



Suez Canal Engineering Energy and Environmental Science Journal

Faculty of Engineering – Suez Canal
University

2025, Vol. 3, NO. 1, Pages 88-99



Introducing Biophilic Design into Orphanages' Built Environment

Fatma H. El-Sayed^{1*}, Usama A. Nassar¹, Ahmed M. Helal¹, Sara M. Atwa¹

¹ Architecture and Urban Planning Department, Faculty of Engineering, Suez Canal University, Ismailia, Egypt

*Corresponding Author: Fatma H. El-Sayed, Email address: fatma.hassan.elsayed@eng.suez.edu.eg

DOI: 10.21608/sceee.2025.344729.1056

Article Info:

Article History:

Received: 15\12\2024

Accepted: 26\01\2025

Published: 30\01\2025

DOI: 10.21608/sceee.2025.344729.1056

Abstract

Vulnerable orphans are significantly affected by their surrounding environment. Inconsistently designed spaces can have detrimental short- and long-term effects on their well-being. Enhancing their built environment is essential for meeting the physiological, psychological, and cognitive functioning needs crucial for their developmental stages. This research aims to discuss an architectural tool that can create a healthy environment within orphanages—spaces where children spend a significant amount of time—intended to evoke positive sensations and behaviors. The study explores the interconnections among three pillars: biophilic design as a tool in architectural spaces, the well-being of orphaned children, and their mind-body systems, as well as their institutions. The research presents successful global examples that illustrate how to create better environments for children, highlighting significant strategies related to demographic, geographic, and economic factors. The findings conclude that well-designed environments positively influence children and that biophilic design strategies are effective tools for enhancing the environments of orphanages.

Keywords: Biophilic design, orphanage, vulnerable children, healthy environment.

Suez Canal Engineering, Energy and Environmental Science Journal (2025), Vol. 3, No.1.

Copyright © 2025 Fatma H. El-Sayed, Usama A. Nassar, Ahmed M. Helal, Sara M. Atwa. All rights reserved.

1. Introduction

The orphanage environment is one of the sensitive contexts that need to be designed with consideration, as it is the place where children and young adults spend most of their time, growing up and developing with physiological and psychological stages and lots of needs that should be fulfilled to flourish their childhood. However, most of the orphanages' settings worldwide are not suitable for children and lead to severe negative impacts that affect their psychological, physiological and cognitive functioning due to the children's vulnerability, as they get affected by the surroundings even more than anyone else. Many studies have proved that delay, depression, fear, detachment and isolation besides other behavior problems are common between orphans (Saraswat2017) (Shulga2016) (Elattar2019). Hence emphasizing the architectural contribution and role in enhancing the environment for these children, in a way that triggers positive sensations and assists them to evolve on the physiological, psychological, and cognitive functioning levels. Through introducing biophilic design strategies into the built environment of orphanages by providing guidelines for the integration process aiming to a healthy environment. This process requires understanding biophilic design connections to human beings, especially children, and architectural space, particularly orphanages.

How to Cite this Article:

El-Sayed, F.H. et al. (2025) 'Introducing Biophilic Design into Orphanages' Built Environment', *Suez Canal Engineering, Energy and Environmental Science Journal*, 3(1), pp. 88-99.

Accordingly, the following figure 1 aims to answer the research question of (why would biophilic design be the tool for enhancing the orphanages' environment?), three parts are arranged, to discuss each pillar and their connectivity illustrated by the following chart as shown in figure 1, followed by a discussion of four worldwide examples that successfully applied a healthy environment for the children in orphanages.

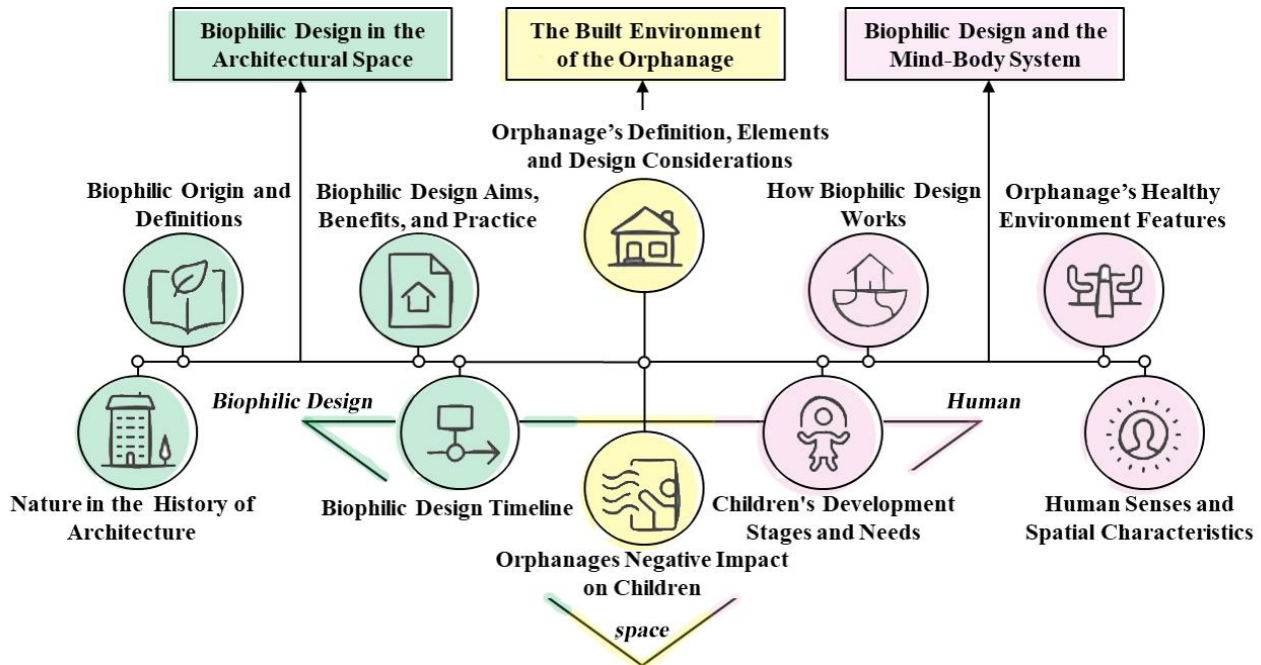


Figure 1: The connection between biophilic design, human, and orphanage, Source: Adopted by the researcher

2. Biophilic Design in the Architectural Space

Lately, the disconnection, that exists in the modern architectural spaces, between the indoor and outdoor, has been noticed by architects, especially after the proven impacts on humans' well-being, as spending most of the time indoors without any contact with the natural world, leads to severe damages on the humans' psychological and physiological health. Therefore, adopting a method that can connect the built environment is a must, one of these tools is biophilic design. That's why, understanding the concept, the origin, definition, aims and benefits, and practice in the architecture field is required to assist in spreading the awareness regarding a healthy environment that is not just considered as a place to inhabit, but a pleasant experience of remarkable memories to evolve positive attachments.

2.1. Nature in the History of Architecture

Since the beginning of creation, people have appreciated the value of nature and the importance of respecting it, as the way people perceive nature reflects how they think as well as their beliefs and values in life (Zarman,2016). Nature used to be incorporated into the environment built of many outstanding ancient civilizations. The göbelki tepe ruins of the prehistoric architecture, the columns' ornamentations in the hypostyle hall of ancient Egyptian temples, Ajanta caves in India (Browning,2014), the Greek columns with nature-based proportions as well as the romans' villas and their gardens ("Biophilic Design in the Ancient World",2021). The Sagrada Familia (Evyapan,2022) and Alhambra palace in Spain (Abdelaal,2018), the residential units, in the modern movement, of falling water villa, the Farnsworth House, le Corbusier's unite d 'habitation (Zhong,2022), are all great examples of incorporating nature directly and indirectly into the built environment.

2.2. Origin of Biophilic Design and Definitions

After sensing the negative effects on earth of loss of biodiversity, ozone depletion, and climatic change, because of humans distancing themselves away from nature, especially after the industrial revolution, environmental awareness began to spread more and more in the 21st century (Zhong,2022). The biophilic concept was one of the theories introduced to the world to engage humans with nature again and overcome the tangible separation in the built environment, between the indoor and the outdoor deduced from the word biophilia. The term was coined by the social psychologist Erich Fromm in 1964, thus in 2001, the concept was adopted on an academic level in 2004, while the term was defined by many pioneers. 2008 Kellert, Heerwagen, and Mador's book was released in which biophilic design was defined as "an approach to designing the built environment in a way that emphasizes the necessity of maintaining, enhancing and restoring the beneficial experience of nature" (Kellert,2008). The definition has been developed by many authors as in

How to Cite this Article:

2020 the definition was introduced by Thomas Hearthrick as “the science of our emotional responses to the world” (Tekin,2023), while another one states that “an architectural and interior design concept that aims to bring humans closer to nature by integrating natural components into the built environment” (Mohammed,2023).

2.3. Biophilic Design Aims, Benefits, and Practice in the Architecture Field

Biophilic design assists in not seeing the nature as an obstacle to overcome in the design, but an advantage that promotes the design and adds a great value to it. Biophilic design also aims to establish a positive connection between humans and the built environment where they live and interact, respect the human mind-body system by creating a healthy environment where people can evolve away from illnesses that inhabit and burn out both the psychological and physiological well-being (Kellert,2015). Incorporating biophilic design into the built environment works on increasing satisfaction levels, releasing stress and anxiety, better coping, enhancing attention and social skills, and improving physical fitness and problem-solving skills (Browning,2014). The list never ends when it comes to mentioning the benefits of applying biophilic design, in both the short and long run, this is due to the proven inherent attachment between humans and nature that makes nature incorporation a must not luxury. Therefore when biophilic design is introduced into the architecture field, not only benefits for human health and well-being are guaranteed, but also an investment that ensures economic benefits, as urban design, architecture, industrial design, and interior design, are all aspects that require the concept through direct and indirect strategies with at least 25% nature access to the outdoor for 75% of the occupied spaces as declared by the international WELL building institute in 2018 (AbdulTharim,2022).

2.4. Biophilic Design Timeline

Many practitioners have developed different interpretations of biophilic design, each has different pillars, categorizations, and taxonomies, aiming to establish a framework that can define the characteristics of nature-based spaces, the following timeline, as shown in figure 2, sums up the previous efforts of founding and developing most distinguished ones:

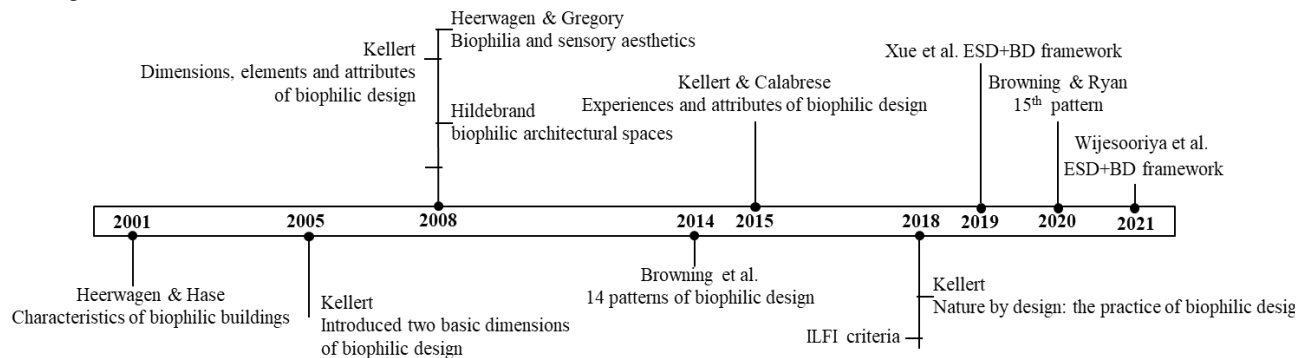


Figure 2: Various contributions in developing biophilic design Source: (Zhong,2022) then modified by the researcher

The most distinctive and used frameworks as a conceptual base are Kellert’s 2008 dimensions, elements, and attributes, Browning et al. 2014 patterns and Kellert’s evolution of 2008’s proposal, in cooperation with Calabrese 2015 experiences and attributes, each one has different pros and cons, as discussed in (Patel,2022) and (Zhong,2022), for example:

- Kellert 2008: the categorization includes inclusive specifications of nature experiences, but repetition and overlaps as well as lack of clarification for some attributes do exist.
- Browning et al.2014: includes proven positive impacts for each pattern on human health but also includes strategies that are inapplicable.
- Kellert and Calabrese 2015: focuses on applying the strategies in the space, but the experience of space and place is hard to be understood when it comes to its relation to nature.

However, the common noticeable characteristic among them all, is that there are no clear guidelines to follow to establish the design process, of incorporating biophilic design into the built environment, easier to be followed step by step and successfully achieved.

3. The Built Environment of the Orphanages

There are various types of buildings that provide care for children in need, some provide services for ordinary kids, for example, kindergartens, hospitals, and schools, some other types provide services for special needs children: rehabilitation centres, physical, motor skills, and exceptional children schools (Khanbabaei,2016). The second type is the targeting sector of kids, the children living in orphanages, as these children are vulnerable ones, who lost one or both of their parents and are forced to live in a new place with different people. While the idea of living in a new environment can be hard to accept, especially if that environment is not suitable for their needs and perception.

How to Cite this Article:

Establishing new rules that preserve the orphans' rights to have a better life through guiding and monitoring the caretakers, in charge of orphanages, dedicating more money for supplying the orphans with their needs, giving them the right to live until marriage age for girls, providing health insurance (Ali,2021). All are recognizable efforts and there is no doubt that these gestures make differences, but not caring about the place where these young people live and interact most of the time is a huge mistake and have severe negative impacts on the children's physical and psychological health. So, rethinking the orphanage design and introducing a method that can change orphans' lives is proof of how powerful architecture can be.

3.1. Orphanage's Definition, Elements, and Design Considerations

Caring for vulnerable people such as orphans, widows, and old people has been always a humanitarian deed, but since the first century AD (Idris,2024), when the first orphanage was established by a Catholic church (Khanbabaei,2016), many definitions can describe the orphanage, whether it's a governmental or non-governmental institution, as they have the same purpose. The Egyptian ministry of social solidarity defines orphanages as a "shelter based on social welfare, cares for children destitute from family care, both genders, between 6:18 years, until reaching the age of stability in work or marriage for female ("model regulations",2024).

The orphanage is a facility where diverse activities take place, it's not only a space for sleeping, but also an educational space, for school subjects, self-expression classes as in arts and crafts and vocational training, also a recreational space, for doing sports, playing, celebrating events, gathering, a healthcare space, for medical treatment. These spaces allow the kids to practice their activities and fulfil their needs, besides the supervision spaces which is considered a focal point that monitors all other spaces, as well as the keep up spaces which provides different types of services as kitchen, laundry...etc. (Brink,1997). Besides the elements that consist of any orphanage worldwide, that must exist in orphanage's design, there are design considerations regarding site planning and building orientation (Sofian,2013). However, there are regulations that can be provided by the country's government to supply the designer with specific standards and guidelines. These regulations could be regarding the building's site selection, infrastructure, and building elements and compositions, all for establishing a better place for children to grow healthily and fruitfully.

3.2. Orphanages Negative Impact on Children

As mentioned before, orphaned children are vulnerable and sensitive, due to the tragedian events they had to go through in early age and the idea of living in a new environment with different age groups of people could be a lot to take in for them (Mohamed,2022). If the environment is not suitable for helping them to overcome this event, severe damages could happen, not only on the physical level such as: physical growth delay, but also on the psychological level, social relations, self-consciousness issues and cognitive functioning such as: emotional problems of guilt, fear, depression, anxiety and mistrust, social phobia, panic, lack of affection and isolation, low self-esteem, lack of sense of belonging and distorted identity, low IQ, attention difficulty, and mental development slow rate, consecutively (Shulga,2016) (Elattar,2019) (Mohamed,2022) (Priyadarshini,2020). These problems lead to even worse habits such as self-discrimination, suppressing feelings, aggression or detachment (Sarawat,2017).

In a comparison done among 136 institutionalized and non-institutionalized children, the famous Bucharest early intervention project in Romanian institutions, great differences were noticed as the first group of institutionalized children show lower levels of alpha and beta power, delay of brain development and right-hemispheric specialization for faces shown in figure 3 (Zeanah,2009).

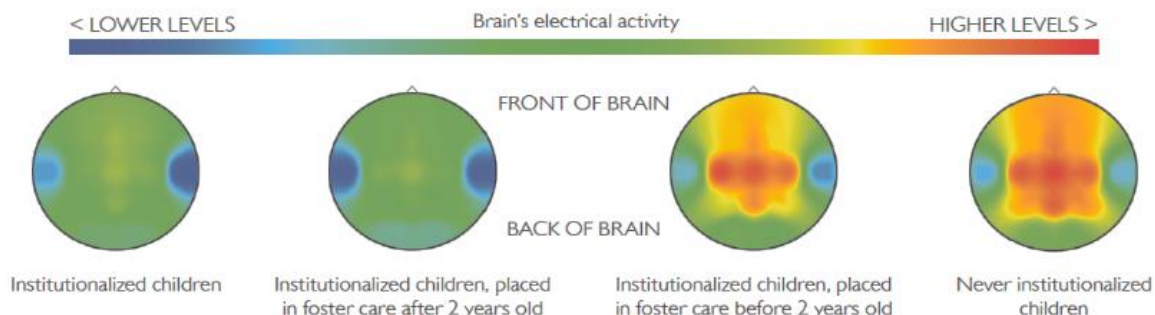


Figure 3: The outcome of the early Bucharest intervention results between institutionalized and non-institutionalized children
 Source: "The Negative Impact",2023

4. Biophilic Design and the Mind-Body System

The experiences which humans live are, as a matter of fact, the engine that led to the development of the brain. This is how the human brain develops and evolves, and this is the reason for such problems occur to children when their environment, which contains all their early age experiences, is not fulfilling or pleasant (Zeanah,2009). It is known that,

How to Cite this Article:

user's activities in space shape the space's elements and characteristics (Patel,2021), these features represent the needs of the user, physically and psychologically. By understanding the children's developmental stages, which contain different needs on each stage, and perception, the architectural interpretation into space can be successful and effective, if the child interacts with the environment, information is collected. This information creates the memories of pleasant or un-pleasant experiences. Hence designing an environment that is suitable for the way children see and understand the world is essential, this process is called "spatial perception". To achieve this target, analysing the children's development stages and their needs is the first step towards that objective (Anbari,2015).

4.1. Children's Development Stages and Needs

Many theories discuss children's development stages, some of these theories are classified as psychodynamic such as: Sigmund Freud's 1906 concept of "psychosexual", Erik Erikson's 1963 theory of psychosocial/personality development, and Jean Piaget's 1952 theory of cognitive development. Other theories are classified as behavioural learning such as Ivan Pavlov's 1927 theory of classical conditioning, Skinner's 1938 theory of operant conditioning, Albert Bandura's 1963 theory of social learning and Abraham Maslow's 1954 theory of hierarchy needs (Kesavelu,2021). Each theory categorizes human development into stages, each stage is unique and requires a group of requirements that must be fulfilled to reach the stage's target and move to the next one successfully. By targeting the childhood phase, of human development stages, it's divided into five levels starting with the survival needs of physical needs, sense of safety and security, need for love and belonging, self-esteem, and finally self-actualization. This classification, according to Maslow, considers the needs as a pyramid, to achieve one need, the previous must be fulfilled (Pilapil,2015), while childhood is three stages, according to Sigmund Freud and Erik Erikson, these stages are early childhood, middle childhood and teenage (Kesavelu,2021). While sensorimotor, preoperational, concrete operational and formal operational categorization can assist in exploring the cognitive functioning development of a child, according to Jean Piaget (Thompson,2017).

4.2. How Biophilic Design Works

To achieve the children's needs in the architectural space through biophilic design, understanding how biophilic design works is pivotal. Biophilic design depends on human interaction with natural elements, directly and indirectly, these interactions occur through evoking the sensory system, which receives all the information from the surroundings during experiencing an environment, to be decoded and analysed through the perceptual system into feelings and attitudes and therefore memories (Gawlak,2020). Hence, biophilic design is a sense-sensitive design that relies on triggering the senses through the extraordinary sensory diversity provided by nature. These senses are categorized into conscious senses of vision, auditory, tactile, gustatory and olfactory and unconscious senses of vestibular, kinaesthesia and proprioception (Turgay,2022). The more sensory play occurs through the body, the more experiences that shape the child's personality.

As a matter of fact, understanding this, answers the question of why would biophilic design be the tool of enhancing the orphanages' environment. As there is a noticeable link between children's needs, biophilic design, and spatial characteristics. Children's physiological and psychological needs revolve around evoking certain positive emotions by providing a safe, soothing, engaging, inspiring, and diverse environment. Each feature includes a group of design considerations that need to be applied in the architectural space by redefining the spatial characteristics related to human senses that are evoked and triggered through biophilic design strategies which are inspired by what humans are naturally attached to, the nature.

4.3. Orphanage's Healthy Environment Features

A healthy environment can be recognized through a group of design strategies, as shown in figure 4, that can be categorized into, a safe environment, through creating a home, that physiologically and psychologically, protects the children from any harm (Jiraschek,2007), a diverse environment, through bringing positive contrast into the space, spacious and intimate, cold and warm...etc. (Roy,2015), soothing environment, through creating a welcoming, relaxing, and comfortable environment, an inspiring environment, through a design that motivates children's imagination to inspire (Krombach, 2023) and finally, an engaging environment, that encourages children to contact with their surroundings to develop the social qualities (Jowell, 2023).



Figure 4: The features of a healthy environment required for orphanages Source: Adopted by the researcher

How to Cite this Article:

El-Sayed, F.H. et al. (2025) 'Introducing Biophilic Design into Orphanages' Built Environment', *Suez Canal Engineering, Energy and Environmental Science Journal*, 3(1), pp. 88-99.

Each feature can be manifested through biophilic design in the built environment, which leads to triggering specific emotions, thoughts, and behaviour and affects the general mood and functioning. These design strategies are also connected to the senses and allow the child to embrace all possible sensory play, creates a rich, healthy and empowering environment. This environment supports children on all levels and allow them to live the multi-sensory experience needed to build a constructive interaction between them and the environment (Khanbabaei,2016).

4.4. Human Senses and the Spatial Characteristics

Each sense, mentioned earlier, is connected to one or more other senses and is associated with certain spatial characteristics. For example, the sense of vision is connected to vestibular and auditory and is evoked by the surroundings’ colours, light, shadow and shapes and forms (Gawlak,2020). While nature is filled of serene sounds of wind, rain, waves, animal sounds create beautiful symphony for the sense of auditory (Helles,2021). An experience that includes the sense of olfactory is proven to create positive place-attachment through encouraging people to engage with that pleasant space (Spence,2020). While inviting the psychical touch, through the sense of tactile, into the space using friendly textures and temperatures, helps to alleviate children’s cognitive functioning (Helles,2021). Even gustatory sense doesn’t sound exaggeration as just using strategies that even evoke the sense is a positive point (Klein,2013). An environment that pays attention to child’s unconscious senses and allows them to push, pull, run, jump, climb..., etc., develops their cognitive functioning.

5. Worldwide Orphanages’ Examples

Understanding how to trigger each sense using the right strategies in a specific space is the trick, as always considering this connection leads to a successful design. The following section will represent selected case studies around the world, that successfully understood this connection and led to achieving positive impacts on the children, and based on the following selection criteria of compulsory and optional points, as shown in table 1:

Table (1): Compulsory and optional points of the selection criteria of Worldwide case studies, Source: The researcher

Compulsory	CS1	CS2	CS3	CS4	Optional	CS1	CS2	CS3	CS4
The building exists and is completed	√	√	√	√	The building includes both genders	√	√	√	×
Achieves biophilic design strategies	√	√	√	√	Up to 18 years	√	√	×	√
Achieves children’s physiological and psychological needs	√	√	√	√	The case study is relevant to Egypt’s conditions	√	×	√	√

The following part includes case studies analysis by providing a general overview, description, which analyse the distinctive features and techniques adopted in each case, and list of triggers of proved positive impacts on the children.

5.1. CS1 - ECONEF Children’s Centre in Tanzania (2018)

ECONEF Children’s Centre is one of the successful examples that seeks to provide a healthy environment for orphans, see figure 5. The main target of this facility is creating a self-sufficient place by exploiting all the available resources by harvesting rainwater, generating electricity using PVC cells, enhancing the harsh climatic features of hot humid climate through the design and even the choice of the site by establishing the building in the middle of the understory of the surrounding fields where traditional activities of planting and gardening take place, teaching the children to participate in the society, by learning the residents’ common craft, independence, and self-reliance. Table 2 shows the basic information and main features of ECONEF children’s Centre.



Figure 5: ECONEF children’s centre building source: (Vanamo,2016), (Kim,2018)

How to Cite this Article:

Table 2: ECONEF Children’s Centre description and most remarkable features Source: (Vanamo,2016)

Location	Arucha region, Kingoria, Tanzania
Climatic conditions	Subtropical, highland climate, hot and humid summer and dry winter
Description	<ul style="list-style-type: none"> • ECONEF children’s center hosts around 26 children in a total area of 2670 m², both genders up to 18 years. • The building’s form consists of 4 cubic closed volumes connected with semi-open, semi-closed spaces, for practicing recreational activities, as well as lowering the humidity in summer through the double ceiling. • The horizontal circulation that leads to the outdoor garden, where agriculture and livestock areas take place, to provide food for the children which they, themselves, participate in taking care of. • The building exploits the climatic conditions, by mimicking the nature of the baobab tree to store rainwater and PV cells for generating electricity. • Nature is present in materials, green elements, color selection, and natural lighting and ventilation through the openings that allow cross ventilation and a direct view of the understory of the surrounding local fields. • The cultural signature of the site is noticeable in the decorative crafts, vibrant colors, local materials, traditional construction methods, design concept, and site selection that provide a possibility to practice the area’s traditional works.
Provided activities	Residential, keep-up, Recreational, and supervision spaces
Project aims	<ul style="list-style-type: none"> • To be a self-sustaining building that provides a safe environment where children can practice their activities and achieve their desires and needs.
Positive Impacts	<ul style="list-style-type: none"> • Sense of participation, ownership, and self-sufficient

5.2. CS2 - Children’s House of the Future in Denmark (2014)

Children’s House of the Future is considered one of the futuristic orphanages, see figure 6. As it aims to change the concept of traditional institution design by providing a home-like design, that considers many details regarding the children which makes the building one of a kind, for example, the multi-functional spaces are distinctive, especially for the activity rooms, the overall dynamic sense brought by the building which symbolizes the children’s energy, the small units that fit perfectly with the children’s scale, all these features and more creates a successful and progressive. Table 3 shows the basic information and main features of Children’s House of the future.



Figure 6: Children House of the Future Building Source: (ArchDaily,2014)

Table 3: Children’s House of the Future description and most remarkable features Source: (ArchDaily,2014)

Location	Keterminde, Denmark
Climatic conditions	Costal climate, cool, unsettled summer and mild, damp winter
Description	<ul style="list-style-type: none"> • Children’s House of the Future hosts around 22 children in a total area of 12330 m², both genders up to 18 years. • The building’s form, of basic geometric shapes, depends on 4 volumes connected, the building consists of variant open, semi-open, semi-closed, and closed spaces to serve different activities from public to private ones.

How to Cite this Article:

	<ul style="list-style-type: none"> • The vertical and horizontal circulation stands out; the bonus spaces add a dynamic effect to the building as well as interactive spaces' concept does exist by providing multi-functional spaces that can be adjusted according to children's activity. • Natural ventilation and lighting is provided by the multi-well-designed openings that respect children's scale. • Nature is present in the design, whether by using natural materials in the exterior and interior, incorporating green elements, animal presence, respecting prominent environmental features of the site, and nature-based color scheme.
Provided activities	Residential, keep-up, Recreational, and supervision spaces
Project aims	<ul style="list-style-type: none"> • To eliminate the traditional institutional building form and fulfil the spatial needs by creating a home-like building to fit perfectly in the residential context. • To create an environment where different age groups of children can live together without any conflicts by designing separate fingers for each group connected with activity spots for gathering and playing.
Positive Impacts	<p>The design of children's house of the future has proven to have positive impacts on the children as it enhances the following:</p> <ul style="list-style-type: none"> • Sense of safety, ownership, community and creativity • Flexibility, functionality and personalization

5.3. CS3 - SOS Children's Village in Jordan (1991)

The Children's Villages depend on establishing an entire City for the children of small houses supplemented by a group of services and recreational spaces scattered between the houses for easy access, see figure 7. Children can enjoy a large area of well-designed landscape, that embraces the buildings and brings a sense of intimacy to the space, providing a combination of outdoor, inside and outside, and indoor spaces where different types of activities take place, SOS villages are great example of adopting vernacular architecture principles which adds a sense of loyalty on their buildings to the surrounding site, replacing the institutional design does exist and healthy environment's features are applied. Table 4 shows the basic information and main features of SOS children's village.



Figure 7: SOS children's village in Jordan building source: (Damluji,2001)

Table 4: SOS Children's Village description and most remarkable features Source: (Damluji,2001)

Location	Al-Alameya district, Aqaba, Jordan
Climatic conditions	Mediterranean climate, mild, wet winter and hot, dry summer
Description	<ul style="list-style-type: none"> • SOS children's village hosts around 72 children in a total area of 20000 m², both genders up to 14 years, as due to cultural and religious factors, children are separated into different settings after the age of 14. • The setting depends on the concept of family homes of small buildings combined forming different levels of open and closed spaces, as a small village for the children using traditional architectural vocabulary to assist in embracing the cultural and geographical aspects of the site. • The used forms and shapes and exposed structure give a static sense while the skyline, the soft landscape elements of different types of trees and plants, different shapes of shades, several levels and steps in many shapes, and the combination of various spaces with diverse degree of enclosure, give the building a dynamic sense. • Nature integration in the built environment is variant, significant, and respectable. The natural and artificial landscaping elements, natural and vernacular materials, nature-

How to Cite this Article:

	based colors, and natural lighting and ventilation techniques, make the building a perfect fit in the context.
Provided activities	Residential, keep-up, Recreational, and supervision spaces
Project aims	<ul style="list-style-type: none"> To create a flexible, affluent, and spacious urban setting where the children feel welcomed and receive a sense of intimacy.
Triggers	<p>The design of SOS children’s village has proven to affect the children positively in a way that is sensitive to their community and culture and triggers the following:</p> <ul style="list-style-type: none"> Calmness, serenity, safety and security Spaciousness, intimacy and happiness

5.4. CS4 - Maher Ashram Orphanage in India (2019)

Maher Ashram Orphanage creates a great example of overcoming the separation between the indoor and the outdoor, which is considered the main target of applying biophilic design, see figure 8. Giving the children the chance to be exposed to the natural elements needed for a healthy childhood, as well as the symbolization of cultural religious factors brings spiritual significance to their lives through architecture. Table 5 shows the basic information and main features of Maher Ashram Orphanage in India.

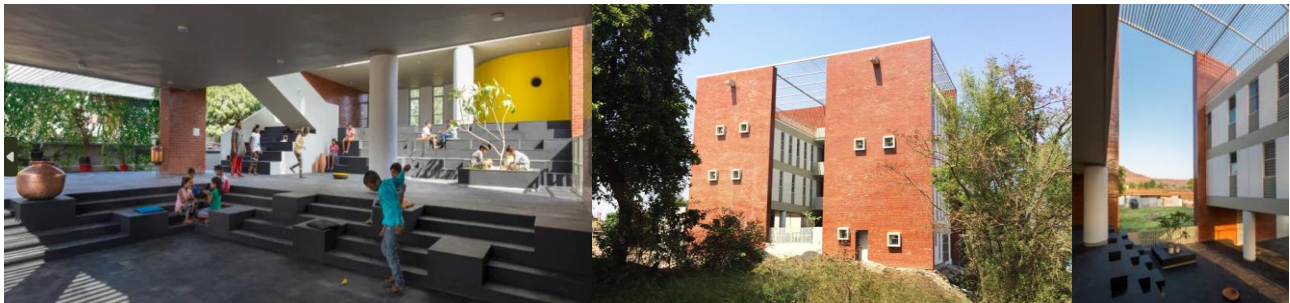


Figure 8: Maher Ashram in India building Source: (Hankare,2022)

Table 5: Maher Ashram Orphanage description and most remarkable features Source: (Hankare,2022)

Location	Pune, Maharashtra, India
Climatic conditions	Tropical wet-dry climate with cold, hot, and rainy weather seasons
Description	<ul style="list-style-type: none"> Maher Ashram hosts around 16 children in a total area of 420 m², both genders up to 18 years. The building is constructed to act as BINDU of a stand-like bastion with a central courtyard (AANGAN) which previews the contemporary values combined with the traditional houses’ spirit.
Provided activities	Residential, keep-up, Recreational, and supervision spaces
Project aims	<ul style="list-style-type: none"> To create a unique visual experience by designing welcoming spaces for gathering and exchanging ideas and strengthening the indoor and outdoor connection. To respect the past by inserting traditional vernacular elements into a design that keeps up with the future. The gallery of activities provided by the design of separating wide-span space into several areas adds multi-functionality and flexibility to the space. The natural lighting and ventilation are enhanced due to the openings that are oriented towards the prevailing wind and the outlook of prominent distinctive features of the context. The color scheme, shiny materials, and decorative items emphasize the importance of the spiritual and traditional signature in the design.
Triggers	<ul style="list-style-type: none"> Social development, spiritual significance, and engagement.

How to Cite this Article:

6. Design Recommendations

The following represents recommendations based on the analyzed case studies for providing guidelines for integrating biophilic design into the built environment of orphanages:

Shapes and forms: using both organic and geometric ones to define each space according to the type of activity practiced in the space, for example: Circles for social gathering space, irregular shapes for child's play space, rectangles and triangles to emphasize power and discipline.

Spaces' composition: incorporating open spaces, inside and outside spaces and closed spaces for public, private and semi-public/ semi-private activities to give the children the opportunity to enjoy their private time of soothing activities as well as social gathering to sense and live the diversity of the built environment.

Outlook: selecting a site with an understory, natural water body or distinctive prominent feature, not only links the children with nature but also creates a sense of belonging.

Natural lighting and ventilation: using suitable techniques which helps in maximizing both natural lighting and ventilation by understanding the site's climatic conditions.

Materials: vernacular, natural materials are the best choice, especially one with earth tone colors, while adding a splash of bright flowery colors with the right amount in the right spaces such as red in playing spaces, orange in recreational spaces, yellow in eating spaces, blue and green in studying spaces.

Natural integrations: ivy walls, green roofs, potted plants, food bearing plants with livestock animals which children participate in caring for, are great examples.

Artificial integrations: climbing walls, fixed, semi and movable furniture, exposed structure, constructed water feature, local handmade elements and others that bring the signature of the site to the built environment.

6. Discussions

The selected case studies indicate that biophilic strategies effectively enhance the environment provided for orphans leading to positive impacts on their physical and psychological health. Each case study shows significant methods of positive interaction with the surrounding built environment eliminating the separation between the indoor and the outdoor. The site selection, space composition, colors, materials, shapes and forms, natural lighting and ventilation techniques, and natural and artificial integrations are all inspired by the most distinctive features in the built environment giving a home-like place originating from nature. Therefore, considering the needs, perceptions, and preferences of the users cooperates as well in creating a successful design with multiple ways of applying it. The way of rethinking the orphanage in each case is inspiring and shows that the aim of implementing biophilic design doesn't necessarily require expensive or complicated strategies, but simple and smart techniques can have the same effects.

7. Conclusion

The study explores the urgency of implementing biophilic design strategies into the built environment of orphanages. The aim is to elevate the quality of their daily life and respect the children's sensitivity and vulnerability, thereby enhancing their physical, psychological, and cognitive functioning to lead them to a better future. It's proven that recklessly designed environments have negative impacts on children and cause severe damage to their mind-body system.

Understanding the three aspects of biophilic design, children's mind-body system and the architectural Spaces to find the connection between them is the key element to successfully derive the features of a targeted healthy environment. This environment not only considers their needs but also understands their perception and perspective.

Accordingly, presenting worldwide examples of successful case studies that focus on triggering children's positive sensations and creating a healthy environment, inspired by nature to nurture the children is essential. These examples consider different economic, geographic, demographic, as well as varying regulations, help in understanding how to implement each needed design strategy in different situations, all targeting creating a healthy environment.

8. References

English References:

- Zarman, W. (2016). The concept of nature in Islamic science teaching. *AIP Conference Proceedings*, 1708. <https://doi.org/10.1063/1.4941196>
- Browning, W.D., Ryan, C.O., Clancy, J.O. (2014). *14 Patterns of Biophilic Design*. New York: Terrapin Bright Green llc.
- Biophilic Design in the Ancient World. (2021). *JOURNAL OF BIOPHILIC DESIGN*, <https://journalofbiophilicdesign.com/podcast-journal-of-biophilic-design/biophilic-design-in-the-ancient-world>.
- Evyapan, E. (2022). *The relationship between Nature and Religious Buildings*. Rethinking The Future., <https://www.re-thinkingthefuture.com/designing-for-typologies/a3944-relation-between-nature-and-religious-buildings/>.

How to Cite this Article:

El-Sayed, F.H. *et al.* (2025) 'Introducing Biophilic Design into Orphanages' Built Environment', *Suez Canal Engineering, Energy and Environmental Science Journal*, 3(1), pp. 88-99.

- Abdelaal, M. S., & Soebarto, V. (2018). History matters: The origins of biophilic design of innovative learning spaces in traditional architecture. *Archnet-IJAR: International Journal of Architectural Research*, 12(3), 108–127. <https://doi.org/10.26687/archnet-ijar.v12i3.1655>
- Zhong, W., Schröder, T., & Bekkering, J. (2022). Biophilic design in architecture and its contributions to health, well-being, and sustainability: A critical review. In *Frontiers of Architectural Research* (Vol. 11, Issue 1, pp. 114–141). Higher Education Press Limited Company. <https://doi.org/10.1016/j.foar.2021.07.006>
- Kellert, S. R., Mador, M., & Heerwagen, J. (2008). *Biophilic Design: The Theory, Science and Practice of Bringing Buildings to Life*. John Wiley & Sons Inc.
- Tekin, B. H. (2023). *HUMAN-CENTRED THERAPEUTIC ENVIRONMENTS: A NEW FRAMEWORK FOR BIOPHILIC DESIGN*.
- Mohammed, I., Onur, Z., & Çağnan, Ç. (2023). An Exploration of Biophilic Design Features within Preschool Interiors. *Sustainability (Switzerland)*, 15(15). <https://doi.org/10.3390/su151511913>
- Kelleret, R. , S., & Calabrese, F. , E. (2015). *The Practice of Biophilic Design Pathways to Wellbeing View project*. <https://www.researchgate.net/publication/321959928>
- Abdul Tharim, A. H., Ahmed, A. C., Saarani, P. S. N., Haossain, N. Q. R., Purwanto, E., Tafriidj, I. S. I., Purisari, R., & Prasetyo, T. (2022). THE DETERMINANT FACTORS OF BIOPHILIC DESIGN STRATEGIES AND OCCUPANTS' PSYCHOLOGICAL PERFORMANCE IN THE OFFICE BUILDING. *Malaysian Journal of Sustainable Environment Special Issue*, 87–106. <https://doi.org/10.24191/myse.v9i3.18292>
- Patel, A., Nakai Kidd, A., Roetzel, A., & DeKay, M. (2022). *A critical review of Biophilic design and its design framework*.
- Khanbabaei, A. (2016). DESIGNING ORPHANAGE WITH THE APPROACH OF CREATING SENSE OF BELONGING TO THE ENVIRONMENT. *THE TURKISH ONLINE JOURNAL OF DESIGN, ART AND COMMUNICATION*, 6(AGSE), 1357–1367. <https://doi.org/10.7456/1060agse/020>
- Idris, K. (2024). *Effect of Orphanage homes among Children at Katsina State North-western Nigeria*.
- Brink, & Barbara. (1997). *GUIDELINES FOR THE DESIGN OF CENTRES FOR STREET CHILDREN with the Architecture for Education Section, UNESCO Paris*.
- Sofian, M. R., Iskandar, S., Azari, A., & Yasir³, M. (2013). *Arts and Design Studies Orphanage Welfare and Care Centre as Integration with Community*. www.iiste.org
- Mohamed, A., Abd-Alla, E.-S., Ramadan Abd-Elfatah, S., Zaki, M. M., Ahmed, H., & Hassinine, M. (2022). Psychological Problems among Orphan Children. In *Journal of Nursing Science-Benha University* (Issue 3).
- Priyadarshini, S., & Rathnasabapathy, M. (2020). *BEHAVIORAL AND EMOTIONAL PROBLEMS AMONG ORPHANS: A REVIEW PAPER Neuropsychological impairments of stroke patients-A Comprehensive Meta-Analytical Study. View project REACH-OUT PROGRAMME AMONG YOUTH AND TEACHING PROFESSIONAL IN CHENNAI "NASHA MUKT BHARAT ABHIYAN" View project* (Vol. 63, Issue 6). <https://www.researchgate.net/publication/352281708>
- Elattar, N. F. M., Alabd, A. M. A., & Mohammed, R. E. (2019). EAS Journal of Nursing and Midwifery Abbreviated Key Title: EAS J Nurs Midwifery. *East African Scholars Publisher, Kenya*, 1(3). <http://www.easpublisher.com/easjnm/>
- Shulga, T. I., Savchenko, D. D., & Filinkova, E. B. (2016). EJ1120236(1). *INTERNATIONAL JOURNAL OF ENVIRONMENTAL & SCIENCE EDUCATION*, 11(17), 10493–10504.
- Zeanah, C. H. (2009). *The Deprived Human Brain Developmental deficits among institutionalized Romanian children-and later improvements-strengthen the case for individualized care*. <https://www.researchgate.net/publication/298207181>
- The Negative Impact of Institutionalization on Children 0-3 years. (2023)*. UNICEF.
- Anbari, M., & Soltanzadeh, H. (2015). Child-oriented architecture from the perspective of environmental psychology. *European Online Journal of Natural and Social Sciences*. www.european-science.com
- Kesavelu, D., Sheela, K., & Abraham, P. (2021). Stages of Psychological Development of Child-An Overview. *International Journal of Current Research and Review*, 13(13), 74–78. <https://doi.org/10.31782/ijcr.2021.131320>
- Pilapil, C. D. , A. (2015). Unfolding the Psychological Well-Being of Orphans: A Qualitative Study of Filipino Children in an Orphanage. *Print) International Journal of Social Science and Humanities Research*, 3, 404–415. www.researchpublish.com
- Thompson, P. (2017). human development. In *Foundations of Educational Technology*. Oklahoma State University.
- Gawlak, A., Matuszewska, M., Ptak, A., & Priefer, M. (2020). *Perception and functionality of space in view of potential and dysfunction of senses Sense-sensitive Architectural Design*. <https://doi.org/10.1186/s41235-020>

How to Cite this Article:

El-Sayed, F.H. et al. (2025) 'Introducing Biophilic Design into Orphanages' Built Environment', *Suez Canal Engineering, Energy and Environmental Science Journal*, 3(1), pp. 88-99.

- Turgay, Z. T., & Sariberberoglu, M. (2022). The Role of the Senses in Children's Perception of Space. *Iconarp International J. of Architecture and Planning*. <https://doi.org/10.15320/iconarp.2022.194>
- Jiraschek, R. (2007). *Improving Child Safety in Residential Buildings via Architectural Design and Technology Integration*.
- Roy, N. (2015). *I'm Still a Kid! A Proposal for Improving Orphanages through the Integration of Nature, Nurture, and the Senses*.
- Krombach, A. G. (2023). *creative spaces to inspire*. Action for Healthy Kids.
- Jowell, T. (2023). *Engaging Places architecture and the built environment as a learning resource*.
- Helles, A. S. (2021). Designing Stimulating Environment to Alleviate Orphan Children Psychological Problems. *European Journal of Environment and Public Health*, 5(2), em0082. <https://doi.org/10.21601/ejeph/11057>
- Spence, C. (2020). Senses of place: architectural design for the multisensory mind. *Cognitive Research: Principles and Implications*, 5(1). <https://doi.org/10.1186/s41235-020-00243-4>
- Klein, L. (2013). Tasting Space. *InVisible Culture: An Electronic Journal for Visual Culture (IVC)*, 18.
- Vanamo, P., Wikström, C., & öster, F. (2016). *Econef Children's Center: Sustainable construction in northern Tanzania*.
- Kim, K., Kohman, M., & Jackson, A. (2018). *ECONEF CHILDREN'S CENTER*.
- ArchDaily. (2014, November 25). *Children's Home / CEBRA*. ArchDaily.
- Damluji, S. S. (2001). *SOS Children's Village Aqaba, Jordan*.
- Hankare, P. S., Narkhede, P. G., & Hankare, P. S. (2022). *Designing interactive spaces for orphanages combined with elders' home*. www.allmultidisciplinaryjournal.com
- Ali, E. (2021). Learn about the state's efforts to support "care institutions and orphans" within social protection programs. *The Seventh Day*.
- "Model regulations", (2024). *Model regulations governing work in residential institutions for children deprived of family care*. Ministry of social solidarity.
- Saraswat, A., & Unisa, S. (n.d.). *An In-Depth Study of Psychosocial Distress Among Orphan and Vulnerable Children Living in Institutional Care in New Delhi, India and Their Coping Mechanisms*. 2017.

Arabic References:

- علي، ا. (2021). اعرف جهود الدولة لدعم "مؤسسات الرعاية والايتم" ضمن برامج الحماية الاجتماعية. *اليوم السابع*.
- اللائحة النموذجية، (بدون تاريخ). *اللائحة النموذجية المنظمة للعمل بالمؤسسات الابوانية للاطفال المحرومين من الرعاية الاسرية*. وزارة التضامن الاجتماعي.

How to Cite this Article:

El-Sayed, F.H. et al. (2025) 'Introducing Biophilic Design into Orphanages' Built Environment', *Suez Canal Engineering, Energy and Environmental Science Journal*, 3(1), pp. 88-99.