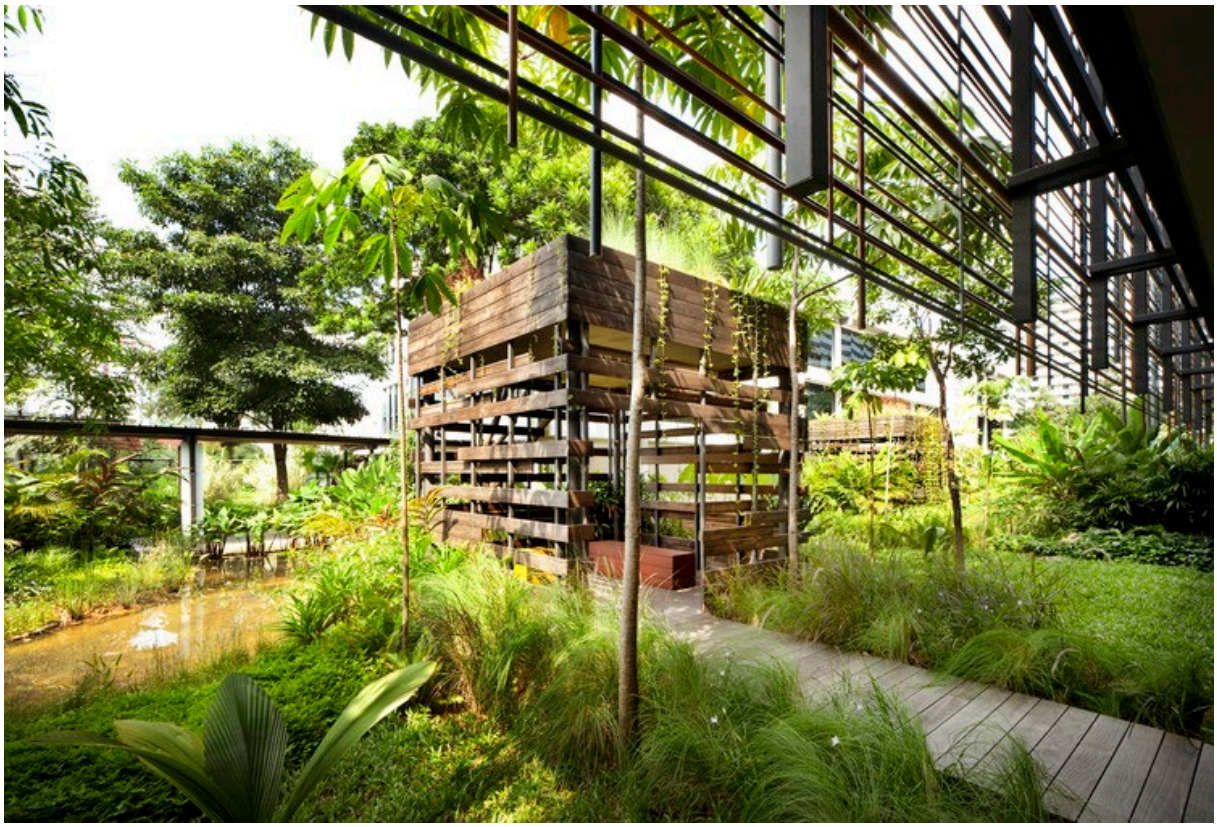
A review of how society and architecture in the Netherlands have responded to the global rise of Biophilia



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Abstract

The term biophilia and its implementations in architecture have since its popularisation in 1984 gained in popularity throughout the world. This research attempts to find how this has taken shape in the Netherlands by answering the research question: How has public opinion in the Netherlands shaped the influence of Biophilia on architecture in the period between the 1960s and 1990s. This will be done by reviewing academic papers, journals and newspapers from the Netherlands and a case study project in Amsterdam. Research found that whilst biophilia has a strong evidence based foundation, it only gained traction in the Netherlands after the year 2000. This is the result of Dutch civilian' wait and see attitude, in which they put responsibilities on the government to create policies on greening. This research adds new values and insights in the way different forces in the Netherlands have shaped the upcome of biophilia in both society and architecture.

Key-words

Biophila, biophilic design, architecture, social movement, Netherlands,

Front cover image by Bingham-Hall (n.d.)

Contents

Introduction

As you enter a space filled with heaps of daylight, your eyes follow organically shaped curves and surfaces whilst the abundant vegetation, which is strategically placed, sparks your interest and subconsciously calms you at the same time. The flowing of the spaces creates a natural path to your destination, whilst also forming partially obstructing your direct field of sight, only to further increase your desire to find out what is behind it. This description could be of an architectural project which would be appointed the label of 'biophilic design'. Distancing itself from traditional modern architecture, where form is the leading aspect of design, biophilic design attempts to reconnect humans with nature through a bottom-up incorporation of both natural materials, as well as shapes and flows. But where does the term biophilic design actually come from? And how has it influenced architecture both worldwide as in the Netherlands?

Following the latest trends and practices in architecture, it becomes clear that an ever-increasing demand and expectation for 'green' architecture has formed over the last decennia. Because of the multitude of ways to interpret the role of 'green' within this framework, it has slowly lost its meaning. Introduced in 1964 by social psychologist and sociologist Erich Fromm and popularized in 1984 by sociobiologist Edward O. Wilson in his book Biophilia (1984), the word "biophilia" has since been the way of describing a more fundamental description of "green" architecture. Biophilic design has a bottom-up approach of 'connecting' with nature instead of the top-down '*re*-connecting', fully utilising the fact that humans subconsciously prefer a natural (feeling) environment.

To understand the current interest in biophilic design, it seems valuable to know where it came from. Therefore, this history thesis will research the following question: "How has public opinion in the Netherlands shaped the influence of Biophilia on architecture in the period between the 1960s and 1990s?" Even though the term Biophilia wasn't introduced or popularized by someone from the Netherlands (Fromm was from Germany and Wilson from the United States), the decision has been made to focus the research on just the Netherlands as existing literature has already examined the worldwide uprise of the term Biophilia and the influence general public has had on it. By focussing on the Netherlands, a more detailed background on the social, political and architectural scope of the term can be found in a specified context. This is because of differences that can be found between countries' history and economic statuses around the world, resulting in geographical, temporal and theoretical diversity among both scholars and the general public (Mol, 2000).

The research will be conducted by reviewing academic papers on the emergence of the term biophilia and its influence on architecture. Furthermore, the history of social movements, architectural magazines, newspaper articles and a case study project all focussing more on the Netherlands, within global theoretical context, will be analysed and linked to biophilia. This will add both scientific and subjective insights on the topic and will be combined to answer the research question and provide insight in intersecting topics. Subjective sources such as Dutch architectural magazines and newspaper articles will be, both qualitative and quantitative, examined to understand the role of the media and the opinion of the public. The academic papers analyse the way social- and environmental movements in the 1970s, 1980s and 1990s have been created and developed, how the term biophilia is introduced and the scientific background on the importance of subconscious connection with nature for humans.

It is expected that the research will find a mix of (social/environmental) movements, political decisions, architectural developments and societal changes, which have shaped the way the last decades of the 20th century formed the basis for architectural changes. A case study project will be examined to give an example of early biophilia in Dutch architecture.

After answering the research question, this thesis will have provided a new look on the way societal and architectural changes have influenced the upcome of biophilia in architecture. It thereby forms a foundation on which the knowledge on the history and implementation of Biophilia in architecture can be expanded. The scope of the research is, due to the focus on a single country, kept quite narrow, but still allows for many different sources and ways to look at the subject, which will result in a subjective implementation of gained knowledge throughout this thesis.

The first chapter of the thesis will explain the scope of the term Biophilic design, after which the following chapters will look into the creation and evolution of environmental movements and the way the media has had a part in the creation. Dutch societies view on the value and responsibility of nature is then analysed and in the following chapters the growing popularity of the biophilic approach and how societal changes have responded to this, both historically and recent years will be discussed through academic papers and a case study project in the Netherlands. Finally, the conclusion and discussion will provide answers on the research question and discuss the scope and value of this research.

01. The scope of biophilia

The term biophilia was first introduced by the German socio-psychoanalyst Erich Fromm (1900-1980), one year before his retirement, in 1964. Erich Fromm first studied jurisprudence, but shortly after started studying sociology in Heidelberg, Germany, in which he received his PhD in 1922. Before the Second World War, he moved to the United States in fear of prosecution by the Nazi regime, where he transitionally moved to more psychoanalyst thought. He taught courses on psychoanalysis and sociology at several universities throughout the United States.

Fromm (1964) depicted the term biophilia as “love of life or living systems”, referring to the psychological tendency in humans to be attracted to all that is alive and vital (Simaika & Samways, 2010), placing it as an opposing force to necrophilia, which is understood as love of the death (Horney Eckardt, 1994). Horney Eckardt (1994) further observes the writings of Fromm not to be descriptive, but rather addressing “the nature of the spirit which informs a productive life; the spirit which should guide all of our activities.” Söderlund (2019) describes this as Fromm’s search for the essence of man, that which defines humanity.

In the 1984 book “Biophilia”, Edward O. Wilson elaborated on this view, portraying it to be “an innate love for nature”, suggesting that biophilia is intertwined with the human nature, and therefore binds humans to all other living species, setting it apart from the psychological approach that Fromm took (Simaika & Samways, 2010). Edward O. Wilson (1929-2021) was an American biologist and in 1975 the founder of sociobiology, in which the evolutionary origin of social behaviour in animals, including humans, is researched. In his book Biophilia (1984), Wilson evocates his personal response to nature and links it to the subconscious connection between humans and the living world, describing this as being biophilic.

Furthermore, Kellert and Wilson (1993) expanded on the term in their book ‘The Biophilia Hypothesis’, by proposing “humanity’s evolved need for connection to the natural world” as an inherent desire which stems from our species’ evolutionary heritage, also associating it with human competitive advantage and genetic fitness (Söderlund, 2019). Social ecologist Stephen R. Kellert (1993) compiled the voices of several authors, all connected to nature in some way, to form a “scientific-based inquiry” (Söderlund, 2019) in which they state that urban society has disconnected from nature, through which a certain value to humans has been lost. To reconnect with nature, Jasper (2007) and Christiansen (2009) state that a collective discontent and desire for change is the foundation for the formation of a

social movement. This collective discontent was found throughout all statements poised by the different authors in The Biophilia Hypothesis (1993).

The Biophilia Hypothesis was, as put in its introduction by Kellert, not meant as merely an idealisation of nature, but to view it as a scientific-based inquiry, which, due to the richness of the topic, requires no less than a multidisciplinary consideration (Söderlund, 2019). All authors that together formed the scientific foundation for The Biophilia Hypothesis, had a connection to nature in a variety of ways, and subsequently shared different views on the topic. For example, Ulrich (1993) viewed biophilia to be a solely positive affiliation towards nature, opposing Wilson's view in which biophilia refers to psychological states ranging from attraction to aversion (Joye, 2011). Ulrich (1993) further proposed that being biologically prepared may help in three different ways to provide adaptive responses to changing natural landscapes. He poses these biological advantages as the selection of adaptive approach behaviours, restoration or stress recovery, and enhanced high order cognitive functioning (Gullone, 2000).

Biophilia, biophilic design, and its subsequent movement consist of different virtues that are relevant to the understanding of the hypothesis on which it is based. Kellert (1993) defined the nine virtues of biophilia as utilitarian, naturalistic, ecologic-scientific, aesthetic, symbolic, humanistic, moralistic, dominionistic and negativistic, in which aesthetic is typically the virtue that confirms biophilia when defining the preference of natural design over human design (Kellert, 2008). These virtues will be the foundation for the case study on the Amsterdam GWL area in chapter 5.

The different virtues comply with the notion that "Even the tendency to avoid, reject, and, at times, destroy elements of the natural world can be viewed as an extension of an innate need to relate deeply and intimately with the vast spectrum of life about us.". Kellert had based the nine virtues on years of studies he had done in the past, ranging from 1983 until 1991, in which he attempted to seek the innate connection of both animals and humans to the natural world (Gullone, 2000). Through these studies, patterns emerged which showed him the subconscious and dependent attitude of humans against nature, where he derived the hypothesis of the nine virtues of biophilia from.

On the opposing end of the scope is biophobia, described as the fear of living things, which is largely accepted as an inherited behaviour (Simaika & Samways, 2010). They also state this has been the result of the evolutionary process where the survival advantage of humans with inherited fear of large carnivores and venomous spiders, scorpions and snakes was greater than those who didn't have this fear. This is an expansion on Ulrich's notion from 1993, where he appoints the majority of phobic occurrences to certain objects or situations that have threatened humans throughout evolution. The term of biophobia has been both appointed to humans destruction of its natural surroundings and the way humans have reacted to this absence of nature, not 'knowing' what nature is in a way (Simaika & Samways, 2010).

After the term Biophilia was popularized and became understood by both the academic world and the general public, several forces throughout society adopted the term and based part of their actions on it. Some of these forces where social movements, that were formed through earlier issues, but were remodelled based partly on The Biophilia Hypothesis and its reasoning, besides other environmental- and health concerns (van der Heijden, 2004). It was furthermore used by both architects and landscape architects, trying to elevate themselves above the regular depictions of greening a city, thereby seeking the more fundamental approach of the inclusion of nature where human and nature are seen as one (Söderlund, 2019). Söderlund (2019) also appoints these architectural approaches to include biophilia in projects, can be appointed to the social movements and the concerns they have raised – and still raise – on environmental issues and the negative effects this has on society.

02. **Uprise of the social movements**

The hypothesis that humans have an innate desire for nature, as raised by Kellert in 1993, partially arose from several decades of social- and environmental concerns growing around the globe, combined with the uprise of (social) movements resulting from this (Söderlund, 2019). Social movements can be seen as all movements targeting towards an, in the eyes of the movement, improvement of a certain phenomenon, event, custom or situation. This can be both environmental and social, partially due to the distinction between these becoming less prominent in the last decades of the 20th century (Mol, 2000).

The formation of social movements happens through the mobilisation of groups of people who affiliate with the same concerns and anger. Brand (1990) has found three phases of large scale societal mobilisation: the 1830s and 1840s, the final decade of the 19th century and the first of the 20th century, and finally the 1960s and 1970s. The first two social mobilisations were focussed primarily on the rights of firstly slaves, then women and lastly the damages done to wildlife following rapid industrialization. In the third mobilisation, environmental concerns grew and joined the 'new social movements' such as third-world- and human rights movements, the gay and lesbian movements and democratisation movements (van der Heijden, 2004).

All three waves of mobilisation have appeared in times of economic difficulty, which may seem to be a causal connection (van der Heijden, 2004). Brand (1990) nevertheless concludes in his research on the different waves of mobilisation that no direct link can be found between economic difficulties and the mobilisation of large groups of people, because economic waves are no longer than 50 years, whilst the interval of waves of mobilisations is 60 to 70 years. Hirschman (1982) on the other hand disconnects the waves of mobilisation from the economic concerns, but rather describes the cycles as periodical variety between times of private interest and public action, in which public action is society's response to widespread concerns.

Huitema (2005) similarly observes different phases in shifting environmental concerns from the 19th century up to the 21st century. He saw a shift from focus on living conditions for humans late 19th century, towards soil- and air quality and the use of chemicals directly after the Second World War. In the 1970s and 1980s this subsequently shifted to the depletion of natural resources and acidification of air and water, whereas the 1990s onwards saw the uprise of concern on the changing global climate. Environmental movements in the Netherlands only really originated after the massive student protest in 1969, where a convergence with the Amsterdam counterculture and rising public concern about pollution occurred (Jamison et al., 1990).

The origin of social movements in the Netherlands can be traced back to the combination of growing higher education and a common concern, whilst in the beginning not reflecting the majority popular sentiment but rather to the intellectual and cultural elites who wrote the scripts for popular culture (Rootes, 2008). Tellegen (1983) appoints the breakthrough of environmental movements to the mid-1970s, when 600 new such movements were erected in a couple of years. Most of these strived for a local and very specific cause, but together formed a broad movement. The rise of these movements are the result of a broader environmental conscious following the report written by the Club of Rome in 1972 (van der Heijden, 2004). Their report, called The limits to growth, was a response to the international monetary system being shaky, economic depression throughout western countries, new environmental movements that were gaining ground and society being stirred up by student protests (Colombo, 2000).

Social movements, which includes environmental movements, in general follow a defined development on three facets throughout the decades from 1970 onwards (Mol, 2000). Firstly, the

changing ideologies that prevail in the movement, secondly the positions compared to other actors and lastly the transformations in the strategic operations between state and market. As a core change through those three facets, the shift from a broad counterculture which included many causes to a single purpose movement completely devoted towards the environment can be seen. This is the result of a shift where ideological perspectives are decoupled from environmental problems, and can therefore be attended as such (Mol, 2000). As opposed to the disconnection between environmental movements and ideologies, the 1980s saw the creation and increase of environmental political parties, which attempted to reach their goals through politics as contrary to the activistic approach the movements have taken in the past. (van der Heijden, 2004).

Whereas ecological movements started out as rebellious and militant groups, their goals together with the approaches undertaken have shifted towards acting as government parties, following the constantly changing role of movements and the government towards environmental issues the Dutch government (Mol, 2000). His research also showed the changing nature of the environmental movements in what he calls “an era of ecological modernisation”. He depicts a changing relationship between environmental organisations, governmental authorities and institutes in which the environmental movements move away from seeing governments as close ally, but rather as an opposing force that can be persuaded by working together with market forces in changing general public opinion on environmental issues. This shift towards ecological modernisation, economic growth combined with environmental improvements, was embraced by a part of Dutch environmental movements throughout the 1980s and mostly in the 1990s (Huitema, 2005).

On the other hand, van der Heijden (2004) saw environmental organisations transforming themselves into political parties, for example in Belgium, where social movement Agalev merged into politics by becoming a ‘movement-party’. This way, the environmental movement thought to unite radical and reformistic tradition and that way move forwards on their goals. In the Netherlands, four left oriented political parties merged in 1990, to become Groen Links (later renamed to GroenLinks), the political mouthpiece of the environmental movement in the Netherlands. These parties were Politieke Partij Radikalen (PPR), de Pacifstische Socialistische Partij (PSP), de Communistische Partij Nederland (CPN) en de Evangelische Volkspartij (EVP), which all suffered major losses during the elections of 1984, after a failed merger the years prior (Yannicke & van Meurs, 2014; Lucardie & Voermans, 2010). Lucardie and Voermans (2010) appoint an important role for the new social movements, which worked closely with both the PSP and the PPR, and later also the CPN, to showcase environmental concerns and the actions these new social movements undertook whilst including their leaders in their political collaboration. As a paradox to this merger, Groen Links continuously drifted away from collaboration with environmental movements, focussing increasingly more on the political tasks.

A force that has played an essential role in the rise and understanding of environmental problems and the movements that attempt to tackle them has been the media, through either newspapers, journals, radio or television. Several studies found that “differing amounts of emphasis and coverage of issues by the mass media lead over time to the public regarding these issues to be of differing levels of importance (Weaver, 1974). Parlour and Schatzow (1978) performed, through the lens of their own time, an empirical research on the role of mass media on collecting, transforming and communicating environmental information from 1960-1972. The research found that academics valued mass media to be a unique force in society but at the same time as a propaganda instrument with the ability to be destructive to democracy. Their research also showed a sharp increase and decline in public interest in the topic of environmental problems, mainly being appointed to the lack of intellectual background on the topic resulting from heterogeneous information being spread by the mass media.

Dutch media only occasionally showed the subtle changes architecture was going through, regarding the inclusion of nature within society from the 1970's. The newspaper Het Vrije Volk (1976) for example wrote an article on a new American movement, where corporate structures were partially abandoning the crowded, dirty and expensive inner cities of America's cities. In return, new offices and university facilities were constructed in green, rural areas. Het Vrije Volk compares this to a different approach on the relationship with nature. The first is an office building built by Kevin Roche and John Dinkeloo, named the Richardson-Vicks Inc. Headquarters in Greensboro, North Carolina constructed in the period of 1970-1974 (Figure 1). The structure seeks the direct connection with its surroundings by placing cars of the office employees both in a basement as well as on the roof of the structure, therefore completely removing cars from the views of the office employees (figure 2). Secondly a library of the Ben Gurion university in Israel is analysed (1971). Being placed in the middle or a rural piece of desert, it completely blocks any connection between the outside and the inside, only allowing interaction between humans and nature outside of the structure (figure 3). Outside this sporadically found architectural coverage, very few notions of nature inclusive architecture are found in the 1970s and early 1980s, except some articles on other American influences on Dutch skyscraper architecture.

Figure 1: Richardson-Vicks Inc. Headquarters in Greensboro, North Carolina (Richardson-Vicks Inc. Headquarters, n.d.)

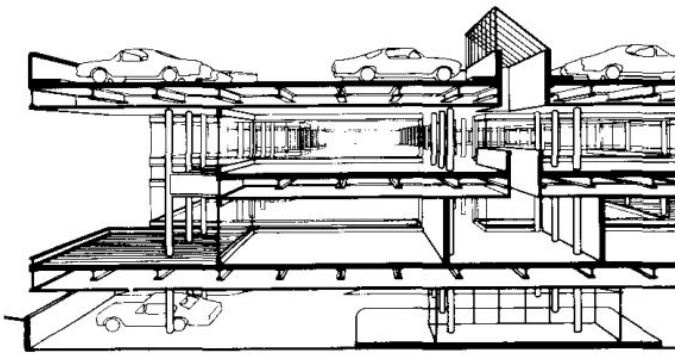

Figure 2: Cross-section Richardson-Vicks Inc. Headquarters (Richardson-Vicks Inc. Headquarters, n.d.)

Figure 3: Ben Gurion, Beersheva, Israel (Artstreetecture 2016–2022, n.d.)

03. General public and nature

As governments are the representatives of the public, the decisions made by these governments will undoubtedly create a certain response within the general public, this chapter will look at the way society has responded to changing laws, views and architectural designs in relationship to nature. The way Dutch society has looked at the governmental decisions that have been made to preserve nature, are measured for example through yearly enquiries, conducted by a governmental association tasked with following societal trends (van den Broek et al., 1997). The year 1995 saw, compared to the years before, the inclusion of more elaborate questions on the way the governments handles preservation of nature, which are compared to previous results, to look for changes in the attitude towards nature.

A research conducted by Volker (1997), published in the Nederlandse Bosbouw tijdschrift (Dutch forestry magazine), analysed an enquiry among Dutch civilians from which they drew conclusions on the way nature was observed and valued throughout the Netherlands. It first sets out what the Dutch society at the time described as 'nature'. From this research they found that only the sea, the sun and wind were solely described as 'real nature', while other examples such as (small) organisms, man-made nature and indoor animals or plants are gradually seen as being less natural. The research furthermore observes forests being placed throughout all categories and levels of being nature, they are seen as the optimal form of 'nature' by the Dutch civilians. Volker (1997) do conclude that natural elements should be implemented throughout agriculture, industry and urban areas, both because of the lack of space in the Netherlands to create dedicated natural areas as well as promoting interaction, and therefore the understanding and appreciation, between civilians and nature.

The enquiry also addressed who Dutch civilians expect to be responsible for creating and maintaining nature, in which they mainly see a large role for the government, through programs for protecting 'real' nature, forcing the industrial sector to improve, as well as creating more awareness and participation from the civilians themselves (Volker, 1997). They found four distinct groups that supported Dutch environmental policy, sympathizers with 'true' nature (46%), recreational-nature enjoyers (25%), agricultural nature supporters (14%) and indifference towards nature (14%). Van den Broek et al. (1997) nevertheless observed that the percentage of Dutch civilians who saw too little attention for environmental problems declined in the period between 1975 and 1995, being the result of either "milieumoeheid" (environmental concern fatigue) or an actual intensification of environmental policy by the government. However, most of Dutch civilians still thought not enough had been done to tackle environmental issues.

Throughout literature on Dutch participation and support for nature conservation and environmental policy, the absence of the youth (ranging in age from 0 to 30 years old) is a consistent factor. Volker (1997) appoints this absence to the youth being occupied by social group processes with the connected seek- and learning experiences, not leaving time to actively experience and care for nature. Realising he importance of teaching the youth to cooperate and learn from nature, started in the Netherlands around 1900, when two professors in biology, E. Heijmans and J. Thijsse, started educating and writing about nature as an ally of humans, instead of the previous view of humans being either ruler or even slave of nature (Coesél et al., 2007).

Van Koppen (2013), professor in environmental policy, observed education about nature for kids was always given attention to by nature protection groups, but was severely lacking in Dutch governmental nature policy. He connects The Biophilia Hypothesis from Kellert and Wilson, where the innate desire for nature is genetic, to language, which is a skill that has to be learned in early youth (4 to 14 years old). Van Koppen (2013) points out two important results from nature education among kids, learning

that nature isn't (always) dangerous and learning to connect nature with positive emotional energy, for example through nature in the urban environment.

5. Biophilia and architecture

All historical events which have shaped the way society looks towards nature and environmental issues have subsequently resulted in the formation of architectural movements and approaches (Krężlik, 2021). Krężlik (2021) also observes a widespread development of terms related to sustainability, and more specifically the nature – architecture – man relationship, which are used in the architectural world, where sustainability as a term only begins to be used in the late 1980's. This is only some years after the emergence of the concept of the biophilic human being, which was introduced and popularized by Wilson in 1984 (Söderlund, 2019). On the chronological scale, this suggests human's deep and subconscious connection was envisioned before the environmental consciousness arose following changing and decreasing nature due to rapid industrialization and growth.

Biophilic (architectural) design literature focusses greatly on the connection humans lost with nature throughout the modern times (Söderlund, 2019). Gullone (2000) for example states, after a review of various papers, that "there is substantial evidence to suggest that, as a species, our modern lifestyle may have strayed too far from that to which we have adapted". Krężlik (2021) has categorised four categories of architects and scholars who have a different approach on the way architecture could move towards strengthening the nature - architecture – man connection. The four different movements are organic architecture, vernacular architecture, tropical and bioclimatic architecture, and lastly, planet-oriented architecture.

The organic architecture movement was defined and structured by Frank Lloyd Wright in four lectures he gave at the Royal Institute of British Architects in 1939, which were published as the book 'An Organic Architecture'. In his lectures, he envisioned nature as the environment in which architecture was built, and therefore "should appear to grow easily from its site and be shaped to harmonize with the surroundings of Nature is manifest here", as Wright wrote whilst designing Prairie-style houses (Krężlik, 2021). Salingaros (2015) remarks in his research on the implementation of biophilic designs throughout history the belief many architects have they can superficially copy an organic form and thereby achieve an improved space for human beings, whilst only creating an abstract sculpture. Söderlund (2019) furthermore observes architects reducing the ideas of Frank Lloyd Wright to purely formalistic and aesthetic decisions, in which the idea of building in accordance with nature is sometimes misunderstood for building only with natural elements. The organic movement can nevertheless be described as architecture that seeks the visual connection to nature and attempts to blend in with its natural surroundings.

Vernacular architecture, architecture that embraces an array of traditions around the world (Blier, 2006), took a completely different approach, in which the (re)connection with nature shouldn't be looked for directly, but through learning from historical architecture in the direct surroundings. In a way, vernacular architecture focusses more on the connection with humans (of the past), through which they see an indirect connection with nature. Orr (1993) views this phenomenon as bioregionalism, which means deciding to relearn the arts of the place to form a "patient and increasingly skilful love-making that persuades the land to flourish."(p.433). The American historian, sociologist and philosopher Lewis Mumford was a profound practitioner and advocate for the vernacular architecture movement. In his book Technics and Civilization (Mumford, 1934) he envisioned a fundamental approach to the architecture – nature – human connection, in which education (on the region) was central. This way, both architecture and the final users would know how to live with the surrounding nature in harmony, forming a more bottom-up approach to architecture.

Tropical and bioclimatic architecture focusses on the architectural works, both urban and on the scale of a building, in tropical climates, from which many valuable insights on a projects thermal behaviour could be drawn. In the mid-1900s many large architectural projects are proposed and undertaken in either tropical or other humid environments. Many of those designers drew inspiration from the challenges the hot and humid climates opposed them during the design process, which they translated to ideas that are useful in less hot and humid climates, in which Europe and the United States are situated (Krężlik, 2021). Furthermore, the technological side of the inclusion of nature in architecture is a main attribute of the movement. Many architects and scholars of the movement approach architecture through detailed technological guides and computer modelling, to form architecture that uses most of nature's given attributes.

Lastly, the planet-oriented architecture movement, in which not the human experience, but mostly the planet and its ecological sphere are the main focus point within architectural decisions. From this planet-oriented view, the movement was responsible for the creation of the first off-grid, self-sustainable houses, that employed a multitude of tactics to minimize the use of materials and creation of waste. This followed from the movement's aim to integrate architecture and ecology in a holistic way (Krężlik, 2021). Within this view, the realisation that new urban projects should have a positive impact on the biosphere instead of destroying it, take up a large part of planet-oriented mindset, in which Jane Jacobs, American theorist and activist who influenced urban studies, has played a large part in shaping an nature-inclusive urban image for society which could be related to.

The four movements form the foundation on which the term biophilia and its subsequent biophilic design could emerge. They share the characteristic that they emerged from care for nature, after which employing different tools, using distinct frameworks and their own vocabulary. Krężlik (2021) chronologically divides the four movements by placing organic-, vernacular- and planet-oriented architecture in the initial phase, after which in more recent years the technological approach of the tropical and bioclimatic architecture has taken over. Whilst this shift to a more technologically driven approach to nature inclusive architecture, it strides away from the essence of biophilic design. Krężlik (2021) summarises it as "the vernacular approach does not fit the globalized world of the architecture of glass and steel, though it has the most potential since the solution it employs has been reviewed for many generations and in its core has regeneration and positive impact on the environment that is a part of it."

Orr (1993) explains this division by the choices technology offers, we can either choose biophilia to form a relationship with nature, or choose biophobia and use technology to suppress and destroy it. This has been a gradual and for a large part unintended process, where technological improvements gave humans ever more opportunities to disconnect from, and control, nature (Söderlund, 2019). Söderlund (2019) further states in his book that biophilic designers see this missing evolutionary (natural) element in the modern-day cities and strive to re-establish this connection to nature in everyday life. For humans to maintain an experience of well-being, Appleton (1975), a landscape architect, posited that they must seek to recreate something of the primitive connection with nature. By combining these understandings with the improving science and technology and science on the topic, design principles for the implementation of Biophilia in architecture could be derived.

The Biophilic design principles as stated in the research by Söderlund (2019), were originally derived from the observations made by Kellert throughout his researches and further refined by Ryan et al. in 2014 by comparing the hypotheses poised by Kellert tot qualitative and quantitative research. The final result are 14 'patterns' of biophilic design principles, divided in three categories: Nature in the space, Natural analogues and Nature of the space, as explained in figure 4 (Ryan et al., 2014). These give hands-on principles, in which the nine virtues set out by Kellert (1993) can be translated to physical

attributes to the built environment. It also makes the term biophilic design easier to grasp, disserting the issue set out by Wilson in 1993 where he states that “part of our difficulty in confronting the future is that we think of utopia on too grand a scale.”. He further states that humans tend to think of a revolution as a grand political, economic, or technical change, whilst what ails us is closer to home and where we should start, which the patterns set out by Ryan et al. (2014) aim at.

		
Nature in the space incorporation of plants, water and animals into the built environment, especially with movement	***Natural analogues*** one degree of separation away from true nature; patterns and materials that evoke nature	***Nature of the space*** the way humans respond psychologically and physiologically to different spatial configurations
1. Visual connection with nature—plants inside and out, green roofs and living walls, water, nature artwork	**8. Biomorphic forms and patterns**—organic building forms, structural systems (savannah effect)	**11. Prospect**—views, balconies, 6 m and above focal lengths, open floor plans
2. Non-visual connection with nature—sun patches, textured materials, bird sounds, weather, nature scents	**9. Material connection with nature**—wood, earth and stone construction, natural colours	**12. Refuge**—protected spaces, overhead canopies or lowered ceilings, places providing concealment
3. Non-rhythmic sensory stimuli—clouds, shadows, nature sounds, water reflections	**10. Complexity and order**—fractal patterns, sky lines, plant selection and variety, material textures and colours	**13. Mystery**—winding paths, obscured features, flowing forms
4. Access to thermal and airflow variability—shade, radiant heat, seasonal vegetation		**14. Risk/peril**—floor to ceiling windows, water walks, high walkways
5. Presence of water—rivers, fountains, water walls, ponds, daylighted streams		
6. Dynamic and diffuse light—light from different angles, ambient diffuse lighting, circadian lighting		
7. Connection with natural systems—seasonal patterning, wildlife habitats, diurnal patterns		

Figure 4: 14 patterns of biophilic design (Ryan et al. 2014)

06. Case study project

Reviewing Dutch architecture projects from the period of 1980 to 2000, the conclusion can be drawn that biophilic design only really started coming into practice after the year 2000. Both in journals as in actual architectural projects, the term biophilia, or related terms such as nature-inclusive, can be rarely found. There have been some notions of the term in newspapers, as mentioned before, in which Dutch architects reflect on the projects of mostly North-American architects. The actual practice of building with nature seems to have only spread to the Netherlands after the turn of the millennium.

Nevertheless, projects which followed the idea of greening the cities did occur. Having a look at one of the first major, and publicly known projects that were built in the 1990’s, and followed certain values of the biophilic design principal, the decision has been made to look at the GWL Area in Amsterdam (figure 5). The project, of which the first houses were delivered in 1993 and ultimately was completed in 1998, consisted of a previously industrial water treatment area for the city of Amsterdam, following the greening efforts of cities by transformation of disused areas as will be further explained in chapter 7. The area has since its transformation been branded as the first sustainable neighbourhood of the Netherlands, and follows several guidelines to adhere to the claim of sustainability. Yearly polls among the residents of the city of Amsterdam show the GWL area to be experienced as most liveable and desirable.

Figure 5: GWL area in Amsterdam, the Netherlands (KCAP Architects&Planners, 2019)

Figure 6: Combination of green spaces and natural elements in architecture (KCAP Architects&Planners, 2019)

Ownership of the buildings is split halfway between social housing and private-house-ownership. The surrounding gardens and streets are divided between municipal upkeep (61%), communal upkeep (21%) and private gardens (18%). This division can be attributed to the streets being the responsibility of the municipality, whilst all greenery is done by the inhabitants of the neighbourhood itself. Van Stiphout et al. (2020) found in their review on the environmental, social and economic performance of the neighbourhood during its existence that the variety in greenery, due to its abundance also creating greater biodiversity, could be mainly appointed to the upkeep being done by the association of inhabitants. Therefore, the inhabitants feel personally responsible for the way their surroundings feel and look, also resulting in pride among the inhabitants, further increasing the willingness of greening the neighbourhood.

The architecture itself is focussed to forming a visual unity with the greenery in the urban plan, hence the decision was made to use red bricks in combination with wooden elements, to both form a contrast in colours as well as connecting it through the natural materials. Biodiversity enhancing implementations, not directly linked to adding greenery, are for example nesting boxes for swifts embedded in the exterior brick walls of some of the buildings (figure 7, bottom right). One other strong positive elements can be attributed to the large variety in spaces (figure 7), complying with the naturalistic virtue as set out by Kellert (1993).

Figure 7: Green elements throughout the area (van Stiphout et al. 2020)

To make a comprehensive analysis of the neighbourhood and its claim to be a sustainable and nature-inclusive area, it will be observed in which way it follows both the nine virtues of biophilia as set out by Kellert in 1993, as well as the design principles that Ryan et al. (2014) derived from this (figure 4). The nine virtues as set out by Kellert (1993) were utilitarian, naturalistic, ecologic-scientific, aesthetic, symbolic, humanistic, moralistic, dominionistic and negativistic. Simaika & Samways (2010) interpreted these virtues and described their definition and function (figure 8).

Sustainability principles applied in GWL area in Amsterdam:

- Greenery on roofs, balconies and in the public space;
- Natural daylight in the buildings, good orientation towards the sun;
- The use of natural materials in, on and around the buildings;
- Both horizontal and vertical greenery;
- Communal support for measures that improve biodiversity, from insects to larger organisms;
- Car free-neighbourhood, parking spot to inhabitant ratio of 0.1, which are situated on the edges of the neighbourhood;
- Great variety in greenery and natural elements, from trees to bodies of water and kitchen gardens;
- Measures supporting biodiversity, such as nesting boxes for birds, places where animals can get in and out of water, flowers to enhance insect populations;
- Multi-layered walkways, both on ground floor as well as suspended several meters up.

When comparing these principles, that have all taken shape in varying ways throughout the GWL area, to the design principles as derived by Ryan et al. (2014), it shows that all biophilic elements are present, some more than the other. As this analysis only focusses on the urban environment and the direct connection between buildings and the environment surrounding it, no comparison will be made for the living conditions inside the various buildings. However, with the abundance of outdoor spaces, both in the shape of gardens and balconies, with plentiful greenery observed on both, one can imagine the living conditions and biophilic principles being drawn to the inside the buildings itself.

The comparison between the nine virtues as proposed by Kellert (1993) in figure 7 is not as clear as the one with the design principles Ryan et al. (2014) had derived from them, due to the virtues being focussed on ideas and emotions, rather than physical implementations, whilst also describing both positive and negative elements of biophilia. The GWL area however, does show several virtues with the hypothesis of Kellert. It can be said that naturalistic, ecologistic-scientific, aesthetic and humanistic virtues can be observed throughout the area, as a strong connection between green spaces and everyday live are intertwined in the masterplan originally shaped by architects KCAP.

Term	*Definition*	*Function*
Utilitarian	practical and material exploitation of nature	physical sustenance and security
Naturalistic	satisfaction from direct experience or contact with nature	curiosity, outdoor skills, mental/physical development
Ecologistic–scientific	systematic study of structure, function, and relationship in nature	knowledge, understanding, observational skills
Aesthetic	physical appeal and beauty of nature	inspiration, harmony, peace, security
Symbolic	use of nature for metaphorical expression, language, expressive thought	communication, mental development
Humanistic	strong affection, emotional attachment, "love" for nature	group bonding, sharing, cooperation, companionship
Moralistic	strong affinity, spiritual reverence, ethical concern for nature	order and meaning in life, kinship and affiliational ties
Dominionistic	mastery, physical control, dominance of nature	mechanical skills, physical prowess, ability to subdue
Negativistic	fear, aversion, alienation from nature	security, protection, safety

Figure 8: The nine virtues of Biophilia explained (Simaika & Samways 2010)

Concluding the comparison of the transformation and further improvements in the GWL area in Amsterdam, it clearly shows that the neighbourhood was designed and shaped by both the architects and the inhabitants with a clear biophilic vision in mind, contributing to the appreciation and liveability its inhabitants appoint to the neighbourhood. Nature thrives in the area, which is reflected by the high approval rates inhabitants give the neighbourhood.

07. Modern Biophilia

Implementing biophilic design has gained in popularity ever since the popularisation of the term by Wilson in 1984. Nowadays, whilst the world is rapidly urbanising, the emphasis of biophilic design is put increasingly more on implementations in the urban environment, ranging from single buildings to entire cities (McDonald & Beatley, 2021). Their book, Biophilic Cities for an Urban Century, broadly summarizes the emergence of large amounts of evidence from the fields of environmental psychology, public health, medicine and economics, showing the many benefits of contact with nature. Following this, they observe a remarkable rise of the understanding of many different organizations, people and cities on the essential role of nature in cities and are working to advance this goal. Furthermore, people are increasingly searching for, and demanding, spaces that have benefits on their health, such as lowering stress (Salingaros, 2015).

McDonald and Beatley (2021) observe many cities which have set out to improve the wellbeing of the inhabitants and nature, doing this by repurposing land which was formerly vacant, paved, or has been demolished, into either new green spaces or constructing projects which include nature throughout, introducing a healing environment. Söderlund (2019) found through empirical reviews on biophilic implementations throughout cities that they were foremost implemented to give environmental benefits, but subsequently also offered many social benefits where inhabitants of the cities were found to socialize more when green spaces were introduced.

Whilst Biophilic design can be applied to any structure or project, its benefits are applied – and studied – foremost in buildings related to healthcare. Some of the first applications of biophilic design are found in health and medical facilities (McDonald & Beatley, 2021). Many studies seek the relationship between biophilia in design and the health benefits they project on its users, as we humans constantly suffer from the absence of natural elements in our surroundings (Salingaros, 2015). One of such studies is conducted in 1984 by Roger Ulrich, professor at Healthcare Building Research at Chalmers University, Sweden, where he found that patients recovering from an operation or treatment spent less time and showed fewer negative signs whilst recovering when they had a view out over a natural scene opposed to a view facing a brick building.

Salingaros (2015) describes that a “positive, healing response to our environment occurs whenever we perceive in our surroundings certain characteristics akin to the organized complexity of nature common to traditional ornament.”, thereby stressing the added value ornaments can have within architecture, and simultaneously criticizing (minimalistic) modern architecture. Mazuch (2017) explains the approach taken in a cancer-treatment centre in London, where a patient can, due to their strong medication, experience hypersensitive or muted sensory functions. By implementing ‘Sense-sensitive design’, in which touch sensitive ornaments and details, combined with natural colours, light shapes and other natural elements, create a positive healing environment (figure 8).

Figure 9: Cancer-treatment facility in London (Mazuch, 2017)

In the Netherlands, biophilic design in the 21st century is mainly implemented on the city- and neighbourhood scale, where large scale projects, set out by governmental parties, aim to provide nature-inclusive living conditions. An enquiry conducted by the Wageningen Economic Research in 2018 by Dijkshoorn-Dekker et al., Dutch companies in the real estate sector said to already have substantial knowledge and experience in building with nature in mind (61%), whilst all other companies who attributed to the research said to envision themselves also building this way in the future, 69% of which within the coming 5 years. Even though, the property sector doesn't feel the responsibility for creating nature within urban areas, they need stimuli from government organisations, the sector itself and financial incentive which can be created by quantifying the added value of green areas throughout projects (van Haaster-de Winter et al., 2020).

08. Conclusion

In this thesis, the history and scope of Biophilia, the uprise of social movements and role of mass media are linked to architecture, focussed on the Netherlands. The research question to be answered is: How has public opinion in the Netherlands shaped the influence of Biophilia on architecture in the period between the 1960s and 1990s? This has been attempted through qualitative research through academic papers, journals, analysis of a case study project and other relevant sources, which gave their (academic) view on the value of the biophilia hypothesis, the uprise of the social movements and how nature is valued throughout the Netherlands.

Results of the research on the Biophilia hypothesis found a strong foundation from which architectural design principles could be conducted. Biophilia is described as the innate desire from humans to connect with nature and is, throughout many academic papers, supported by substantial evidence on promoting health among humans.

Originating from social movements, environmental movements took shape in the Netherlands starting at the student protest of 1969, after which a transformation of social movements (which also includes environmental movements) from militant protest groups into either institutionalised movements or

political parties could be observed. The media of the 1960s to the 1990s is largely seen as a key force in shaping the opinion of the public, and thereby also steering the public debate and concern on environmental issues. Research on the view of the Dutch civilians on nature in general and the role of the government in policy making concluded that Dutch civilians think of the creation and maintenance of nature as primarily being a role of the government, which should implement rules and policies to promote both biodiversity and environmental benefits.

In connecting biophilia with architecture, four distinct architectural movements of the 20th century were observed, organic, vernacular, tropical and bioclimatic, and lastly planet-oriented. The movements all included different elements of the nine different virtues of Biophilia, as proposed by Kellert (1993). These virtues were later translated to physical attributes to the built environment by Ryan et al. (2014), making the term biophilic design easier to grasp and implement. The case study of the GWL area in Amsterdam shows an example of the virtues of biophilia in urban Dutch architecture, which promotes itself by the inclusion of nature and improved health benefits. Modern biophilia in general has expressed itself foremost in the urban environment and health facilities, based on strong links between the exposure to natural elements and improved health and revalidation.

This research has shown that Dutch architectural implementation of the different virtues of the biophilia hypothesis have emerged later, and in less expressive ways, compared to the rest of the western world. This can partially be attributed to the role the government is expected to take in forcing green policies, also following from the partial integration of social movements and politics. Therefore, it can be concluded that the slow rise of the biophilic approach throughout Dutch architecture can be appointed to the wait and see attitude of Dutch society.

06. Discussion

After broad initial research on the topic of biophilia, the decision had been made to focus on the history and implementations of biophilia in the Netherlands, to add knowledge to the already existing literature on biophilia, which was widely available on the emergence of Biophilia. Through the limitations of only focussing on the Netherlands, fewer sources on the implementation of biophilic design in projects throughout the Netherlands is found, limiting the ability to link the research on biophilia and social movements to Dutch architecture.

Whilst the research focussed primarily on the architectural implementation, critical voices and concerns on the biophilia hypothesis itself have been largely neglected. A critical look at the validation of the hypothesis could provide a valuable insight in the value it has been appointed. Nevertheless, academics are broadly unified in contributing the health benefits that follow from implementation of the biophilia hypothesis.

Whereas the research on biophilia and the social movements is backed up by large amounts of qualitative sources, research on the role of the media and Dutch civilian's view on nature and the following responsibilities was found to give fewer sources. In additional research, focus could be put on more quantitative research, to get an improved understanding of the impact of these factors in the Netherlands.

Nevertheless, this thesis has provided an overview of the forces that have brought the biophilia hypothesis into architecture, both worldwide as in the Netherlands. Linking it to the different movements, governments and other actors throughout society, new knowledge and insights into the relation between social, economic and cultural developments and the uprise of biophilia have been created and a foundation for future research and debate on the topic and its implementations throughout architecture is given.

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