

Design and Psychology: Encouraging Pro- Environmental Behaviour Through Environmental Interior Design

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CONTENTS

Key Terms	4
Introduction	5
1. Environmental Design	8
1.1 Introduction.....	8
1.2 Sustainability in Current Interior Design Practice.....	8
1.3 Environmental Design.....	9
1.4 Cradle-to-Cradle & Circular Economy.....	10
1.5 Biophilic Design.....	12
1.6 Conclusion.....	14
2. Environmental Psychology	15
2.1 Introduction.....	15
2.2 Environmental Psychology.....	15
2.3 Cues, Goals and Habits.....	16
2.4 Pro-Environmental Behaviours.....	17
2.5 Conclusion.....	18

3. Encouraging Pro-Environmental Behaviours through Environmental Design.....	20
3.1 Introduction.....	20
3.2 Education Design.....	20
3.3 Office Design.....	22
3.4 Conclusion.....	25
Conclusion.....	26
Bibliography.....	28
List of Figures.....	35
Additional Readings.....	36

Key Terms

Built Environment

This term is used broadly in this essay to encapsulate man-made structures or settings of varying scales from individual buildings to cities (Kaklauskas and Gudauskas, 2016). It involves a vast range of industries, but in this essay, largely refers to architecture, construction, and interior design.

Environment

Throughout this essay, environment is used in two different contexts. Regarding environmental design, sustainability, and pro-environmental behaviours, it refers to the wider natural world, the living and non-living things that compose the earth itself (Johnson et al., 1997). Concerning environmental psychology, it describes surroundings, natural and man-made, in which people operate.

Environmental Design

The definition is evolving alongside the discipline, however, it is broadly understood as “the planning, production, and evaluation of objects of every scale, including products, buildings...and infrastructure, in a reciprocal relationship with the functioning and resilience of natural systems” (Erlhoff and Marshall, 2008, pp.147).

Environmental Psychology

The most comprehensive and pertinent definition of environmental psychology describes it as an examination of “the influence of the environment on human experiences, behaviour, and well-being, as well as the influence of individuals on the environment” (Steg, van den Berg and de Groot, 2018, pp.2). As stated in the ‘Environment’ definition, the discipline studies both natural and built surroundings.

Sustainability

This term was defined by the World Commission on Environment and Development in 1987 as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987, pp.41). The term sustainability will be used as such in this essay with interior design as the method of “development”.

INTRODUCTION

As conversations around climate change continue, it is evident that efforts of sustainability in interior design are insufficient (Cargo, 2013; Sorrento, 2012; Hayles, 2015). The divergence between environmental goals and their implementation in interior design has been coined the “sustainability gap”, with several causes identified (Steig, 2006). One such cause is the broadness of the term ‘sustainability’. Its lack of focus and clear guidelines is daunting and may inhibit practitioners from knowing where to begin.

Yet, the emergence of environmental design may provide a solution. This field applies the principles of sustainability to design through a variety of theories including new materialism, vibrant architecture, ecological design, Cradle-to-Cradle, circular economy, and biophilia. The specificity and practicality of these enable designers to easily adopt the theory most in line with their existing practice. This essay will begin by outlining the most prevalent environmental issues in interior design. An analysis of Cradle-to-Cradle and biophilia will then explore how environmental design may resolve these issues.

However, the principle aim of this essay is to consider whether sustainable interior design can be pushed beyond material solutions. It seeks to question if interior spaces can be designed to be both physically and psychologically sustainable. To elaborate, can an environmentally designed interior encourage the occupants of the space to adopt sustainable behaviours?

The impact of interior environments on human experiences, mood and behaviour is anecdotally recognised within interior design. Yet, interior designers remain largely ignorant of environmental psychology, the study into how humans’ experiences and actions are influenced by their surroundings. This essay will utilise environmental psychology to explore whether an application of its principles to sustainable interior design could promote environmentally friendly attitudes and behaviours in the occupants of such spaces. The aim of this is to understand whether sustainable interior design can be optimised to reduce the resource consumption and waste production of both interior and occupant, achieving a dual benefit.

To understand and investigate this, the essay will predominantly focus on secondary sources. Due to timescale and the topic's complexity, it was not possible at this stage to use primary research methods. Gosling, Gifford and McCunn support this, suggesting "the problem of documenting space is not a simple one...[interiors] are hard to analyse quantitatively" (2013, pp. 4). However, this essay will hopefully provide the opportunity for future expansion into primary research.

The first chapter, as stated earlier, will begin by discussing the current degree of sustainability in interior design before introducing environmental design as a response to this. In their article *Environmental Histories of Design*, Fallan and Jørgensen contextualise the emergence of environmental design. They express the importance of design within environmental discussions, highlighting how the designer is intrinsic to man's destructive effect on nature (Fallan and Jørgensen, 2017). Braungart and McDonough's Cradle-to-Cradle principles (2008) then present a practical application of environmental design to mitigate the designer's role in the climate crisis. Braungart and McDonough have been central to environmental design since the 1990s when they presented the *Hannover Principles* (1992) and an alternative economic system, termed circular economy. Whilst idealistic, their principles can be readily employed by governments, businesses, and designers. As such, many countries have set goals to switch to Braungart and McDonough's circular economy system. This is led by the Netherlands who aim to have a fully circular economic system by 2050 (Construcía, 2020). This is one of many examples of the wide-ranging success of, and long-term engagement with, Braungart and McDonough's theories. This mainstream popularity further highlights how sustainability does not have to be a lesser alternative. Biophilia has similar recognised success. Browning and Ryan (2020) introduce biophilia as a sustainable design practice that appeals to people's psychological responses. They contextualise the discipline, highlight its scientific and economic benefits, and apply it to the various sectors in interior design. Similar to Braungart and McDonough, their comprehensive outline provides designers with guidelines ready for implementation. Their consideration of biophilia also begins to question whether environmental interiors can influence a behavioural response.

The second chapter continues this discussion of behaviour in summarising the foundations of environmental psychology and considering its relevance to sustainability discourse. Bonnes and Bonaiuto (2002) adeptly contextualise environmental psychology and analyse its shift

towards ecology in the late 1960s. They suggest how this propelled environmental psychologists to study the reciprocity between people and environments, both man-made and natural. Steg and de Groot (2018) progress this dialogue in the second edition of *Environmental Psychology: An Introduction*. This exhaustive compendium compiles the work of the most prominent contemporary theorists in the field. Steg and de Groot (2018) use this research to emphasise how human behaviour is responsible for environmental damage and promote environmental psychology as a means of adjusting these behaviours to have a positive environmental outcome. This strongly aligns itself with the aims of environmental design as well as the main question of this essay as to whether environmentally designed interiors can encourage occupants to adopt sustainable attitudes and behaviours.

The third and final chapter employs the above theory in conjunction with environmental design theory to analyse two case studies. The case studies are two interior design projects exhibiting circular and biophilic design approaches. The first is Marthagården, a kindergarten in Denmark utilising biophilia to improve children's educational experiences (Lendager, no date). The second is 6 Orsman Road, a workspace in London implementing both circular and biophilic methods to provide physical, mental, and economic benefits to occupants (ArchDaily, 2020). Outside of the home, children and adults spend most of their time in either an educational or workplace setting, respectively (Gettysburg College, no date). Consequently, these were selected as the opportunity to influence behavioural changes is more significant in these settings. Environmental psychology studies into the effects of learning and work environments on behaviour were utilised in an analysis of the case studies. This analysis then attempts to determine whether an interdisciplinary collaboration between environmental design and environmental psychology can motivate widespread adoption of sustainable interior design practices alongside attitudinal and behavioural changes in the occupants of the resulting spaces.

1. ENVIRONMENTAL DESIGN

1.1 Introduction

Interior design is often overlooked in considerations of improving sustainability. However, it significantly contributes to the total environmental damage caused by the built environment, particularly through energy and resource consumption.

This chapter will be divided into four sections. The first will attempt to establish what the current environmental impact of interior design is. The second section will introduce environmental design as a potential response to this environmental impact. The latter two sections will then analyse in greater depth two environmental design theories: circular economy and biophilia. These will attempt to determine which is most applicable to interior design to reduce its environmental impact most significantly.

1.2 Sustainability in Current Interior Design Practice

In recent years, sustainability has become a buzz word. However, it is interpreted in vastly varying ways. In this essay, it focuses on the ability of interior design to accommodate the needs of present occupants without damaging the resources and ecosystems that ensure future generations can meet their needs, within or outside of interior design (WCED, 1987). This is predominantly achieved through resource conservation, and reduced energy consumption and waste production.

Interior design is a key sector in the built environment. Yet, whilst the detrimental effect of the built environment is widely acknowledged, little attention is granted to interior design as a component of this (Maté, 2007). The built environment accounts for 50% of all extracted materials and 35% of carbon emissions in the European Union annually (European Commission, 2011). Additionally, it creates approximately 830 million tonnes of waste (EEA, 2012). Interior design is resource intensive and a huge generator of waste. Non-domestic interiors “can be replaced every 3-10 years”, discarding of all fixtures, fittings and

finishes which are only to be replaced (Casas-Arredondo, Croxford and Domenech, 2018, pp.916). During a building's lifetime, it may have between 30 and 40 fitouts (RICS, 2018). The embodied energy used to construct the building, therefore is outweighed by that of the subsequent fitouts (Zabalza Bribián, Arando Usón and Scarpellini, 2009). This emphasises the recurrent, accumulative, and long-term environmental impact of interiors as opposed to the long-term but singularly occurring damage of the building's exterior. Whilst it remains important to tackle environmental issues in architecture, it is imperative that more attention is given to interior design (Sorrento, 2012; Hayles, 2015).

Research suggests that little is being done within the interior design industry itself to improve current practices. Celadyn stresses that “design requirements for the conservation of natural resources, are neither sufficiently recognised by interior designers, nor appropriately highlighted in the current design practice” (Celadyn, 2019, pp.1). In a survey of 539 architects and 142 designers inquiring as to how frequently they specified recycled products and materials, it was found that “91% (615) do so ‘never’ or ‘less than ¼ of the time’” (Chick and Micklethwaite, 2004, pp. 256). Whilst this survey was undertaken over 15 years ago, it is evident that there has been no significant improvement in the industry (Hayles, 2015). Lack of knowledge or awareness can no longer be an excuse. It is the interior designer's responsibility to educate themselves and utilise the available resources to improve their practice. The following sections will introduce relevant environmental design theories and propose an application to interior design.

1.3 Environmental Design

As argued above, designers have both caused environmental problems and have the skills needed to solve those problems. The emergence of the environmental movement in the 1960s and concepts such as the Anthropocene in the 1980s highlighted this. The Anthropocene can be defined as the era from which the impact of the human-made on Earth and nature became distinct and significant (Fallan and Jørgensen, 2017). This broadened the understanding of who is a designer and what is designed, including anything from pesticides to cruise ships. In understanding this, the discipline of environmental design was established.

The Nature v. Culture divide is both cause and effect of the Anthropocene. The othering of Nature, particularly through man's determination to dominate it, is widely thought to have

contributed to the environmental crisis (Harkness, 2020). The built environment is a notable example of this. It highlights how humans have sought to control and tame nature as well as separate themselves from it. This is explored further in the following sections which analyse the two different approaches to environmental design most applicable to interior design: Cradle-to-Cradle and biophilia.

1.4 Cradle-to-Cradle & Circular Economy

Cradle-to-Cradle, introduced by Michael Braungart and William McDonough (2008), is an approach to environmental design in which products and systems continually circulate within biological or technical cycles. This suggests that design should replicate nature in its management of resources – the waste of one living organism is the food of another. Applied to practice, this means reusing materials, products, and systems until they can no longer be reused. In separating biological and technical materials, the integrity and quality of the material is retained and its lifecycle for reuse extended. At the end of its usable life, it can also return to the earth (Braungart and McDonough, 2008).

The theory of circular economy expands upon this. In this system, it is suggested that products are designed to be disassembled. Customers loan these products for a defined amount of time and return them to the manufacturer at the end of their use. The manufacturer then breaks the product down and reuses its components and materials (Braungart and McDonough, 2008). This financially benefits the manufacturer, improves convenience for the customer and reduces the amount of raw materials that are extracted and wasted.

The opportunity this provides to the discipline of interior design is evident. If the continuous cycle of fitouts was designed to be disassembled and reused there would be an immense reduction in resource use, waste, and embodied energy. A system could be established between designers and suppliers for the return and reuse of materials to the financial advantage of both supplier and client. The client and their perception of the cost of sustainable interior design remain a key barrier to its implementation (Hayles, 2015). Approaches, such as this one, which provide added value to the client could be key in removing these barriers. A successful example of this is in the Circl Pavilion in Amsterdam, a building designed in accordance with circular economy principles (see figure 1.1). In particular, the client decided to rent the lift from the manufacturer, Mitsubishi, rather than

buy it outright. In removing ownership, the responsibility has been placed on the manufacturer to ensure the lift has the longest possible lifetime (Circl, 2017). In addition, the manufacturer is responsible for its maintenance. For this to benefit them financially, the manufacturer will remove designed obsolescence and produce a superior product. ‘Products of service’ are just one aspect of Cradle-to-Cradle. Combined with other principles, such as an awareness of material flows, specification of biological and technical materials, and designing in harmony with the local culture and environment, the interior design discipline could benefit the environment rather than merely minimising its damage.

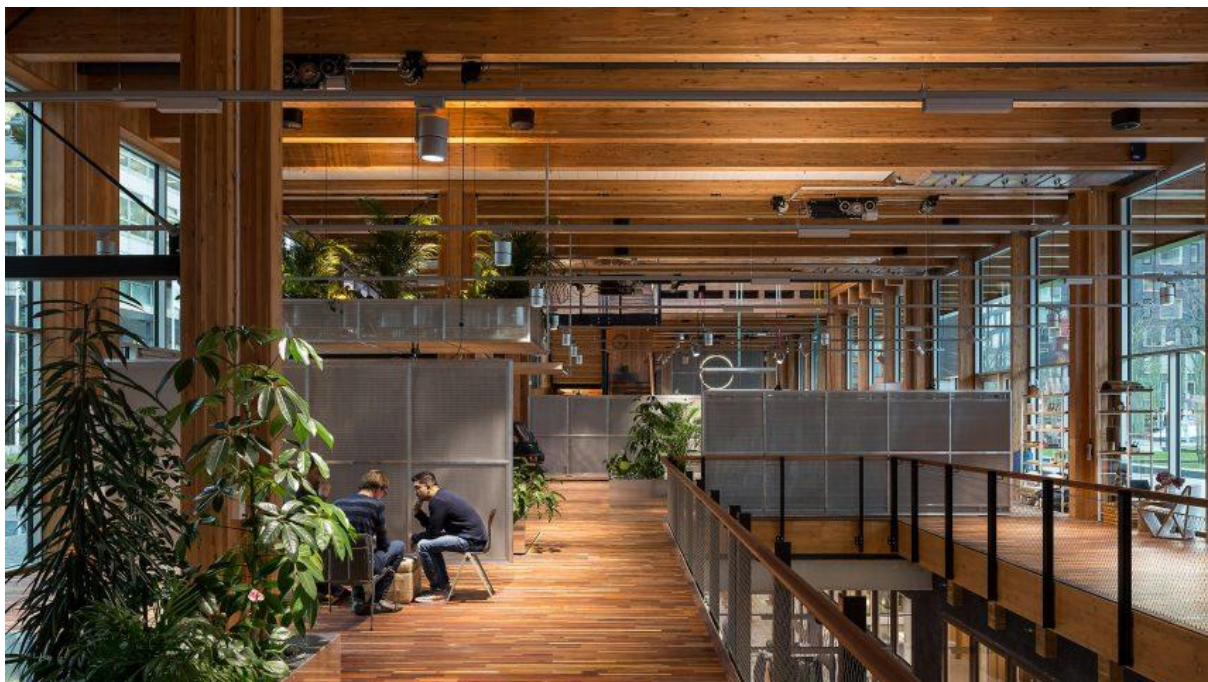


Figure 1.1 The Circl Pavilion has a predominantly timber structure that has been designed for disassembly, in line with Cradle-to-Cradle principles (Griffiths, 2018).

The concept of circular economy revolves around reuse and responsible material specification. In doing so, it directly addresses the practical obstacles to sustainable interior design, namely resource consumption and waste production. The improved specification of materials would enhance waste opportunities at the end of an interiors’ life whilst reuse and ‘products of service’ would prolong this lifecycle altogether. Yet, this practical approach to interior designs’ exploitation of the environment neglects the Human v. Nature divide behind this desire to control and dominate. The following section proposes an approach with greater social and cultural implications.

1.5 Biophilic Design

Biophilia was a term coined in 1964 by Erich Fromm which “has evolved to denote mankind’s innate biological connection with and responsiveness to experiences of nature” (Browning and Ryan, 2020, pp.2). It is only relatively recently in human history that we have come to live in built environments, such as cities. Hence, the basis of this theory is in the evolution of humans in the natural environment (Gifford and McCunn, 2018). In interior design, biophilia introduces natural elements into indoor environments to cater to human’s innate connection with nature. As such, biophilia corresponds with this essay’s exploration into whether environmentally designed interiors can promote sustainable human behaviours.

Modern-day built environments are far removed from nature or any references to it, geographically and aesthetically (Browning and Ryan, 2020). Maté notes that “in our modern, urban society, we can spend up to 90% of our time indoors” (2007, pp.28). This strengthens the disconnection between humans and their natural environment. An underlying effect is that this removes people’s awareness of the damage that climate change is inflicting on the environment. Additionally, it weakens their sympathies and willingness to contribute to climate positive actions. Biophilic design reintroduces nature into interiors to combat this disconnection (see figure 1.2). In particular, biophilic elements in environments occupied by children can create an attachment to nature that correlates with climate positive attitudes and values in adulthood, such as support of conservation measures (Schultz et al., 2004). It is the responsibility of the interior designer to incorporate biophilic elements into educational settings to ensure this long-term impact on future generations. Yet, this is only one example. Biophilic interior design has been proven to positively influence other areas such as healthcare, office design, hospitality, and more (Browning and Ryan, 2020).



Figure 1.2 This example of biophilic interior design incorporates natural materials, daylight, and plants (Baldwin, 2020).

However, sustainable practices are not always ensured when introducing or replicating nature in the built environment. Whilst biophilic design can have a long-term impact on people's attitudes towards nature, it can also negatively affect nature itself when not implemented correctly. In contrast to Cradle-to-Cradle, biophilic design does not have set guidelines to ensure sustainability. This enables biophilic interiors that have not considered energy use, resource consumption or waste production. Effective biophilia not only introduces the aesthetics of nature to interiors but integrates intrinsically sustainable natural processes within these spaces.

Braungart and McDonough's Cradle-to-Cradle theory has aspects of biophilia, particularly in its replication of nature's waste systems. An interdisciplinary approach incorporating biophilia and circular economy into interior design practices has the breadth and depth required for the discipline to redirect itself towards a sustainable output. Whilst Cradle-to-Cradle provides designers with clear guidelines to address practical issues of resource and energy use, biophilia reconnects people with nature to challenge social attitudes and encourage a sense of responsibility towards the environment. The latter of these begins to approach how interiors can be designed to endorse sustainable viewpoints and behaviours as this essay seeks to determine.

1.6 Conclusion

This chapter has established that sustainability in interior design remains limited and ineffective. Current practices are having a significant impact on resource extraction, energy consumption, and waste production which is contributing to environmental damage and climate change. It has also been noted that the discipline currently considers itself disparate and independent from nature. However, this chapter argues that environmental design offers a viable solution to these issues. Environmental design takes the approach that natural and built systems are intrinsically linked, a perspective that appears promising in tackling the Nature v. Culture divide. More specifically, it proposes that Cradle-to-Cradle be integrated into current interior design practices. The applicability of Cradle-to-Cradle to interior design provides practical, comprehensive steps for practitioners to limit their environmental damage swiftly and effectively. In focusing the broad term ‘sustainability’, it may also encourage greater adoption. Yet, whilst this approach targets designers, it neglects the occupants.

The importance of appealing to occupants’ attitudes and actions through interior design is determined latterly in the chapter. Biophilic design presents an emotive, evolutionary solution. It (re)connects people with nature to encourage long-term climate positive actions. This supports the broader aim of this essay to establish if interiors can be designed to influence sustainable behaviours. This chapter therefore concludes that a combination of circular and biophilic design will be most compelling towards reducing the environmental impact of interior design and encouraging behavioural change.

The following chapter will further explore the anecdotal recognition of the interior designer’s influence on occupants’ bodies, perceptions, and actions through a consolidation of existing research. An analysis of environmental psychology will present the theory behind these suppositions and attempt to indicate whether interiors can encourage inhabitants to assume environmentally friendly actions. This will go beyond existing discourse on sustainability in interior design to propose that interiors can be designed to be both physically and psychologically sustainable.

2. ENVIRONMENTAL PSYCHOLOGY

2.1 Introduction

Environmental psychology investigates how peoples' experiences and actions are affected by their surroundings. Its broad understanding of 'environment' encompasses both natural and built environments, highlighting its pertinence to the interior design field. To understand whether interior environments, designed and non-designed, can influence users to behave in more sustainable ways we first have to understand whether they determine human behaviour.

This chapter, separated into three sections, will first discuss the origins and theories of environmental psychology. The second section will investigate how behaviours are formed and reformed in response to an individual's surrounding environments. Lastly, the third section will explore whether behaviours beneficial to the environment can be encouraged through the lens of pro-environmental behaviour theory.

2.2 Environmental Psychology

The term 'environmental psychology' was first coined by Hellpach in the early twentieth century, but it wasn't a recognised discipline until the late 1960s (Hellpach, 1911; Bonnes and Bonaiuto, 2002). Psychologists had begun to realise that "the influence of the physical settings on the behaviour and experience of the person...cannot and should not be ignored" (Proshansky and Fabian, 1986, pp.25). Credit is often given to Brunswik and Lewin who are regarded as the 'founding fathers' of this field (Gifford, 2007). Their influence led to an increase in research into the effect of physical spaces on human behaviours in the 1940s and 1950s.

However, as noted by Bonnes and Bonaiuto (2002), the built environment was prioritised over natural environments in these early studies. An emerging awareness of environmental issues in the late 1960s brought ecology to the fore. They argue "that the progressive influence of the full ecology...perspective led environmental psychology to shift its main perspective of observation" (Bonnes and Bonaiuto, 2002, pp.36). The corresponding timelines of the emergence of environmental psychology and ecology has led to the two

becoming intertwined. Moreover, as the perspective of environmental psychology shifted and broadened so did the definition. It is now commonly defined as “the study of the effects of built and non-built or physical and natural environment on human behaviour and the consequent human behaviour towards the built and...natural environment” (Rajamanickam, 1999, pp.189-190). This emphasises the reciprocal relationship between people and environment, a now fundamental understanding within the field. The framing is key to recognising the detrimental impact that human behaviours are having on the natural environment. As such, it is a particularly pertinent area of study to analyse within this essay.

Whilst the perspective of the discipline has shifted, the interdisciplinary nature of the field was ever-present. Throughout its early years, architects and engineers collaborated with psychologists to better understand how to design with their users’ needs in mind. As the field progressed to consider natural environments, there was greater collaboration with geologists and environmental scientists (Steg, van den Berg and de Groot, 2018). Interior design itself is a relatively new discipline and so is not a named collaborator in the field. Yet, it is easy to see how environmental psychology could similarly benefit interior design. Furthermore, environmental design relies on an interdisciplinary approach, particularly between designers and environmental scientists. The introduction of environmental psychology into this field, with studies into human-environment dependency, inherently lends itself. In consideration of these factors, a natural relationship between environmental psychology, environmental design and interior design is evident.

2.3 Cues, Goals and Habits

The previous section established that interior and exterior environments do influence human behaviour. However, it is now necessary to understand how it does so. This section will explore the theory behind cues, norms, goals, and habits.

One way that behaviour can be influenced is through cues. Lindenberg defines cues as “elements in the environment that convey important information or trigger an affective reaction” (2018, pp.145). These cues may then affect the norm conformity of an individual. Norms are understood to be informal, socially implemented rules which can influence behaviour. For example, litter on the street is a cue which suggests to an individual that others have not conformed to the norm not to litter. This may then affect that individual’s

behaviour, such as influencing them to litter as well due to the norm having been weakened (Horne, 2001). It is therefore apparent how cues and norms are significant in improving or inhibiting behaviours that support the natural environment even within this small-scale example.

These two concepts are linked to goal-framing theory and overarching goals. Overarching goals can be separated into three distinct goals: “normative goal: to behave appropriately, conform to social norms and rules”, “gain goal: to maintain or improve one’s resources”, “hedonic goal: to maintain or improve the way one feels right now” (Lindenberg, 2018, pp.146). Whilst these all influence behaviour, normative goals are particularly relevant to behaviour relating to the environment. One argument is that this suggests the individual must consider environmental concerns a social norm to behave in a way beneficial to the environment. In contrast, Steg and Vlek argue that it is also important to consider “contextual factors such as physical infrastructure” as these “contextual factors determine which type of motivations (and thus which goal-frame) most strongly affects behaviour” (2009, pp.312). This emphasises that whilst goals can influence the way an individual interacts with their environment, the environment can similarly determine the individual’s goals. As such, cues can be designed in an interior to shape social norms and goals to the environment’s advantage.

However, it is widely recognised in environmental psychology that habits can prevent efforts to influence an individual’s behaviour. Habits are “cognitive structures that automatically determine future behaviour by linking specific situational cues to (chains of) behavioural patterns” (Klockner and Verplanken, 2018, pp.239). This means that when facing recurring, everyday situations or choices, people don’t have to make decisions again as the behaviour has become subconscious (Klockner and Verplanken, 2018). Whilst it is difficult to change habits, it is not impossible. The final section of this chapter will explore how habits can be deactivated to form new behaviours and expand on pro-environmental behaviours; a concept that has been briefly touched upon in this section.

2.4 Pro-Environmental Behaviours

Pro-environmental behaviour is defined as “behaviour that consciously seeks to minimise the negative impact of one’s actions on the natural and built world” (Kollmuss and Agyeman,

2002, pp.240). An alternative definition is “behaviour that harms the environment as little as possible, or even benefits the environment” (Steg and Vlek, 2009, pp.309). The difference between definitions is subtle. The first suggests there must be intention behind the behaviour whilst the second does not. As Stern (2000) argues, the impact-oriented rather than intent-oriented definition focuses on actual environmental difference as intention may not result in the best action. Yet, the intent-oriented definition allows an understanding of people’s attitudes and motivations which can be better used to target their behaviours (Stern, 2000). An increasing focus for environmental psychologists is to find ways to encourage this behaviour in individuals and so in considering both definitions, a more effective, wide-ranging approach can be undertaken.

As previously stated, habits are widely recognised as the main barrier to the formation of pro-environmental behaviours. Nonetheless, these barriers can be overcome. Klockner and Verplanken (2018) have identified two successful strategies: a significant change in situational cues in the target group’s surroundings and the formation of implementation intentions by the target group. The former is most relevant for interior designers looking to influence behavioural change. Interior designers can design new cues in a setting which promote pro-environmental behaviours. The latter strategy refers to dedicated plans which outline when and where the new behaviour will take place (Holland, Aarts and Langendam, 2006). The combination of design strategies, such as cues, and psychological strategies, such as implementation intentions, solidify these new pro-environmental behaviours to ensure a long-term effect. This multi-faceted, interdisciplinary approach, incorporating environmental psychology strategies into existing interior design practices, will be most significant in removing barriers to the formation of pro-environmental behaviours. Furthermore, it establishes that interior design can be an effective tool for encouraging individuals to behave sustainably as this essay aimed to determine.

2.5 Conclusion

This chapter aimed to establish whether natural and built environments can affect human behaviour and mood, and if so how. In recognition of the detrimental effect of human activity on the environment, it further questioned whether this theory could be applied to limit this human impact.

As such, it found that environmental psychology has determined that human behaviours are influenced by physical surroundings. Studies within this field have identified elements within these environments that influence behaviour. Namely, cues, norms, goals, and habits. These psychological and physical factors indicate both how individuals are impacted by their environment, and how individuals in turn effect the environment. This recentering to recognise the reciprocity between people and environments has adjusted the focus of environmental psychology onto pro-environmental behaviours. Consequently, the door has been opened to other disciplines, including ecology, environmental sciences, and, most significantly for this essay, environmental design.

This chapter latterly established that a collaboration between environmental psychology and interior design can effectively encourage pro-environmental behaviours in individuals using the above psychological and physical factors. To expand upon this, the following chapter will explore how an interdisciplinary application of environmental psychology and environmental design could give interior design a broader, longer-lasting environmental legacy.

3. ENCOURAGING PRO-ENVIRONMENTAL BEHAVIOURS THROUGH ENVIRONMENTAL DESIGN

3.1 Introduction

The first chapter outlines environmental design, particularly circular and biophilic design, as the most effective method for reducing the environmental impact of interior design. The second chapter then establishes that the application of environmental psychology to interior design can influence occupants to assume pro-environmental behaviours. This final chapter seeks to understand how environmental design and environmental psychology could be combined within interior design to not only minimise damage but positively benefit the environment.

This chapter will analyse case studies to argue how the above approach can enable actual sustainable advances in the interior design discipline alongside attitudinal and behavioural changes in both designers and occupants. The first section will analyse examples in education design whilst the second section will explore office design.

3.2 Education Design

In interior design, education design refers to the design of learning environments, such as nurseries, schools, and universities. As was outlined earlier in this essay, individuals who develop an attachment to nature as children have been found to display climate positive attitudes and support conservation measures in adulthood (Schultz et al., 2004). This finding provides opportunities for both biophilic design and environmental psychology, highlighting the relevance of educational design as an area of analysis within this essay.

Further environmental psychology studies have found that biophilic design in educational settings promotes more creative play, develops more positive relationships, and results in better scores for selective attention tests, and English and Maths tests (Dowdell, Gray and Malone, 2011; Van den Berg et al., 2016; and Wu et al., 2014). An example of a learning

environment that successfully incorporates biophilic design to encourage these results is Marthagården in Frederiksberg, Denmark.

Marthagården is a 1000m² kindergarten renovated by Lendager Group in 2013 (see figure 3.1). The design refurbished two existing buildings as well as creating a new space to connect these. This new space was built from breathable, sustainable materials whilst six tonnes of wooden furniture was upcycled and reused (Moeslund Mains, 2020). This reuse conforms to circular design principles. However, the new spaces, incorporating biophilia, have had the most significant impact on the children, teachers and parents that occupy the building. The 'Healthy Kitchen' and 'Eco-Board' introduce ideas of sustainability and healthy lifestyles to the children, including energy production, organic food growth, and waste recycling (Lendager, no date). This develops a connection to nature at an early age which may lead to outcomes like those found by Shultz et al. (2004). Whilst the long-term effect has not yet been proven, the current sustainability credentials of Marthagården are evident through the reorientation of the occupants' priorities. The ethos behind the design decisions is outlined by the Lendager Group (see figure 3.2) and re-emphasises how the environmental design philosophy has informed the aims, experiences, and actions of the kindergarten's occupants.

Yet, the designers could have employed more circular design methods. Whilst existing buildings and furniture were reused, reuse of materials in the new building could have been more extensive. Furthermore, the new building could have been designed for disassembly to ensure the materials are reused when the building reaches the end of its lifecycle.

Despite this, the case study establishes that biophilic interior design can influence pro-environmental behaviours in educational settings. The children have formed an attachment to and understanding of nature, whilst the parents and teachers have reconnected with nature. This has influenced the occupants to assume pro-environmental behaviours both within and outside of the school.



Figure 3.1 The ‘Healthy Kitchen’ in Marthagården offers a ‘hands-on’ biophilic approach to sustainability (UrbanNext, no date).

10 POINTS FOR MARTHAGÅRDEN:

- 1/ To be, to live and to learn are guiding principles.
- 2/ To create a healthy indoor climate through the use of natural materials and utilization of passive properties such as sun, wind, water and greenery.
- 3/ To create the basis for happy children and adults through a healthy food culture.
- 4/ To create an organic children's community with stimulation for all six senses.
- 5/ To create a diverse Marthagårde through social sustainability for children, starting with 'one institution, one entrance, one identity'.
- 6/ To work with spatial recycling and rational value creation in the existing buildings.
- 7/ To use the passing of seasons to change the usage patterns of the buildings.
- 8/ To make it easy to chose to arrive by bike to the institution.
- 9/ To reduce the energy consumption of the building so that it creates more energy than it uses.
- 10/ To create a children's town in the town, in a scale that creates possibilities for exploration, activities and flexibility.

Figure 3.2 The Lendager Group highlighted their biophilic sustainability goals for the project in “10 Points for Marthagården” (Lendager, no date).

This highlights how an environmental psychology and environmental design approach to educational interiors can encourage sustainable behavioural change. Alongside a positive environmental outcome, the children’s overall mental and physical wellbeing is benefited. As such, interior designers of educational settings have a responsibility to incorporate biophilic design features. Biophilia also emerges as the most significant design method to conquer the Nature v. Culture divide to ensure this future generation protect rather than dominate the natural world. The following section will analyse how circular economy and biophilia in office design can continue to influence pro-environmental behaviours in adulthood.

3.3 Office Design

In the context of this essay, office design is the design of workplace environments. Office and education design are separate practices within the interior design discipline. However, one naturally follows on from the other. School is the environment that children spend most of their time in outside of the home, whilst for adults this is the workplace (Gettysburg College, no date). It is important to target these spaces as the time spent within them offers the greatest opportunity outside of the home to encourage pro-environmental behaviours. Office design

also has broader potential as it can institute sustainable changes on an organisational, and even international, level. It is widely acknowledged that global businesses are responsible for a large proportion of environmental damage, yet the onus is often placed on the individual as a consumer (Ambrose, 2019). If environmental issues within office design are addressed, this may lead to advances elsewhere in a company. For example, workers who benefit from environmental design in a head office may implement sustainable company practices or specify environmental interior design within their other workplaces.

Environmental psychology studies into the effects of biophilic design in offices have shown similar results to those in educational settings. These studies have recorded increases in cognitive capacity, productivity, concentration, and improved physical and mental health, such as through stress reduction (Browning and Ryan, 2020; Beganskas, 2018). An increase in worker productivity and improved health, resulting in fewer sick days, can have economic benefits for companies. Client perceptions about the cost of sustainable interior design is one of the main barriers to its widespread implementation (Hayles, 2015). If clients can be convinced of the long-term profitability of environmental interior design, they may be more likely to specify it. Circular design can offer similar economic incentives for clients. Effective circular design involves efficient space planning, recycled materials, minimal finishes and ‘products of services’ which all reduce costs. A combination of biophilia and circular economy in office design provides mental, physical, and economic advantages to the workers and owners of the companies occupying these spaces.

All the above qualities are evident in 6 Orsman Road, a 3158 m² workspace designed in 2020 by Waugh Thistleton Architects. This building provides a template to creating circular, adaptable offices. The cross-laminated timber (CLT) and steel structure is demountable, enabling flexibility and reusability. It has been left unfinished to reduce material use as well as enhance its reusability whilst the furniture within the building is made from offcuts (ArchDaily, 2020). Additionally, the clay finishes and Marmoleum tiles conform to Braungart and McDonough’s biological cycles for reuse (2008). Despite these minimal finishes, the design aesthetic has not been compromised (see figure 3.3). Some designers can be deterred by the starkness of circular design. Yet, this workplace provides inspiration as to circularity’s visual possibilities.



Figure 3.3 The demountable, reusable CLT and steel structure does not deter from the appealing aesthetics of 6 Orsman Road (ArchDaily, 2020).

Waugh Thistleton Architects have also considered biophilic design through the inclusion of natural daylight, air-purifying plants, and timber interiors to improve employee productivity, wellbeing, and staff retention (ArchDaily, 2020). However, the biophilic design features are not as successfully integrated as the circular design measures. A more concerted inclusion of biophilia would have a greater effect on occupants' attitudes and habits as was evident in Marthagården. Regardless, the office may have sufficient situational cues to encourage occupants to assume some pro-environmental behaviours.

Overall, Waugh Thistleton Architects have integrated circular and biophilic design to provide mental, physical, and economic benefits to the occupants and clients. This environmental office design provides a foundation for interior designers to be inspired by and expand upon. Following this approach offers designers an opportunity to improve their social and environmental impact, both physically and in encouraging occupants to assume pro-environmental behaviours.

3.4 Conclusion

This chapter analysed existing examples of interiors with circular and biophilic design features to establish whether these can promote pro-environmental behaviours in occupants. The areas of education and office design were chosen due to the significant amount of time inhabitants spend in them and the natural link between the two.

It was identified that education and office environments, particularly with biophilic design elements, do effect occupant behaviour. Observations of the case studies were supported by previous environmental psychology studies. These studies suggested that by connecting humans with nature, people are motivated to incorporate environmentalism into their normative goals and may change their behaviour accordingly. Furthermore, environmental psychology provides evidence of improved occupant mental and physical wellbeing that incentivises clients to specify biophilic interiors.

Yet, the importance of circular design should not be neglected. It offers benefits such as improved wellbeing and greater staff retention, the latter of which is just one of many economic incentives for clients. The 6 Orsman Road example also provides interior designers with practical and aesthetic inspiration to reduce their environmental impact. This highlights that a two-pronged approach of circular and biophilic interior design, supported by environmental psychology, positively impacts the natural environment whilst stimulating a pro-environmental behavioural change in occupants, designers, and, to a lesser extent, clients.

CONCLUSION

This dissertation sought to determine whether environmental interior design could be utilised as a tool for encouraging pro-environmental behaviour. Most interior designers remain unaware of how best to counteract the damage that their designs inflict upon the earth and its ecosystems, and therefore are unaware of how to achieve an environmental interior. The first chapter addressed this gap in knowledge. It proposed Cradle-to-Cradle and biophilia, two fields within environmental design, as the most applicable to address sustainability barriers in interior design. Yet, this tackles just one part of the question. To understand the latter part, how interior environments can influence sustainable human behaviours, the second chapter explored environmental psychology and pro-environmental behaviour. In the final chapter two interior design case studies employing circular and biophilic techniques were analysed alongside existing environmental psychology studies. This approached the question as a whole.

An exploration into environmental design highlighted that addressing the divergence of humans and nature is fundamental to encouraging pro-environmental behaviours. The Human v. Nature divide is both a cause and effect of the environmental crises. People have found refuge from the ‘threat’ of the natural world in interior spaces. Now, in our modern society, people spend 90% of their time inside (Maté, 2007). This provides the interior with significant influence over their moods, experiences, and behaviours and supports the supposition that interior design can be utilised in attempts to combat the climate crisis.

Biophilia and Cradle-to-Cradle were found to be the appropriate methods to utilise this influence. Biophilia appeals to our innate attachment with nature. Integrated into interior design, people regain a respect for and understanding of nature. This is essential if humans and their infrastructure are to grow in harmony with earth’s natural systems. Cradle-to-Cradle proposes a similar approach to development, suggesting “buildings...can be entwined with surrounding ecosystems in ways that are mutually enriching” (Braungart and McDonough, 2008, pp.87). Alongside a significantly reduced environmental impact, these interiors hugely benefit inhabitants. Environmental psychology has proven that biophilic and circular design measures have a positive impact on mental and physical wellbeing. In return, occupants of

those spaces are more likely to support sustainability measures, thus exhibiting pro-environmental behaviours.

This dissertation found that encouraging pro-environmental behaviours through environmental interior design ensures the earth benefits from a reduced design and human impact. To solidify these findings in practice, future research should determine the specific environmental design features required to optimise influence over human behaviour.

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