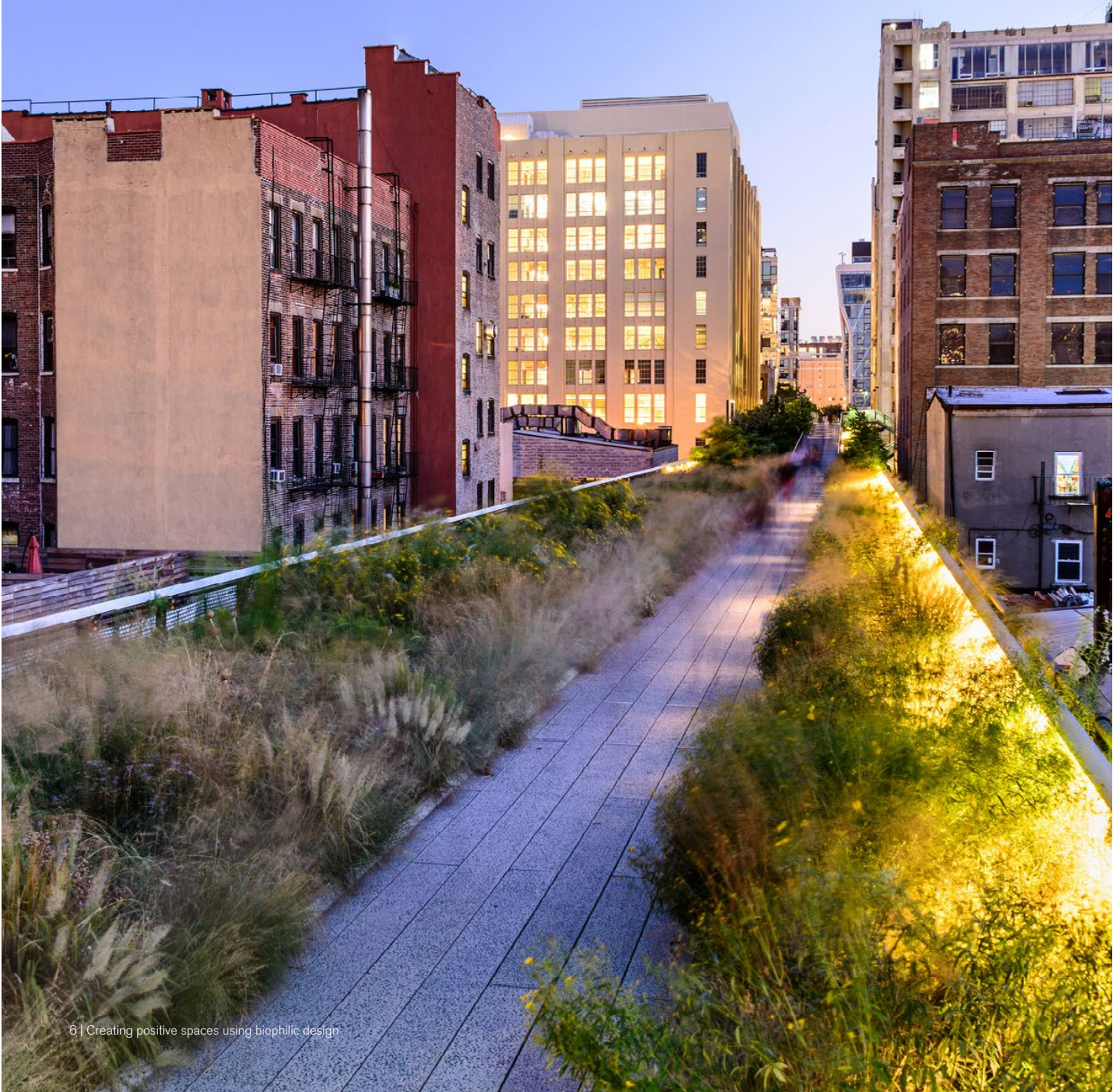
**In this inspirational guide we share our insights and research on Biophilic Design (designing nature back into the built environment) and show you that, due to the profound effect it can have on people's wellbeing, it is more than just an aesthetic consideration. We aim to provide you with an understanding of both its human and economic benefits, to arm you with a convincing business case, and to propose a range of practical methods for implementing Biophilic Design no matter what your budget.**

We hope that by the time you put this guide down you will understand:

- What Biophilic Design is
- Why we should focus on this human-centred approach to design
- How to implement it at a variety of scales
- Who is already doing it
- Where and when it can be used

Whether this is all new to you, or you're already using a biophilic approach, this guide will help you communicate the benefits of designing in a human-centred way to your clients, decision makers or those who inhabit your spaces.

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# CHAPTER 1: WHAT IS BIOPHILIC DESIGN?



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## BIOPHILIA IS:



**The passionate love of life and of all that is alive; it is the wish to further growth, whether in a person, a plant, an idea or a social group.”<sup>1</sup>**

– Erich Fromm



**The innately emotional affiliation of human beings to other living organisms. Innate means hereditary and hence part of ultimate human nature.”<sup>2</sup>**

– E.O. Wilson

Biophilic Design offers guidelines for how to create built environments that support our innate human attraction to nature and natural processes (biophilia).

“Throughout our evolution, we’ve spent 99.9 per cent of our time in nature. Our physiology is still adapted to it. During everyday life, a feeling of comfort can be achieved if our rhythms are synchronized with those of the environment.”<sup>3</sup> – Yoshifumi Miyazaki

Our response to natural environments stems from our evolutionary development and survival. It makes sense that our ancestors felt calmer in places that had an abundance of greenery and living elements, as they indicated the availability of food and water and this meant they could focus on other things. Similarly, spaces that offered both the security of being contained, or sheltered, and that had a good vista over the landscape would have been essential for our ancestors to keep an eye out for predators or animals to hunt. The theory behind these ideas are summarised in the next chapter - see the Savannah hypothesis section.

We still experience a psychological inheritance of this survival instinct (even though we don’t have to worry about foraging for sustenance or predators in the same way) in our urban environments. This means that a space designed to have a sense of refuge and prospect with plenty of living elements in (or references to them) can make us feel less stressed and more productive.

With this in mind, **Biophilic Design offers an approach to creating buildings and spaces that respond to our human needs.** Biophilic Design principles can be applied to existing and new buildings, interior and exterior spaces alike. They can be implemented at a range of scales and budgets and have greatest impact within the urban environment where we have strayed the furthest from nature.

It is essential that, as we spend more time indoors and in urban environments, we find ways to increase our contact with nature and natural elements to take advantage of its benefits. And here’s why...

A nighttime photograph of a city skyline, likely Hong Kong, featuring a prominent skyscraper with a glowing top. The city lights are reflected in the water below. The image is used as a background for the infographic.

# 66%

By 2050, 66% of the developed world will be urbanised, and thus we are becoming increasingly distanced from nature.

# 11.7 million

In the UK in 2015/16, 11.7 million working days were lost due to stress.

# 20 billion

In 2002, the European Commission calculated the costs of work-related stress in the EU at €20 billion a year.

### WHY IS IT RELEVANT NOW? A CHANGE FOR THE BETTER

Creating spaces that enhance wellbeing is an important design aim to achieve. Why? Because as **urbanisation has increased, stress rates have also rocketed**. Coincidence? We don't think so. Here's some astonishing facts that demonstrate why:

- By 2050, 66% of the developed world will be urbanised<sup>4</sup>, and thus we are becoming increasingly distanced from nature.
- North Americans spend 93% of their time indoors<sup>5</sup> whilst Europeans spend 85-90% of their time indoors.<sup>6</sup>
- Stress has been called the "health epidemic of the 21st century" by the World Health Organization,<sup>7</sup> causing significant costs for employers and increasing the need for individuals to focus on their physical and mental health.
- We recover significantly faster from stress when exposed to a natural environment, in comparison to an urban setting.<sup>8</sup>
- In the UK in 2015/16, 11.7 million working days were lost due to stress.<sup>9</sup> This doesn't take into account the indirect stress related costs, such as decreased concentration and productivity.
- In 2002, the European Commission calculated the costs of work-related stress in the EU at €20 billion a year.<sup>10</sup>

With a vast body of research to support the ethos, it's important that we find ways to creatively develop the implementation of the principles of Biophilic Design and make it financially accessible, to increase the uptake.

We hope to explore and promote the discussion around creating positive human-centred spaces, whilst **helping the architecture and design community expand the services they offer**. In Chapter 2, we'll show you how a Biophilic approach to design can improve the Triple Bottom Line: wellbeing for building occupants, employee productivity for businesses, and return rates for clients. Considering that our health and wellbeing are intrinsically linked to that of the natural environment around us, surely we should want to protect it and enable it to flourish.

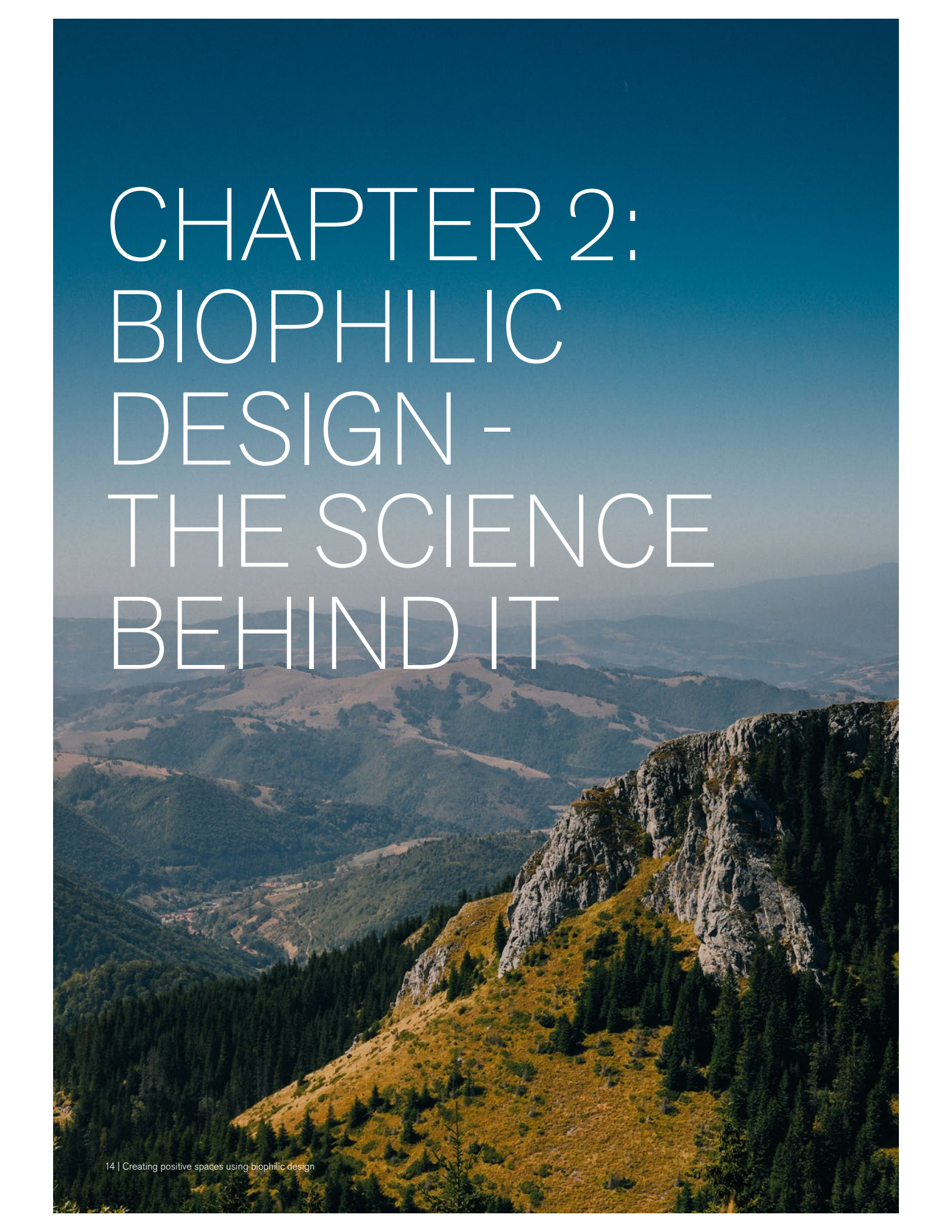


### BIOPHILIC DESIGN - THE OVERVIEW

Human centred design has risen-up the agenda for the design industry in the last couple of years and Biophilic Design is still a relatively new field of practice. In this design guide we will introduce you to Terrapin Bright Green's neuroscientific & psychological take on Biophilic Design. This approach is concerned with what goes on in our heads when we connect with nature, as well as our perception of it, and considers how to enhance spaces with:

- **Nature in the Space:** designing in direct contact with nature or natural systems.
- **Natural Analogues:** design strategies that use references to, or representations of, nature.
- **Nature of the Space:** mimicking the spatial qualities of natural environments to evoke/enhance human responses.<sup>11</sup>

Terrapin Bright Green offer an accessible framework for interpreting, adapting and applying Biophilic Design principles into design practice. In Chapter 3, we'll go into more detail on their "14 Patterns of Biophilic Design", where we will expand on these approaches by giving you some 'how to' examples to fit any budget. But first...



# CHAPTER 2: BIOPHILIC DESIGN - THE SCIENCE BEHIND IT

There has been a great deal of scientific research around why the desire for a nature connection is so deeply embedded in our physical and mental states. This has led to the development of theories about how Biophilic Design can help fulfil that need and improve wellbeing. These theories explain our physical and psychological reactions to elements within our built and natural environments, and offer us opportunities to be creative and utilise these responses to create positive spaces.

We have selected some of the best bits to get you thinking about how to bring Biophilic Design theory into your practice:

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**Circadian Rhythms** are the ‘physical, mental and behavioral changes that follow a roughly 24-hour cycle, responding primarily to light and darkness in an organism’s environment.’<sup>13</sup>

\*In 2017, the Nobel Prize in Physiology or Medicine was awarded to the scientists who discovered the molecular mechanisms that control Circadian Rhythms.

**Natural daylight** triggers cells in the eye that signal the secretion or suppression of melatonin - the sleep inducing hormone that regulates our **Circadian Rhythms**.<sup>14</sup>

However, artificial light can throw our Circadian Rhythms out of kilter and have physiological, cognitive and overall health consequences.

We can reset our Circadian Rhythms through increased exposure to sunlight.

Designing spaces that offer occupants more opportunities for exposure to natural light will help them reset their Circadian Rhythms and improve wellbeing and performance.

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**The Prospect-Refuge Theory**<sup>17</sup> argues that we have an ‘inborn desire’ for prospect so that we can observe things without being seen by others.

**Savanna Hypothesis**<sup>18</sup> suggests that human preference is to be in lush healthy Savannah-like environments where we can see potential threats or prey across open grasslands from a place of safe refuge.

Why do we feel more comfortable and safe in some environments and not others? Biophilia recognises the need for inhabitants to have the structure of a natural environment. For example, Savannah-like **open spaces contrasting with more sheltered “safe” spaces. These create spaces that enable both excitement and exploration with quiet areas that allow us to restore mental and physical focus.**



**It's what we crave because we know instinctively that we must have it to survive. We must breathe Nature, smell Nature, feel it, hear it, touch it, live it, eat it to be whole. We must be immersed in it.”<sup>37</sup>**

– Helena van Vliet, AIA – Principal at Helena van Vliet Architect, LLC

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### **Attention Restoration Theory**<sup>19</sup>

Nature can replenish our mental and attentional capacity after we've tired our brains out from too much “directed attention”. That is, nature can reactivate the tired parts, and so we can enjoy “effortless attention” for a short while at least.<sup>20</sup>

People have a strong tendency to prefer **natural views** over urban landscapes, inducing more positive emotional and physiological states. Liking for urban scenes increases when trees and other vegetation are incorporated.<sup>21</sup> We also view natural movement more positively than mechanical movement, and occasionally shifting our attention to something natural is beneficial for attention restoration.<sup>22</sup>

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### **Ecological Valence Theory**<sup>23</sup>

This theory explains our colour preferences and responses to them. **We seek colours that are reminiscent of nature** when it is thriving<sup>24</sup>, for example:

Incorporating **references to nature** (natural analogues), such as natural materials, patterns, textures or colours that mimic nature can make us feel better and have a **positive physiological effect**. For example, using wood in interiors can reduce blood pressure and increase the feeling of comfort.<sup>25</sup>

**Blue: clear sky or clean water** –  
calming and relaxing

**Green: healthy vegetation** –  
calming and restorative

**Yellow: warmth and sunshine** –  
happy and welcoming

**Red: healthy ripe fruits** –  
energising and exciting

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### **‘Blue Space’ Theory<sup>26</sup>**

We prefer environments (built or natural) containing water. They can have a positive effect on us and we perceive them to be more **restorative** than those without.

**Incorporating water into environments** has been found to reduce stress, lower heart rate and blood pressure, and enhance relaxation, positive emotions, concentration, and memory restoration.<sup>27</sup>

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### **Mindfulness<sup>28</sup>**

Mindfulness<sup>29</sup> techniques **purposefully increase awareness of the present moment through connection with one’s senses**, reducing stress<sup>30</sup>, anxiety, and physical disorders.

**When working with distraction we experience higher levels of stress<sup>31</sup>** which can lead to depression<sup>32</sup> and behaviours that increase the risk of heart disease.<sup>33</sup> Should we have no quiet place to escape to, **Biophilic Design can encourage the sensory awareness** required for mindful states through:

**Sight** – Natural light and views out to nature create awareness of the present moment. Planted partitions in open plan offices can block visual distraction and dampen sound.<sup>34</sup>

**Smell** – Introducing plants can improve air quality<sup>35</sup> and introduce pleasant, natural aromas. Vaporised stem oil from Hinoki Cypress trees creates a 20% increase in NK cells (cells that protect us from disease agents) and lowers fatigue.<sup>36</sup>

**Hearing** – Recorded sounds, such as flowing water, mask disruptive noises.

**Touch** – Tactile sensory contrasts create a sense of momentary awareness. We can also zone spaces with changes in floor surfaces, acoustic and visual landscapes.

A photograph of a wooden cabin with a gabled roof, partially obscured by a dense forest of green trees. The cabin is situated on a hillside overlooking a calm body of water. The text 'CHAPTER 3: HOW TO GET YOUR CLIENTS ON BOARD: THE SALES PITCH' is overlaid in large, white, sans-serif capital letters on the left side of the image.

# CHAPTER 3: HOW TO GET YOUR CLIENTS ON BOARD: THE SALES PITCH



**Despite so many office workers living in city-dominated lives, with increasingly limited access to natural elements, they all share an affinity with the natural world. No matter where they are, people yearn for more natural light, peace and quiet, and most importantly, the chance to be closer to nature.**

**It follows, then, that businesses that boast offices with design elements inspired by nature, such as more natural light and greenery, will have employees that are happier and more productive at work, and perhaps healthier too.”<sup>38</sup>**

– Sir Cary Cooper (CBE FAcSS), Psychologist

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Biophilic Design can have **tangible benefits within the workplace, educational, hospitality, retail and domestic sectors** – creating savings and improving profits. Using Biophilic Design can create a greater sense of health and well-being for inhabitants, staff and visitors alike. But it can also have hugely **beneficial financial implications** that stem from improving the health and well being of the building occupants. This research on a few of the sectors should help you convince your clients that the economic benefits add up:

## SECTOR

## EVIDENCE

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**Offices:** Offices can be more productive and create lower levels of stress, fostering greater happiness and creativity, whilst helping to retain staff and reduce absenteeism.

- Energy costs make up just under 1% of business operating costs, whilst staff costs in salaries and benefits are over **90%**.<sup>39</sup>
  - In 2013, the cost to Europe of work-related depression was estimated to be **€617 billion** annually.<sup>40</sup>
  - Studies have shown that **10%** of employee absence can be attributed to working in environments with no connection to nature.<sup>41</sup>
  - The inclusion of living elements or views onto nature in an office environment can:
    - Prevent fatigue when completing tasks that demand high levels of attention.<sup>42</sup>
    - Speed up call processing by **6-12%**<sup>43</sup>
    - Increase performance by **10% to 25%** on tests of mental function and memory recall<sup>44</sup>
    - Increase wellbeing by **15%**, productivity by **6%** and creativity by **15%**<sup>45</sup>
    - Reduce absenteeism by **15%**<sup>46</sup>
- 

**Education:** Schools can increase focus and concentration in students and staff whilst reducing the impacts of cognitive fatigue, stress and ADHD. This can improve the schools performance and staff and student retention.

- Optimising exposure to daylight alone can:
    - Increase the speed of learning by **20-26%**
    - Improve attendance by an average of **3.5days/year**
    - Improve test scores by **5-14%**<sup>47</sup>
  - Creating naturalised learning spaces for children can:
    - Enhance their cognitive abilities and increase ability to focus<sup>48</sup>
    - Reduce symptoms of Attention Deficit Disorder (ADD)<sup>49</sup>
    - Increase physical activity, nutrition and creativity<sup>50</sup>
    - Reduce stress<sup>51</sup>
- 

**Hospitality:** Hotels and restaurants can decompress the stress of everyday life for their guests and staff, whilst commanding higher rates of return on rooms with nature connections.

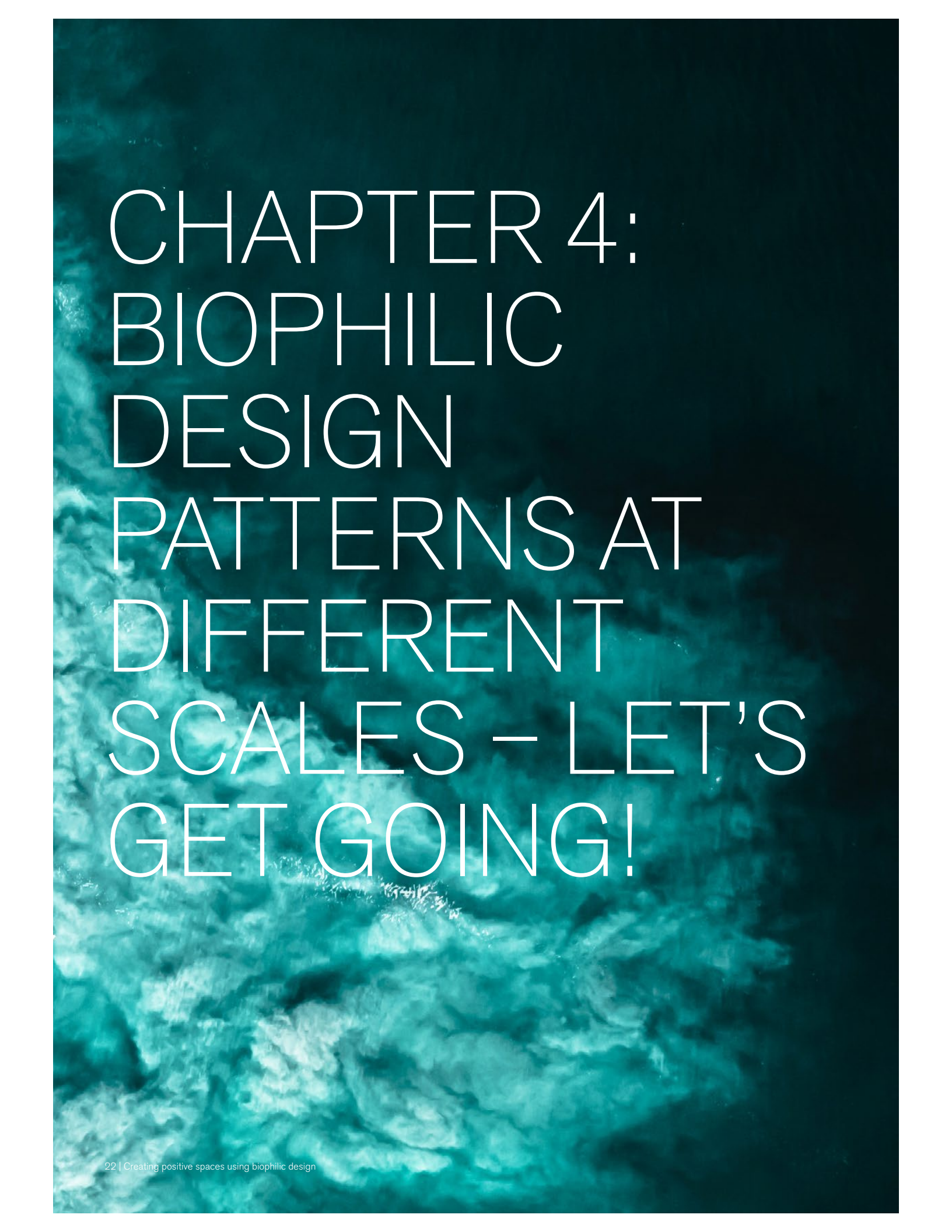
- The Opryland Hotel in Nashville, which is abundant in Biophilic features, enjoys **85%** occupancy/year. This is well above the national average of **68%**.<sup>52</sup>
  - Hotels charge more for rooms with views to natural landscapes, as guests show a preference for views and request them.<sup>53</sup>
  - Hotel rooms with a view to water have room rates **11%-18%** higher than those without a view.<sup>54</sup>
  - Hotel guests spend **36%** more time in Biophilic hotel lobbies than conventional lobbies, thus spending more money inside the hotel.<sup>55</sup>
-



“

**If pharmaceutical companies could put this effect in a pill, they would do so and they would make billions. But they can't. Nature can't be packaged or marketed.”<sup>56</sup>**

– Tristan Gooley

The background of the page is an aerial photograph of turquoise water. In the lower half, there is a prominent white wake from a boat, with the water churning and creating foam. The upper half of the image is a darker, calmer turquoise color. The text is overlaid on this background in a clean, white, sans-serif font.

# CHAPTER 4: BIOPHILIC DESIGN PATTERNS AT DIFFERENT SCALES – LET'S GET GOING!

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Biophilic Design shouldn't be seen as an expensive option, but as a **creative exercise to improve wellbeing**. The key to this is recognising the opportunities and creating strategies that make it accessible at a variety of scales. With that in mind, we'd like to inspire you with examples of how to implement Biophilic Design at different scales according to time, levels of disruption, and economic considerations:

- **No Cost** – educational shift in culture and awareness.
- **Low Cost** – petty cash, money in pocket, one-off costs, such as decoration.
- **Medium Cost** – interior design and refurbishment, medium budget and ongoing maintenance, such as furniture and furnishings.
- **High Cost** – large scale interior refurbishment, new build projects and ongoing maintenance, from structural features to architectural considerations.

If you are going for **WELL Building Standard™** certification, this section could help you think of practical ways to achieve the mind concept. If that means nothing to you, check out our previous design guide: **Creating Positive Spaces using the WELL Building Standard™** ([www.interface.com/well-guide](http://www.interface.com/well-guide)). This section may also offer you some design approaches to achieve other human-centred building standards.

We've used the **“14 Patterns of Biophilic Design”** as a framework to offer practical ways to implement Biophilic Design to interior and exterior environments. We've broken the patterns down into a handy table that you can reference quickly and there are examples at a range of scales for you to pick and choose from when you need to. Each of the examples in the table can be introduced into the built environment in exciting and creative ways, no matter what your budget. Think of them as a starting point for your creative interpretation. There's no need to opt for just one strategy either – blend them all to create a unique approach for each design project and space.

If you think this is all way too much to take on just yet, you may be surprised by some of our easy to implement solutions. We have come up with some nifty approaches to implementing Biophilic Design that can have a big impact without too much disruption. However, if you are ready, your clients are on board and you have the resources available, think big and be bold!

# NATURE IN THE SPACE

Biophilic Design Pattern	No Budget	Low Budget	Medium Budget	High Budget
<p><b>1. Visual Connection with Nature</b> View to elements of nature, living systems and natural processes</p>	<p>Plants in view outdoors: Changing layout of furniture to take advantage of views outside if building situated in natural landscape/ next to park/body of water</p>	<p>Cut flowers on tables &amp; desks</p> <p>Potted plants on desks &amp; shelves</p>	<p>Hanging plants: kokodema, macramé, baskets</p> <p>Window planters</p> <p>Plant services –hire of plants with monthly subscription for maintenance</p> <p>Trellis wall plant screens</p> <p>Interior and exterior planting scheme</p>	<p>Cut Flowers subscriptions</p> <p>Landscaped gardens with seating areas</p> <p>Living green walls</p> <p>Internal courtyards</p> <p>Green roof</p> <p>Lightwell Atrium</p>
<p><b>2. Non-Visual Connection with Nature</b> Sounds, touch, smells, or tastes that engender a positive reference to nature</p>	<p>Natural soundtracks to create acoustic backdrop</p>	<p>Scent atomisers and diffusers</p> <p>Cleaning products: low VOC, good quality and nice smelling hand soaps/ moisturisers</p> <p>Citrus or coffee smells (stimulate taste buds)</p>	<p>Sound masking: natural sounds/ water lapping</p> <p>Furniture materials: chairs, tables, stair cases, use soft/ contrasting materials for relaxation vs. focus spaces</p> <p>Include kitchen with healthy food options</p>	<p>Green walls that release scent and are touch resilient</p> <p>Zoning: floor textures – carpet/ timber/ stone/ biometric</p> <p>Refurbished operable windows</p>
<p><b>3. Non-Rhythmic Sensory Stimuli</b> Objects or materials in consistent yet unpredictable motion as found in nature (e.g: grass swaying/ripples on water/leaves in a breeze)</p>	<p>Opening windows to allow breezes to create gentle movement in plant leaves, blinds or curtains</p>	<p>Blinds: cut outs to project shadows and light</p> <p>Kinetic artwork: mobiles</p> <p>Bird boxes and squirrel houses in sight</p>	<p>Lighting that projects dappled light (gobo/ moving lights)</p> <p>Handmade/ glazed reflective tiles</p> <p>Lights in trees</p>	<p>Fans blowing onto green walls to create movement</p> <p>Light reflecting off water features/ fish tanks to create rippling movements</p> <p>Digital: moving screens, projections of patterns</p> <p>Indoor willow tree</p>
<p><b>4. Thermal &amp; Airflow Variability</b> Changes in air temperature, humidity, airflow across the skin and surface temperatures that mimic natural environments</p>	<p>Enable opening and closing of windows throughout the day according to comfort levels</p>	<p>Clay paints and surfaces: absorb heat/ moisture imbalances</p> <p>Seasonal winter considerations: fire pits, blankets, hot water bottles</p>	<p>Visible mechanical ventilation</p> <p>Covered outdoor spaces: eating areas, canopy in winter, covered outdoor exercise spaces, weather proof</p> <p>Kinetic water features: cools the air and increases humidity, zones areas by making them feel different, trickling water/ fountains</p>	<p>Green walls: absorb heat, humidity &amp; moisture imbalances</p> <p>Installing windows that can open individually &amp; skylights</p> <p>HVAC (heating, ventilation and air conditioning) delivery combined with natural plant strategy</p>



CHAPTER 4: BIOPHILIC DESIGN PATTERNS AT DIFFERENT SCALES – LET’S GET GOING!

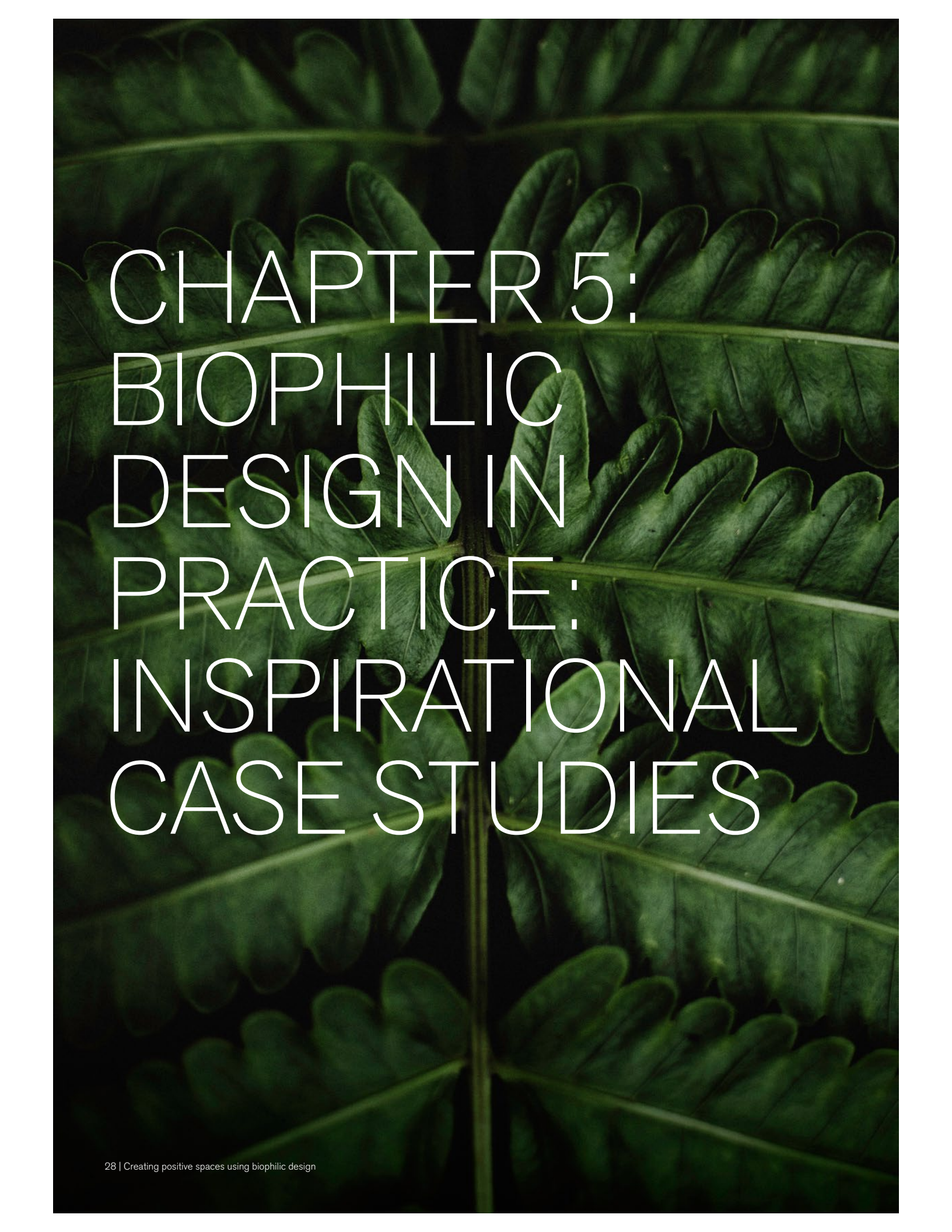
Biophilic Design Pattern	No Budget	Low Budget	Medium Budget	High Budget
<p><b>5. Presence of Water</b> Seeing, hearing or touching of water</p>	<p>Positioning of furniture to face water features</p>	<p>Sight: Imagery with water in the composition, instances of the colour blue, LED screens, projection of water flowing/ waterfall, ripples, bouncing light</p> <p>Contrast/ use of tonal variation of blues – depth for different feels (ecological valence theory): fabric, carpet tiles, curtains, wall paint, lighting (use for changing times of day – circadian rhythms)</p>	<p>Seating by non-fixed water features</p>	<p>Pools of water in or outdoors</p> <p>Full height glass walls/ windows to see water flow down – rain or water feature</p> <p>Fountains, flowing water (sound masking) and zoning of spaces</p> <p>Offices/ hotels: showers, pools, steam rooms, waterfalls, bath in the bedroom</p>
<p><b>6. Dynamic and Diffuse Light</b> Varying intensities of light and shadow that change over time to mimic natural patterns and cycles</p>	<p>Position desks close to windows/skylights</p>	<p>Fairylights</p> <p>Colour changing LED lights or lampshades projecting colour &amp; pattern</p> <p>Adjustable blinds to control light</p>	<p>Sheltered space outside</p> <p>Planting to create shadows (deciduous windows)</p> <p>Materials: light reflecting floors, tables, walls and surfaces, mirrors, light reflective paint, tile glazes, white surfaces, sequin/mirrored surfaces</p>	<p>Glass roof – skylight</p> <p>Glass doors/ walls</p> <p>External fins (architectural)</p> <p>Circadian lighting</p>
<p><b>7. Connection with Natural Systems</b> Awareness of natural processes such as seasons and temporal changes</p>	<p>Position furniture to enable views of sky/ weather outside</p>	<p>Rain catchers, wind chimes, rainbow maker (prism)</p> <p>Inside/outside: cloud maps, tide charts, temperature/ humidity/ air pressure measurements, moon cycles</p>	<p>Exterior: water features/ ponds (ripples from raindrops, freeze in winter)</p> <p>Plant deciduous trees outside</p>	<p>Planters – Boston ivy facades</p> <p>Patio/ rooftops with seasonal plants</p> <p>Position building surrounded by nature</p>

# NATURAL ANALOGUES

Biophilic Design Pattern	No Budget	Low Budget	Medium Budget	High Budget
<p><b>8. Biomorphic Forms &amp; Patterns</b>            Contoured, patterned, textured or numerical arrangements that mimic nature</p>	<p>Display occupants' pictures of natural forms/patterns on screensavers or social media</p>	<p>Artwork (mimic shapes and patterns)</p> <p>Light fittings e.g: petals, mushrooms, pineapple shapes</p> <p>Fibonacci series, photos of natural forms</p>	<p>Patterns: undulating glass (underwater feel), tiles, floor tiles, wallpaper (colour/ texture), screens of etched glass/partitions</p> <p>Organic shaped furniture</p> <p>Mathematical: fractals (3's), patterns within patterns, repeated forms at different scales</p>	<p>Columns like trees, spirals (stairs, corridors, Gaudiesque), cell like facades</p> <p>Layout of interior/ exterior spaces: curved paths and zones</p> <p>Freedom to be experimental, pavilions installations, structures</p>
<p><b>9. Material Connection with Nature</b>            Materials and elements from nature that reflect local ecology/ geology to create sense of place</p>	<p>Display objects occupants have found in local natural environments e.g. stones, shells, seedpods, branches</p>	<p>Materials: natural colours, textures and patterns</p> <p>Wallpaper that mimics natural material surface</p> <p>Use of nature inspired colour – ecological valence theory</p>	<p>Wood: handles/ hand rails, timber wall panels, veneer</p> <p>Bark tiles, cork, leather, wood, stone</p> <p>Biomimetic tiles, wallpapers, flooring</p>	<p>Clay/ ceramics furnishings and fittings</p> <p>Materials: colour, texture, pattern</p> <p>Timber cladding</p> <p>Structural timber beams</p>
<p><b>10. Complexity and Order</b>            Rich sensory information that adheres to a spatial hierarchy similar to nature</p>	<p>Move existing furniture and plants to organise spaces into zones</p>	<p>Layer light</p> <p>Wallpaper</p>	<p>Zoning spaces using pattern, texture, light, sound, colour and touch</p>	<p>Partitions (glass textures, etched film on glass)</p> <p>Exposed structure and mechanical systems (exoskeletal)</p> <p>Mimic natural hierarchy in structure and key architectural elements</p>

## NATURE OF THE SPACE

Biophilic Design Pattern	No Budget	Low Budget	Medium Budget	High Budget
<p><b>11. Prospect</b> Unimpeded view over a distance for surveillance and planning</p>	<p>Consider seating orientation and positioning by windows</p>	<p>Wayfinding through signpost</p> <p>Low partitions</p>	<p>Seating (low back), tiered communal seating</p> <p>Window seats</p> <p>Transparent materials: glass/ polycarbonate walls/ doors/ partitions</p>	<p>Wayfinding through structure</p> <p>Choice of site for building (in nature)</p> <p>Balconies – sense of space, mezzanine, elevated platforms (interior and exterior)</p>
<p><b>12. Refuge</b> Place for withdrawal with protection from behind and overhead</p>	<p>Move existing furniture and plants to create private spaces for retreating &amp; restoring energy</p>	<p>Headphones</p> <p>Set up quiet corners (seat, lamp, carpet)</p> <p>Curtains/partitioning</p> <p>Outdoor seating - benches</p>	<p>Raised platforms</p> <p>Refuge pods</p> <p>Outdoor mezzanine or gazebo</p>	<p>Pavilion arcades &amp; walkways</p> <p>Indoor winter garden</p>
<p><b>13. Mystery</b> The promise of more information using partially obscured views to entice an individual to go further into the environment</p>	<p>Move existing furniture and plants to create partial views through the interior space to enhance sense of intrigue</p>	<p>Leafy/planted screens</p> <p>Mirrors – disorientate</p> <p>Trompe D’oeuil Mural</p> <p>Slowly revealed view or artwork (so you have to keep walking to reveal more of it)</p>	<p>Screen/ curtain/ frosted glass creates shadow movement and implied activity that you want to see</p> <p>Obscured views: plants hanging, glass, partitions (or semi obscured with frosted glass)</p>	<p>Winding paths through spaces, gentle curving (slightly disorientating)</p> <p>A pull towards a space: sounds, smells, light, wonder</p> <p>Labyrinths</p> <p>Digital mapping projection</p>
<p><b>14. Risk/Peril</b> Identifiable threat to create tension paired with reliable safeguard</p>	<p>Create a supportive culture that encourages everyone to step outside their comfort zone e.g. learning new skills</p>	<p>Images: view down from mountain top, murals (Trompe D’oeuil)</p> <p>Ham-mocks, hanging chairs/ swing seats, hanging shelves</p>	<p>Seating over drops</p> <p>Uneven flooring</p> <p>Water: digital LED</p>	<p>Glass elevator/ escalator/ floor/ railing: height (walkway, double height atriums, tree houses, gazebos)</p> <p>Hanging walkways</p> <p>Bouldering walls</p>



# CHAPTER 5: BIOPHILIC DESIGN IN PRACTICE: INSPIRATIONAL CASE STUDIES



**Fresh air. Daylight. Minimal noise. A steady temperature. These four factors are the secret ingredients of healthy, productive work environments. And yet, many people spend their working week sitting in sealed up, stuffy offices that are dim and dingy, or lit up like operating theatres. They sit shivering in winter or sweating in summer, are distracted by incessant disruptive noise, and never see the sun or the sky during the day. This isn't good – for the health of people, or for the health of the planet.”<sup>58</sup>**

– Jane Henley, Operations Manager, Green Building at IFC/ World Bank Group

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We have picked out four inspiring projects from around the world to illustrate how Biophilic Design can be implemented at different scales. We've gathered a range of insights into the projects from the Biophilic elements they used, the costs, the design intent and the impact it has had. We hope these case studies inspire you to think about incorporating some biophilic elements into your own spaces. Let's have a look...

# OFFICE DESIGN

## MEDIUM COST/SCALE

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### BYGGVESTA – STOCKHOLM

**A&D:** Studio Stockholm

**Cost:** Overall, the cost of the refurbishment was 5,250 000 SEK. 35-40% of that cost is attributed to biophilic elements such as wooden materials, wooden structures and plants

**Area:** 1000m<sup>2</sup>

**Year:** 2017

**Design intent:** Student housing developers, ByggVesta, focus heavily on creating community hubs for residents, such as cafes, study areas, lounges and receptions. They also aim to do this sustainably. Their old office was neutral, small, and had no reception or lunch room. Here's what those involved in the project have to say about the process of creating ByggVesta's new office and the intent behind the design:

### What Studio Stockholm say:

"ByggVesta develops housing and public welfare for a sustainable society. The concept for their new office reflects their concern for the environment both for the human and the environment in general. Their head office is created by the employees' strong desire to "Feel at home" in their office, in the sense that "Home" is the place where you feel at peace and secure. The layout is designed with the inspiration of a home where you move through a combination of environments optimised for ByggVesta's different needs. The functions are concentrated around the home hub, the kitchen, and are rounded off with indoor / outdoor environments in the form of a quiet terrace. The layout solution offers a wide variety of different environments, designed for different functions and tempo. The visual experience is derived from nature's different dens, bird and insect nests. The materials, colour and vegetation in different combinations create variety and different intensities within the office environment. We have worked with honesty in materials and protected the environment in all our choices. This is in order to create wellbeing for the people at ByggVesta."

– Boel Allende, Studio Stockholm







**What ByggVesta say:**

“Together with Studio Stockholm, we did a brief for important qualities in the office. Places to unwind, places for activity, places for social encounter. Natural material, soft feeling, lots of greenery and a soothing atmosphere... Our client group defined the vision that our future office should feel as comfortable as a HOME. That became the base of the future design concept. The zone with the best view is the zone for calm reading, quiet work.”

– Cecilia Wallin, ByggVesta

**What occupants say:**

- The new offices positively impact their day-to-day life very much
- They feel proud to work at ByggVesta
- They feel better in the new offices in comparison to their previous workspace
- Visitors feel happy with their experience of the office
- There is more space for focused work
- The atmosphere is more sociable, with more frequent interactions between people and groups, such as the introduction of ‘swap meetings’, where people sell and swap things with each other, and yoga sessions

**Biophilic Design Features:**

<b>Nature in the Space</b>	<ul style="list-style-type: none"> <li>· Natural light through plenty of large windows</li> <li>· Plants on the floor, shelves, in planters and trellises</li> <li>· Window seats to observe the outdoors</li> <li>· Outdoor terrace</li> </ul>
<b>Natural Analogues</b>	<ul style="list-style-type: none"> <li>· Economically and environmentally friendly materials used throughout such as wood and leather</li> <li>· Nature-inspired wallpaper</li> <li>· Timber patterning on floors</li> <li>· Wooden floors in the kitchen area</li> </ul>
<b>Nature of the Space</b>	<ul style="list-style-type: none"> <li>· Different spaces inspired by nature: dens, bird and insect nests</li> <li>· Choice of private spaces for staff to retreat to: aquatic feeling kitchenette, informal lounge spaces</li> <li>· Choice of larger gathering places: patio, social dining areas</li> <li>· Zoned areas with changes in carpet</li> <li>· High back chairs for prospect &amp; refuge benefits</li> </ul>

# OFFICE DESIGN

## HIGH COST/SCALE

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### WWF LIVING PLANET CENTRE – WOKING, UK

**A&D:** Hopkins Architects

**Cost:** £20.2 million (€22.8)

**Area:** 3,600 m<sup>2</sup>

**Year:** 2013

**Design intent:** WWF's new UK base, the Living Planet Centre, reflects the ethos and environmental credentials of the company, as well as providing the public with an interactive place to visit and learn about the work WWF does. They aimed for this new building to be an 'exemplar' green building for the rest of the world, making it sustainable, environmentally friendly and inspirational.

**Impact:** In their old offices, staff satisfaction was at a mere 27% for their 300 employees. Now, 95% of employees report feeling proud to work in the Living Planet Centre. As well as benefiting people, the project also benefitted the planet: The Living Planet Centre has achieved a BREEAM 'Outstanding' rating, and 99% of construction waste was diverted from landfill. Bike sheds with a green roof also encourage cycling to work.





**What occupants say:**

“The trees and the ceiling - I feel like I'm ‘in touch’ with the environment. The building embraces the equity of the WWF brand, it's nice to hear the birds tweeting.”

“I find the environment makes me feel part of a professional organisation while at the same time allowing me to exit the ‘buzz’ and get real quiet time for tasks that need it”

**Biophilic Design Features:**

<p><b>Nature in the Space</b></p>	<ul style="list-style-type: none"> <li>· Natural soundtracks, background noises and scents</li> <li>· Planted indoor trees</li> <li>· Large panes of glass allowing for natural light and views onto nearby canal and common</li> <li>· Tranquil gardens with: wetlands area, wildlife pond, native plants, growing fruit and vegetables using harvested rain water, bat, bird and bug boxes, outdoor spaces for work</li> </ul>
<p><b>Natural Analogues</b></p>	<ul style="list-style-type: none"> <li>· Use of wood in structural elements, desks etc</li> <li>· Biomorphically formed pods in entrance</li> <li>· Reclaimed timber used</li> <li>· Images of arctic and tropical seas and different animal species</li> </ul>
<p><b>Nature of the Space</b></p>	<ul style="list-style-type: none"> <li>· Four immersive timber ‘zones’ to reflect WWF's key work (wildlife, forests, rivers and oceans)</li> <li>· Spaces for private working: ‘quiet booths’, ‘concentration zones’, sofas and break out spaces</li> <li>· High ceiling, open atrium layout with a curvaceous roofline made of arched wooden pillars encourages prospect through the interior</li> <li>· Glimpses into each contrasting experience zone through wooden ‘fins’, creating a sense of mystery and a small clue to what is behind</li> </ul>



**What other people say:**

“

**WWF is all about respect for nature and biodiversity and we wanted to reflect this in the landscape design of its new Living Planet Centre and Headquarters. The end result is a rich and stimulating, yet simple and functional landscape setting that will be enjoyed by the employees of WWF-UK, the residents of Woking and by public visitors.”<sup>59</sup>**

– Andrew Grant, director, Grant Associates.

“

**It’s a fantastic eco-building that shows how it’s possible to use our planet’s resources wisely, but also helps us all to connect with the natural world.”<sup>60</sup>**

– Sir David Attenborough.

“

**Affordability is often cited as a key barrier to investment in sustainable buildings. By developing a truly exemplar building on a budget, WWF will inspire and influence the construction industry and policy makers alike.”<sup>61</sup>**

– Paul King, chief executive, UK Green Building Council.

# HOSPITALITY DESIGN

## MEDIUM COST/SCALE

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### RESTAURANT VAKST – DENMARK

**A&D:** Genbyg

**Cost:** £237,000 (€268.000)

**Area:** Ground floor 80 m<sup>2</sup>, basement 120 m<sup>2</sup>

**Year:** 2016

**Design intent:** Vakst, meaning growth in Danish, is a restaurant that resembles an indoor greenhouse. The aim was to create a vivid, lush, organic garden-like atmosphere within a city, much like a garden party. This restaurant has two levels, one of which is underground. The lower floor represents the soil where plant roots flourish and the floor above is the light area in which the foliage grows. Environmental sustainability through the re-use of materials was a priority in the creation of this restaurant.

### What Genbyg say:

We talked to Rasmus Fex, Designer at Genbyg, about the intent, impact and features of the design. Let's take a look at what he had to say...

“The overall vision was to create a space with a design that reflects the Nordic kitchen and the dual atmosphere of a city and a garden. Cofoco, the owner of the restaurant, wanted to incorporate green elements at the same time as using recycled materials. They said to us – ‘Can you make a greenhouse inside?’ That was the only brief, so it was really free for us to come up with the concept. The brief was also to create an organic space like a garden party, so on the first floor we have garden lights across the ceiling. Downstairs, we made a tent. We found some recycled, old tablecloths and put them together for a big tent in the ceiling.”

– Rasmus Fex, Genbyg.

“You get a feeling of being on an old farm or barn. Before, the restaurant was called ‘Work in Progress,’ but people hardly went there because it didn't have any concept or DNA... Now it is fully booked all the time. There is a lot of green and I think people just love that, like sitting in a greenhouse. There is a really nice atmosphere in there. And all the materials have soul because they have been used before.”

– Rasmus Fex, Genbyg.

This design was nominated for the international Restaurant and Bar Design Awards in 2016.







**What occupants say:**

Trip Advisor Reviews:  
91% excellent or very good

“The interior is modern but warm, as the whole place is outfitted with plants and feels like the inside of a greenhouse. There is seating on two levels -- one at street level and another floor on the sub-level with skylights to the street above. A unique design and one that we enjoyed.”

“The interior is most inviting with soft lighting and dozens of potted plants.”

“The design of the restaurant - which features a central greenhouse, wood and concrete - is superb.”

“A really beautiful atmosphere... an indoor “greenhouse” added to the experience.”

**Biophilic Design Features:**

<p><b>Nature in the Space</b></p>	<ul style="list-style-type: none"> <li>· Greenery: floor plants, hanging plants, potted plants on shelving, planters</li> <li>· Large windows and glass walls to allow plenty of natural light</li> </ul>
<p><b>Natural Analogues</b></p>	<ul style="list-style-type: none"> <li>· Exposed wooden greenhouse structure</li> <li>· Wooden floors and furniture</li> <li>· Stone walls</li> <li>· Leather seat coverings</li> <li>· Recycled materials used throughout, such as old scaffolding planks to form the bar and teakwood chairs from an old High School</li> </ul>
<p><b>Nature of the Space</b></p>	<ul style="list-style-type: none"> <li>· Swing seats offer a sense of risk</li> <li>· Views across restaurant through the greenhouse windows allow for prospect</li> <li>· Tent-like feel and darker nooks in the basement create a sense of refuge</li> <li>· Light pools from skylights in the basement create a sense of mystery</li> <li>· Views partially obscured by plants also creates mystery and encourages exploration</li> </ul>

# HOSPITALITY DESIGN

## HIGH COST/SCALE

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### NAMAN RETREAT – DA NANG, VIETNAM

**A&D:** MIA Design Studio

**Cost:** Undisclosed

**Area:** 1600 m<sup>2</sup>

**Year:** 2015

**Design intent:** The five-star Naman retreat includes the 'Pure Spa', a free flowing, no-wall sanctuary with 15 luxury treatment rooms to create a 'healing and tranquil cocoon,' and a health club for exercise, meditation and yoga. This spa touches on all the senses to create peace and tranquillity, with the aim to create a state of natural relaxation.

As well as the Spa, the resort has a series of villas, restaurants and bars that incorporate features to evoke a feeling of being at one with nature.

Guided activities are also on offer for mindfulness and getting in touch with nature, such as tai chi, yoga, hiking, biking, beach meditation, fishing and gardening.

### What MIA Design Studio say:

- With use of local plants, each retreat becomes a healing environment where the guest can enjoy a luxurious wellness in privacy.
- Water and vegetation are indeed strong elements in this luxurious setting.
- The façade is composed by latticed patterns alternated with vertical landscapes that filter the strong tropical sunlight into a pleasant play of light and shadow on the textured walls. Various plants are carefully allocated and become a part of the architectural screens.
- Different areas flow smoothly into each other and the beautiful landscape creates an amazing journey into a dream-like experience.



Naman Retreat designed by Vo Trong Nghia Architects, Photograph by Hiroyuki Oki



**What occupants say:**

“The hotel itself is beautiful and the architecture is very unique.”

“The retreat is very green with plenty of trees around.”

“The whole facilities are surrounded by bamboos, so it is a very ‘zen’ atmosphere.”

“The hanging plants and design is stunning.”

Naman Retreat has an 80% occupancy rate and on Trip Advisor, 95% of reviews are excellent or very good.

**Biophilic Design Features:**

<p><b>Nature in the Space</b></p>	<ul style="list-style-type: none"> <li>· Situated in nature with beach access, lush foliage, landscaped gardens, courtyard gardens a green roof, rooftop terraces and balconies with sea views offer abundant views to nature</li> <li>· Tranquil open spaces on the ground floor surrounded by hanging gardens and lotus ponds</li> <li>· Large open-air atrium and skylights bring in natural light</li> <li>· The exterior is reflected in a palm-tree-lined body of water to create a softer transition and views between the building and the landscape beyond</li> <li>· Several bodies of water such as plunge and swimming pools</li> <li>· A gentle breeze passes through the inner courtyard, cooling the building and moving the trailing plants and shallow pools.</li> </ul>
<p><b>Natural Analogues</b></p>	<ul style="list-style-type: none"> <li>· In-room fragrance menu for essential oils</li> <li>· Biomorphic bamboo pillars and structures</li> <li>· Calming colours used throughout</li> <li>· Natural materials such as stone and wood used</li> </ul>
<p><b>Nature of the Space</b></p>	<ul style="list-style-type: none"> <li>· Ambient lighting in bars and restaurants and tucked away Jacuzzis in secluded corners of the building create a sense of refuge</li> <li>· Open views around the resort offer prospect</li> <li>· Glass exterior shaded by panels and plants and partially obscured views create a sense of mystery</li> <li>· Hammocks, stepping stone like platforms across bodies of water, balconies and elevated platforms give a sense of risk/peril.</li> </ul>





### **FURTHER INSPIRATION**

These case studies are just a tiny sample of the exciting and innovative Biophilic Design in practice in a couple of sectors. For more inspiration, take a look at the Living Future Institute's Living Building Challenge (<https://living-future.org/lbc/>) and some of the certified WELL Building Standard™ projects (<https://wellonline.wellcertified.com/community/projects>).

Human Space's Biophilic Design Hub (<http://humanspaces.com>) also has a wealth of articles and Case Studies to further your knowledge in this area.

# CHAPTER 6: SO, WHAT'S THE FUTURE OF HUMAN CENTRED DESIGN?



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Not every Biophilic Design feature has evidence to support its positive effects. But that's just the nature of such an innovative and emergent approach to design. Many aspects are being tested in ongoing projects such as the BRE Biophilic Office project, where pre- and post-occupancy data will be gathered over the next two years.

In **2017 BRE** launched **The Biophilic Office Project**, in which they are refurbishing one floor of an office building on their Watford campus in the UK. During this process, research will be gathered on how Biophilic Design can be implemented at a low, medium and high level and the subsequent benefits to the health, wellbeing and productivity of the office occupants.<sup>62</sup>

The project will spend its first year measuring quantitative and qualitative aspects of the existing building and occupants. A four-month refurbishment process will then take place based on this information. This will see the floorplan redesigned to reflect three zones with low, medium and high scale of Biophilic implementations. Following this, a year-long study of the benefits of each zone, and the return on investment (ROI) of each Biophilic aspect will take place.

One of our **future design guides will be on how to conduct pre-and post-occupancy studies**, so perhaps you'll pick that up and contribute to this growing body of evidence to support Biophilic design.

The BRE project has the potential to change and aid the development of design standards, and building codes.

As we are all becoming more aware of issues around things like air quality, so too are governments - policies to combat negative impacts on human health are emerging globally. Biophilic Design has a big part to play in counteracting some of the negative impacts of human activity by re-introducing nature and its benefits into the urban environment. **Everyone has role to play, from interior designers and architects, to urban designers.**

Biophilic Design is already a feature within the likes of human-centred building standards such as the WELL Building Standard™, so its benefits are being recognised as having a positive effect on psychological wellbeing and are being adopted by the architecture and design community. There are some exciting developments in materials and technologies that mimic nature – be that real or virtual – and these are becoming increasingly sophisticated with time. So much is happening as Biophilic Design is gaining momentum, so it really is a case of *watch this space...*

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This design guide has been produced as part of Interface's DesignLab. DesignLab is a community of forward thinking architects and designers who want to create positive spaces for people and planet.

Interface want to share their innovative approach to human centred design and help architects, designers and decision makers pave the way towards innovative ways of creating sustainable buildings with wellbeing at their heart.

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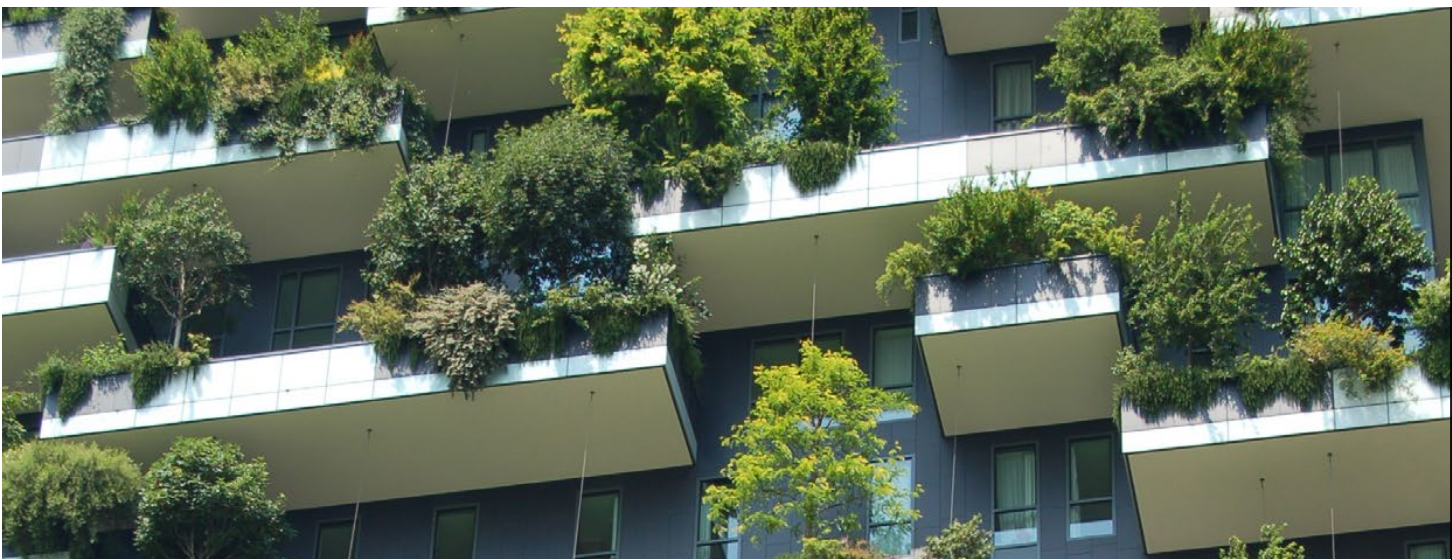
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