



# *didactic* garden

our return to biophilia



# *didactic* ecology

*returning to biophilia*

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Submitted in fulfilment of part of the requirements of the degree MArch(Prof) in the  
Department of Architecture in the Faculty of Engineering, Built Environment and  
Information Technology and the University of Pretoria

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Reggio Emilia Pre-primary School, Occupational Therapy and Community Sports and Culture Centre  
De Rapper Street Park, Sunnyside, Pretoria  
ELANDSPOORT 357-JR  
31 Borke Street, Pretoria, 0002  
25°45'4.97"S  
28°12'36.41"E

Magister of Architecture [Professional]  
Environmental Potential  
Regenerative Architecture | Biophilic Design | Didactic Landscape

Architectural Approach: The site was analysed in terms of potential didactic “garden” spaces as a new approach to early childhood development. An identity for each “garden” was derived from, firstly, the natural elements that already existed in each garden and secondly, how the importance of natural ecologies and systems can be taught through their rehabilitation and conservation. The architecture fills the role of the latter by facilitating the didactic rehabilitation, awareness and conservation of each garden space.

Stephanie Kelly, 2016

Department of Architecture  
University of Pretoria

In accordance with Regulation 4[e] of the General Regulations [G.57] for dissertations and thesis, I declare that this thesis, which is hereby submitted for the degree Master of Architecture [Professional] at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution

I further state that no part of my thesis has already been, or currently being, submitted for any such degree, diploma or any other qualification.

I further declare that this thesis is substantially my own work. Where reference is made to the works of others, the extent to which that work has been used is indicated and fully acknowledged in the text and list of reference.

Stephanie Kelly

God's Garden

“THE Lord God planted a garden  
In the first white days of the world,  
And He set there an angel warden  
In a garment of light unfurled.

So near to the peace of Heaven,  
That the hawk might nest with the wren,  
For there in the cool of the even  
God walked with the first of men.

And I dream that these garden-closes  
With their shade and their sun-flecked sod  
And their lilies and bowers of roses,  
Were laid by the hand of God.

The kiss of the sun for pardon,  
The song of the birds for mirth,--  
One is nearer God's heart in a garden  
Than anywhere else on earth.

For He broke it for us in a garden  
Under the olive-trees  
Where the angel of strength was the warden  
And the soul of the world found ease.”

Dorothy Frances Gurney  
(Willis, 2006: 11)

Dedicated to my late grandmother, Daphne Kelly, whose poem, *God's Garden*, stood, engraved onto a stone, in *her* garden and inspired the essence of this dissertation.

Thank you

To Ryan, despite having your own architectural degree to complete, you have been my constant strength and sanity and I don't think any words could describe how much you have helped me these past five years.

Tegan, my sister and my best friend, for everything

Marguerite, for your encouragement and belief in me always

To my Parents and my Granny for always believing in me, and for all the encouraging phone calls and messages.

To Arthur, for your guidance, mentorship and encouragement

My Heavenly Father

*Didactic*

[di|dac|tic]

Adjective:

“Intended to teach, particularly in having moral instruction as an ulterior motive.”

(Oxford Dictionary 2016, sv didactic)

*Garden*

[gar|den]

Noun:

“A garden is a planned space, usually outdoors, set aside for the display, cultivation, and enjoyment of plants and other forms of nature. The garden can incorporate both natural and man-made materials.”

(Oxford Dictionary 2016, sv garden)

Verb:

“The activity of tending and cultivating a garden.”

(Oxford Dictionary 2016, sv garden)

*Didactic Garden*

“A planned space set aside for the display, cultivation, and enjoyment of plants and other forms of nature with the intention to teach moral instruction as an ulterior motive.”

*Biophilia*

[bio|phil|i|a]

Noun:

“an innate and genetically determined affinity of human beings with the natural world.”

(Oxford Dictionary 2016, sv biophilia)



## Abstract

Biophilia is a term that refers to man's love of other living things. However, over the last few hundred years, we have lost the love of nature. The urban built environment embodies the increasing disconnection between man and the natural world, with parks and natural resources showing signs of neglect and degradation.

In response to a regenerative approach to making architecture, the dissertation combines the theories of Stephen Kellert and Edward Wilson, in that our biophilic roots finds their extension in the form of an urban garden that aims to teach its users the importance of the conservation and protection of natural resources in our cities.

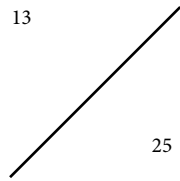
The design aims to re-stitch broken ecologies: The dwindling natural ecologies that exist in the urban environment as well as the barriers to people's cognitive development on a site riddled with infrastructural barriers preventing reconnection. It does so on a derelict park alongside the channelised Walkerspruit in Sunnyside, Pretoria.

## Vertaling

Die term Biophilia verwys na die mens se aangetrokkenheid na ander vorms van natuurlike lewe. Hierdie liefde van die natuur het egter gedurende die afgelope paar honderd jaar verlore geraak. Die oprigting van stedelike omgewings verteenwoordig 'n toenemende isolering van die mens vanaf die natuurlike wêreld. Hierdie tendens word getoonbeeld deur die verwaarlosing en degradering van parke en ander natuurlike bates.

Hierdie proefskrif is 'n respons waarin 'n regeneratiewe benadering tot argitektuur ondersoek word, deur van die teorie van Stephen Kellert en Edward Wilson te kombineer. Dit belig die wyse waarop ons biologiese wortels gegrond en verleng word in die stedelike tuin en lei die verbruiker tot kennis van die waarde van instandhouding en beskerming van ons natuurlike stedelike hulpbronne.

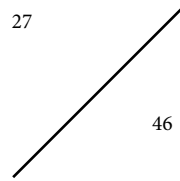
Die ontwerp van hierdie studie poog om afgetakelde ekologie te herstel. Die fokus is op die huidige afnemende natuurlike ekologie aanwesig in verstedelike omgewings asook belemmering wat die kognitiewe ontwikkeling van mense kortwiek, soos die teenwoordigheid van infrastruktuur wat herkonnesie met die natuur belemmer. Die studie is geplaas in 'n afgetakelde park langs die kanaal waarin die Walker spruit vloei, in Sunnyside, Pretoria.



*Introduction*



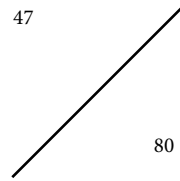
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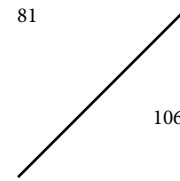
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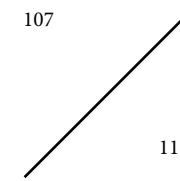
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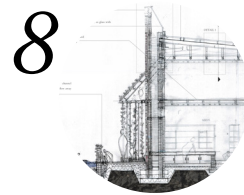
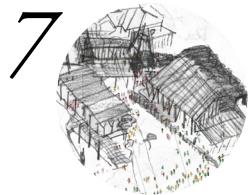
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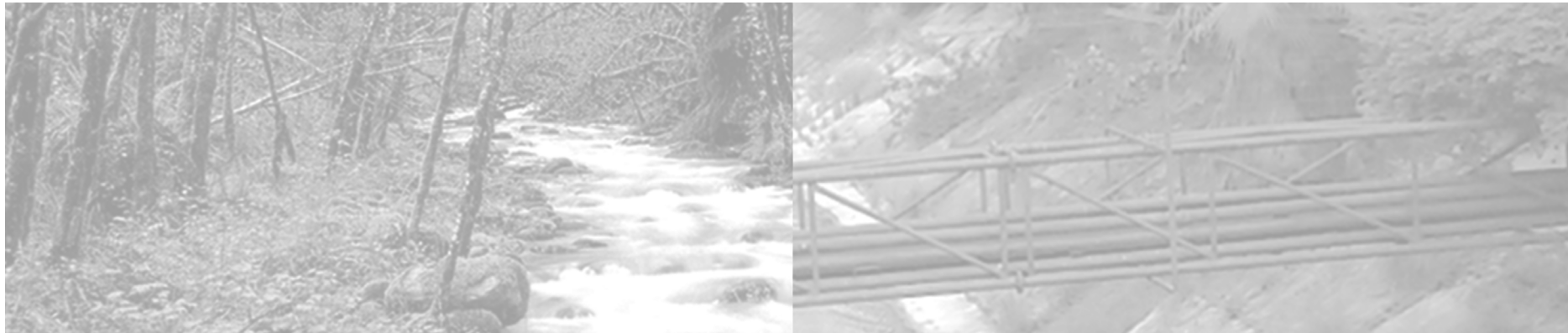


*introduction*

Chapter 1

Fig 1.1 No man ever steps in the same river twice. (dailygarlic.com. 2016)

“We cannot win this battle to save species  
and environments without forging an emotional bond  
between ourselves and nature as well -  
for we will not fight to save what we do not love.”  
(Gould, 1993: 39)



## 1.1 Preface

E. O. Wilson coined the term biophilia back in 1984 as the urge of man to affiliate with other forms of life. The term “biophilia” means “love of life or living systems.” It was first used by Erich Fromm (1964: 47) to describe a psychological orientation of being attracted to all that is alive and vital. Wilson uses the term in the same sense when he suggests that biophilia describes “the connections that human beings subconsciously seek with the rest of life” (Wilson, 1994: 350). He suggested the possibility that the deep attachments and connections humans have with other forms of life forms (and nature as a whole) are rooted in man’s biology.

Over the last few hundred years, however, there has been an ever increasing disconnection of humans from the natural environment (Maller, et al., 2005:48). But what does this mean? The **natural environment** or nature can be defined from many different angles, but for the purpose of this dissertation, nature refers to **natural ecosystems** or the dynamic complexities of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit” (United Nations 1992: Article 2). The **disconnection** between man and nature refers to the **physical and metaphorical barriers** built between nature and man and therefore **interference and destruction** of the balance of natural ecosystems throughout history.

The aim of this dissertation is to depict how architecture can play a regenerative role in its environment through the re-stitching and rehabilitation of existing broken ecologies. This will be carried out by applying and critiquing the principles of biophilic design, through which the importance of these ecologies will be taught through their rehabilitation and conservation.

In Figure 1.2, the separation is seen between the natural river and what the river has become in our cities.

Fig 1.2: Natural River vs. Apies River Channel. (Author. 2016)

## 1.2 Background: our return to biophilia

The movement away from, and return to, ecological architectural design has been a journey extending across the last three centuries. However, the most significant paradigm shift has only recently occurred in the last fifty years with architectural theories and applications emphasising the importance of the interdependent relationship between humanity and nature. The theories of biophilic design are one of the latest theories that has emerged through the progressive furtherance of the sustainable architectural design movement.

The Enlightenment and the architectural project of rationalism brought with it feelings of domination over nature. Descartes (1637) advanced the philosophy that human minds and bodies were separate (Vinning, et al., 2008: 1). With the increasing focus on a scientific and empirical approach to nature came developments in science and technology. Many of these discoveries further enhanced people's abilities to control or transform nature into pristine gardens (Vinning, et al., 2008: 1). Later, the Industrial Revolution and Rapid City growth brought with it deforestation and large ecological destruction. Modernism and the International Style soon followed with design principles that promoted placelessness and designing a building on a clean site (Nesbitt, 1996: 468). (In Figure 1.4, the images show the movement away from nature in architecture)

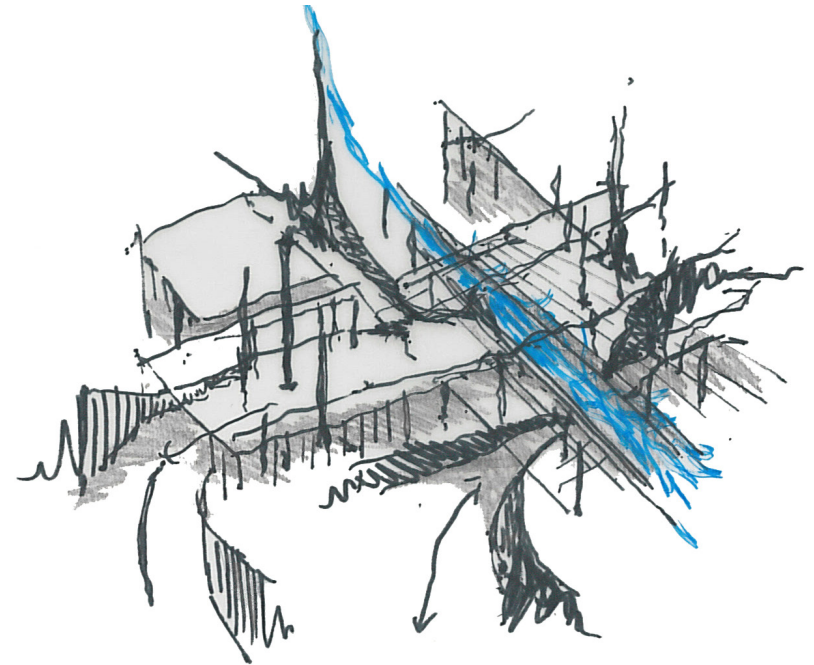
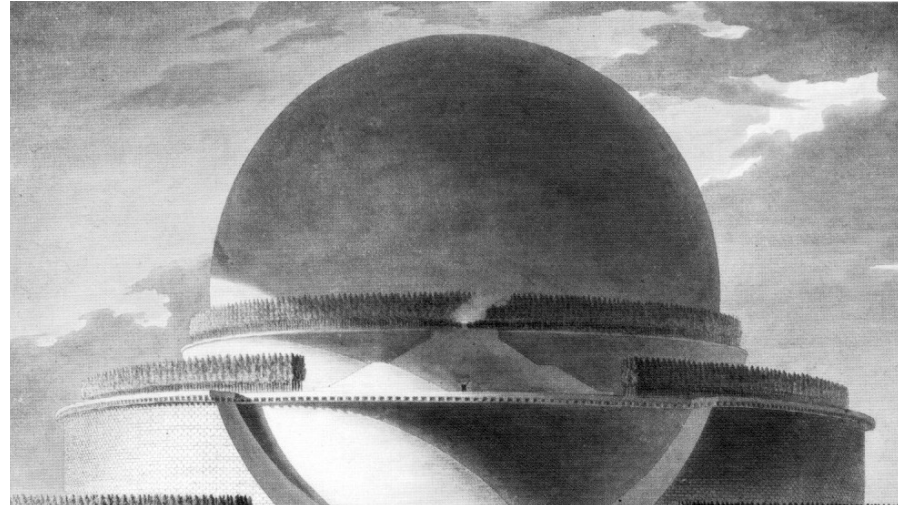


Fig 1.3: Drawing from conceptual development. (Author. March 2016)





1. Descartes. (www2.stetson.edu. 2016)



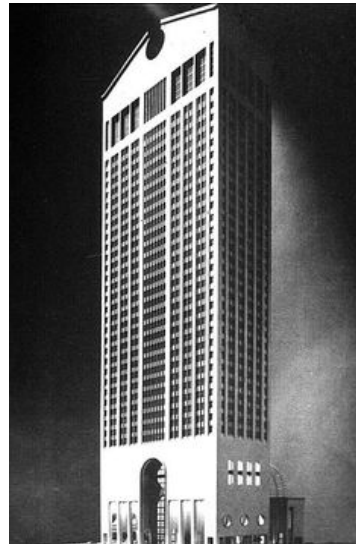
2. Architectural Rationalism.(doorofperception.com. 2014)



2. Palazzo della civiltà del lavoro. (www.flickr.com. 2011 )



3. Industrial Revolution (www.flickr.com. 2009)



4. The International Style. (http://www.3quarksdaily.com. 2005)



5. Statement Architecture. (en.wikiarquitectura.com. 2014)

Fig 1.4 Architecture and its movement away from nature. (Author. 2016)

### 1.3 Problem Statement

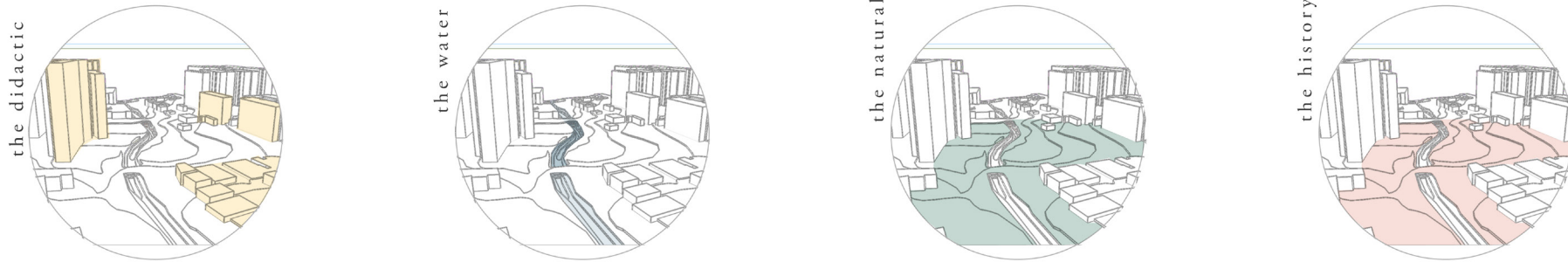
The concept of biophilic design arises from the increasing recognition that the human mind and body evolved in a sensory rich world, one that continues to be critical to people's health, productivity; emotional, intellectual, and even spiritual well-being. The development during the modern age of industry; artificial production, electronics and the city represent a small fraction of the history of human evolution. Humanity evolved in an adaptive response to natural conditions and stimuli, such as sunlight, weather, water, plants, animals, landscapes, and habitats, which continue to be essential environments for human development (Kellert, Heerwagen & Mador, 2008: 9).

Unfortunately, modern developments and technical accomplishments over the last few centuries have nurtured the idea that humans can transcend their natural heritage. This belief has encouraged a view of humanity as having escaped the order of natural ecosystems, with human progress and civilization measured by its capacity for **controlling** and altering the natural world (Kellert, Heerwagen & Mador, 2008: 10) As a result the remaining natural spaces in the urban environment show signs of degradation and neglect.

### 1.4 The Urban Issue

The Apies River and Walkerspruit within Pretoria embody broken ecologies and the control of natural systems. Historically, the river served as a natural representation of the Pretorian identity, where people used to spend Sunday afternoons along its banks, interacting with the animals and plants of the river (Van Der Waal Collection, 1989).

Today, however, the river has become a **barrier**. The Walkerspruit is an inaccessible engineered channel. No attention was paid to connecting the water to the urban context and no attention was given to the biophilic advantages humans have with water bodies and their ecosystems. The consequences thereof are still experienced today, as concerns regarding ecology and natural systems are being introduced in urban design strategies and architectural design (Jansen Van Vuuren, 2011).



The modern age of urbanization has led the ever more increasing construction of barriers limiting man's access to natural spaces which prevents them from developing love and respect for the earth and its resources (Crain, 2003: 145). These barriers include the lack of direct experience and contact with natural materials and processes in early childhood when the sensory impact of these natural features is the fundamental mode of learning; the lack of use of living environments in schools where the young minds of children are most susceptible to the benefits of the natural world; and the lack of diverse and sustainable landscapes in residential suburbs where children live. Today, the built environment often creates barriers to children's independent mobility and therefore their experience of nature (Kellert, Heerwagen & Mador, 2008: 153-156).

Located along the Walkerspruit in Sunnyside, Pretoria, on the empty park space situated between Bourke and Leyds Street and North of De Rapper Street, the site holds four key informants, namely: the river or riparian element, the sparsely scattered trees on the site, the biophilic heritage of the site and lastly, the densely populated pre-primary schools surrounding the site. (Refer to Figure 1.5)



Fig 1.5: Site location and informants. (Author. 2016)

## 1.5 Summary of Issues

### Barriers

The vehicular roads between the schools and the site inhibit access to an open natural space alongside the Walkerspruit

### Broken Ecosystems

The natural site, as it is, shows signs of neglect and degradation, depicting how Pretoria and its engineered past have disregarded the need to integrate natural sites into the urban fabric.

### River serves as a barrier and safety hazard

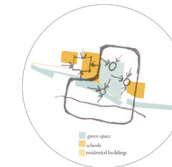
The river serves as a barrier in itself as it proves inaccessible to children as well as unsafe.

### Schools ignore ecologies

Current early childhood development centres in the area ignore the potential of the open site as a vehicle for biophilic involvement.

### Dead zone

The space has become a lost space along the Walkerspruit, due to the nature of the area. The high rise flats and lack of safe green spaces for children result in a dead space. The large scale difference between buildings and ground leave it feeling lost and out of place



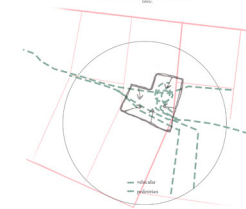
**School ignores ecologies**  
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**Barriers**  
The vehicular road between the school and the site inhibits access to an open natural space alongside the Walkerspruit.



**Broken Ecosystems**  
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**Barriers**  
The river serves as a barrier and safety hazard as it proves inaccessible to children as well as unsafe.

Fig 1.6: An example of Green Architecture. Bosco Verticale, Stefano Boeri. (Bosco Verticale. Techinsider. 2014 )



Fig 1.7: An example of Biophilic Design .Alvar Aalto's Villa Mairea in Noormarkku, Finland, 1939. (Villa Mairea. Ideasgn.com. 2013 )



## 1.6 Architectural Issue

In Architectural terms, humans, seeking shelter from the elements, were compelled to construct buildings and cities. Historically, the form of those structures arose from the materials and elements of their immediate environs (Kellert, Heerwagen & Mador, 2008: 59). Applying what was at hand to give structure to existence, people instinctively constructed places that provided the integral information, form, and meaning that their sense of well-being required (Kellert, Heerwagen & Mador, 2008: 60). Sustainability was an everyday ritual, giving back to the earth what we took from it. However, what happened to cause this slow progression of control and the building of barriers between natural ecologies and the built environment that has led to much of the architecture we experience today? An architecture that disregards the long-term potential of a interdependent relationship between humans and place.

The Green design movement focuses on increasing competence of the use of natural resources, removing discrepancies such as toxicity, and achieving sustainability through capable and disciplined practice (Refer to Figure 1.6). This is insufficient because it misses the potential that emerges out of the human presence on this planet: the possibility of organizing human activities so that they continuously feed and are fed by the living systems within which they occur (Mang & Reed, 2012: 26).

This is what Biophilic design aims to achieve: an interdependent, holistic relationship between humans and their environment, building within a culturally and ecologically relevant context, all basic to human health, productivity and well-being. These latter objectives are the essence of biophilic design. (Kellert, 2008: viii) (Refer to Figure 1.7)

The intention of the scheme is derived from two drivers: the theories of biophilic design, that state that “effective application of biophilic design must integrate two domains of health: children and planet” (Chawla, 2006: 57-78); as well as the key informants of the site which include the large amount of schools in the immediate area (Refer to Chapter 2). Children must spend enough time in naturally, healthy environments for biophilia to be instilled as a **lifelong affect**. Therefore, in order for biophilic design to become restorative, humanity’s biophilic afflictions need to be **taught** at a young age (i.e. A didactic biophilic design)

## 1.7 Research Questions

How can architecture help to rehabilitate and conserve dwindling natural ecosystems through education about the importance and fundamental value of their role in creating an ecological, healthy and regenerative environment in the urban context and therefore instil lifelong biophilia within its users?

## 1.8 Sub-questions

What can be done architecturally to rehabilitate the dwindling natural ecosystems in the urban environment and what role could these rehabilitated ecologies play in a regenerative city?

What relationship can building, as a catalyst of the didactic, have with the natural ecologies that exist, and through biophilic experiences, reconnect with the direct environment?

Is it possible for the inhabitants of this urban environment to contribute and build on these existing natural ecologies and repair broken ones?

Can the spatial and experiential attributes of natural ecologies act as drivers in the making of architecture that have spatial hierarchies, haptic experience, and didactic function?

Can architecture, while expressing sensitivity in the learning environments that exist, accommodate a new form of the didactic that address the gaps in the current methods of learning that do not completely assist in a child's full development?

## 1.9 Research Methodology

### 1.8.1 Literature

Theoretical desktop studies relating to concepts of biophilic design are investigated to further understand the meaning of man's love of other living systems and how this love can be exemplified to form a regenerative architecture.

### 1.8.2 Mapping

An in depth understanding of the site and mapping within the urban framework informed the development of a master-plan and group framework. This investigation will be conducted through in depth eco-mapping of the site alongside reinterpreting the existing ecosystems through the critique on Ken Yeang's 1995 book *Designing with Nature* (1995: 48). Yeang explores design through the both eye of an ecologist and an architect and focuses on diagrammatically analysing a site as an ecosystem in order to better understand how they interact with their immediate environment. Eco-mapping dealt with all environmental issues of the site including, ecologies, landforms, relationships on the site, circulation and movement patterns, existing vegetation and climatic conditions. This method is used to establish the site characteristics that led to the informants of a design approach.

There are four main informants that exist on site. These have been identified as the tree, the water or river, the existing schools and the biophilic memory of the site. Understanding where they exist, the biophilic attributes these informants possess, and the spatial qualities they possess will be investigated. The existing learning centres that exist around the site must be investigated in order to react and integrate a new didactic ecology on the site.

### 1.8.3 Applied Research

**Data:** Data is then summarised and applied to relevant aspects in order to complete the requirements for the design. The collection of site photos is essential in the study of site characteristics, scale, existing habitats and ecosystems and enables an appropriate design response.

**Analysis:** The relevant data collected is then turned into evidence that supports the intentions of the dissertation and its arrival at a relevant conclusion. The data is analysed to obtain the most relevant evidence relating to the outcome of the project. The data analysis is completed in computer investigations through the building of models and the delineation of presentation formants.

## 1.10 Delimitations

Delimitations: The aim of this dissertation is not to propose a new way of thinking about sustainability but to explore the use of current principles of biophilic design.

Biophilic design principles encompass an extremely wide field of sustainable design principles, ranging from biomimicry to the use of natural light. For the purpose of this dissertation, biophilic principles that relate to evolved human-nature relationships will be broadened upon.

The layout of the existing preschools alongside the site will be assumed according to their exterior as the aim of this project will only be to relate to the schools on a visual and circulatory level and not to carry out architectural alterations and additions to the physical buildings themselves.

## 1.11 Assumptions

It is assumed that the soil on site, which is excavated to create the bio-swimming pool and sunken playground courtyard is adequate for the use of berms or rammed earth as construction methods.

It is also assumed that occupants of the surrounding flats support the mini urban framework proposal of pedestrianising the motorways alongside the flats and that the relevant rezoning of the roads into public park spaces will be implemented.

Lastly, it is assumed that the Grade R building which is part of the Ring Ting Pre-primary school property will be demolished and its materials used in the proposed construction. The Grade R learners will be moved into the new classrooms of the proposed dissertation.





Fig 1.8: Author's conceptual interpretations of the didactic garden. (Author: 2016)

## 1.12 Hypothesis

It is proposed that humans can become more directly connected with their environment once more through an architecture which creates a synergy within its environment. Through the practise and application of biophilic design, the building will aid in creating a new ecology. An ecology that teaches and stirs an awareness of the users' biophilic heritage.

By facilitating a didactic space where users can experience and learn from their environment, through the design of an architecture that contributes to the development of young learners in a densely populated community, will ultimately establish an awareness of our place as humans within the greater natural ecosystem and foster lifelong regenerative thinking.

## 1.13 Objective

The project is intended to firstly reconnect a lost park space along the Walkerspruit in Sunnyside to the surrounding residential and school environment, which embodies the issues of industrial modernity where natural elements in the urban context are disregarded and neglected and the potential identity of place-based architecture is ignored. The proposed architecture, critical of the principles of biophilic design and appropriate within a culturally and ecologically relevant context, aims to facilitate a didactic landscape in which the importance of natural resources and natural parks will be taught to the children of the adjacent schools through the existing natural space's rehabilitation and conservation in the form of a new type of childhood development. This will foster emotional well-being and ultimately, a new regenerative philosophy to be instilled within the child to be carried with them throughout their lives and promote healthier cities in the future. In Figure 1.9, an initial conceptual collage was carried out to visually express the objectives and intentions of the scheme.