FIGURE 2.1

Day 252, Planet Earth

(Lorraine Loots, 2013)

chapter two

THEORETICAL APPROACH

2.1 PREFACE

This chapter frames the argument of the dissertation from a theoretical point of view, and is aimed at discovering and developing the **qualities of landscape** that are to be explored and adopted into the making of architecture. Existing theories related to environmental preferences and restoration within the discipline of architecture will be examined. The diagram below explains the methodology of how these existing theories will be translated into a **design framework** that will serve as design informants at **different scales.** Regenerative design and development will serve as the overarching philosophy in which other theories and models are embedded.

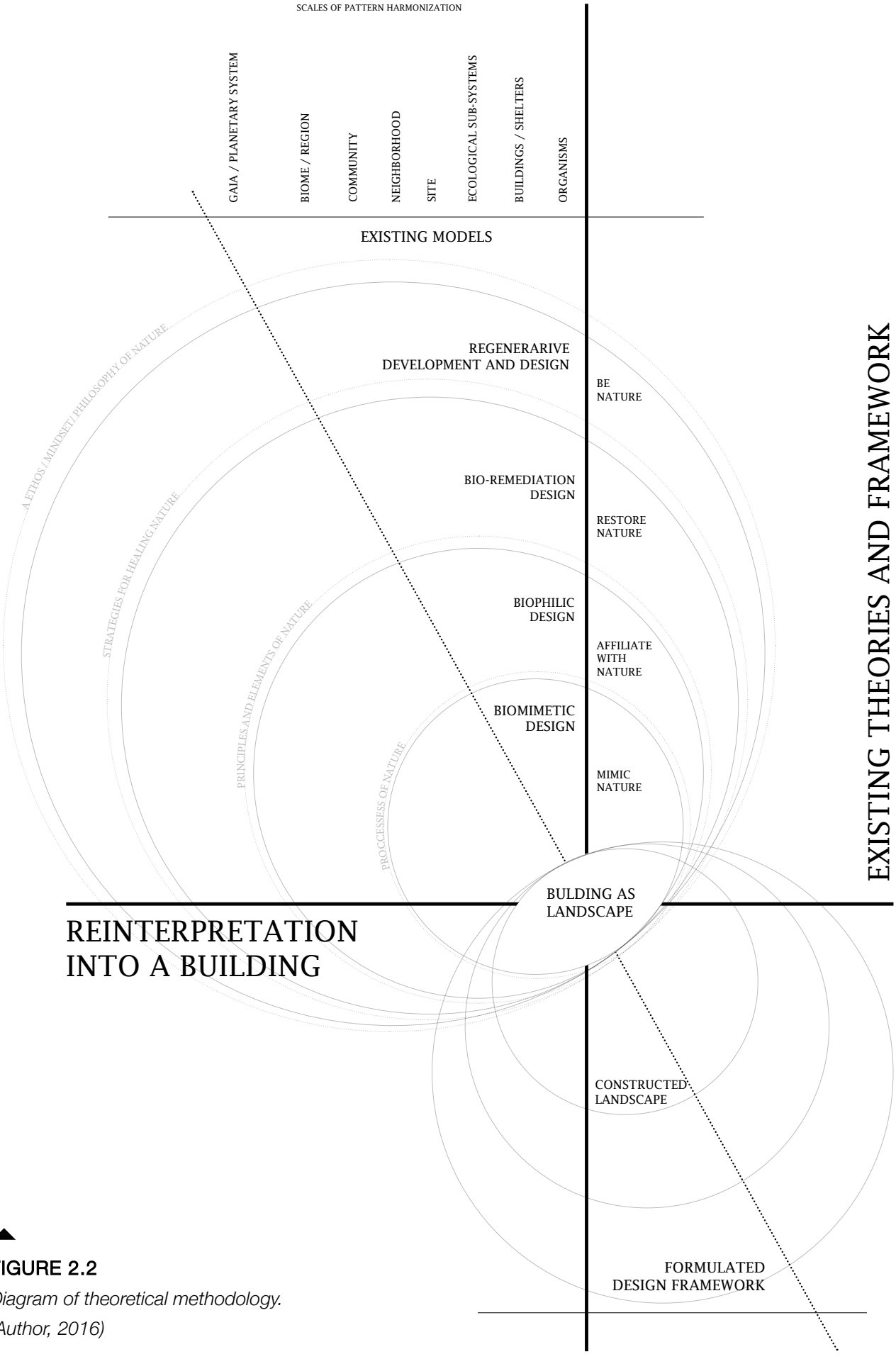


FIGURE 2.2

Diagram of theoretical methodology.

(Author, 2016)

2.2 REGENERATIVE DESIGN & DEVELOPMENT

Worldviews are coherent systems of beliefs that shape how individuals interpret and interact with the world by shaping how they think and, consequently, what they think about. The regenerative-sustainability paradigm suggest that our worldview and mindset need to undergo a major shift from a 'mechanistic' to an'ecological' or **living systems worldview** (Du Plessis, 2012:7).

Regenerative design is a philosophy of architecture that suggests that the role of the human being merges with nature in order to be an integral part of an **interconnected web of life.** Damage to any part of this web ripples back to harm every other part as well. Regenerative practices suggest that human beings are not destined to be merely apologetic destroyers trying their best to minimize the damage they do, but rather to be co-creators that can construct greater states of **systemic health** than would have been the case if no action was taken (Mang & Reed, 2012:26). Ultimately, the purpose of humanity aligns with the purpose of the planetary system itself, having an evolutionary function that looks to continuously improve itself through feedback loops, learning and adaptation to achieve **ever-evolving** levels of diversity, resilience and abundance.

The question remains difficult. How can those working n the built environment – a field that has a disproportionate effect and impact on global resources and systems – best support a smooth and timely transition for a **paradigm shift** to take place? Five aspects that support how regenerative development can be implemented will briefly be discussed (Mang & Reed, 2012:24).

2.2.1 THE ROLE OF HUMANS

It is not enough to seek to mitigate the outcomes of human activity on nature. Human beings need to once again take their place as an irreplaceable part of nature. From this perspective, regenerative development and design proposes the **reconnection of human aspirations and activities with the evolution of natural systems,** and the shifting of human communities and economic activities back into alignment with natural processes. This new role that humans take on doesn't suggest only the preservation or the restoration of an ecosystem. Instead, it is the continual evolution of human culture in association with the evolution of life (Mang & Reed, 2012:26).

2.2.2 A NEW MIND

The first step towards regenerative outcomes is not a change of practices but a change of mind. It requires a new way of thinking about how buildings are planned, designed, constructed and operated. Regenerative development acquires much of its creative thinking from a fundamental shift in focus. Rather than seeing a site and development project as a collection of things, such as slopes, drainages, roads and buildings, a regenerative designer fosters the ability to see everything as **energy systems and webs of interconnected dynamic processes** that are continually structuring and restructuring a site (Mang & Reed, 2012:26).

2.2.3 A NEW ROLE

A shift also takes place within design practices, the processes that are associated with it and, most importantly, the role and responsibilities of the designer. A regenerative practitioner **designs an ecosystem that integrates natural and human living systems** to create and sustain greater health and well-being for both. The participatory and collaborative nature of a regenerative process also requires psychological and cultural literacy, together with the ability to tap into the **latent creativity of communities** by merging broader sets of expertise and insight into the design process (Mang & Reed, 2012:27).

2.2.4 WORKING DEVELOPMENTALLY

Regeneration should be perceived as a developmental process that improves the value of the whole (Mang & Reed, 2012:27). Regenerative design continues to be seen as a **vehicle for reversing the damage** caused by source-to-sink processes, by creating self-renewing resource systems.

2.2.5 THE IMPORTANCE OF PLACE

The definition of place within regenerative thinking is that it is a unique, **multilayered network of living systems** within a geographic region that is a result of complex interactions, through time, natural ecology and cultural activities (Mang, 2009: 16). The responsibility of a regenerative designer is to understand the importance of place during the design and development stages, and to understand what is required to ensure that the ongoing regenerative capacity of the project, and the people who inhabit and manage it, is sustained through time.

Regenerative development can thus be summarized under the following philosophical departure points. **Human beings, together with their artifacts and cultural constructs are an inherent part of ecosystems.** Their actions and endeavors should be rooted in the context to contribute positively to the functioning and evolution of its ecosystems and cycles, enabling the self-healing processes of nature (Du Plessis, 2012:20).

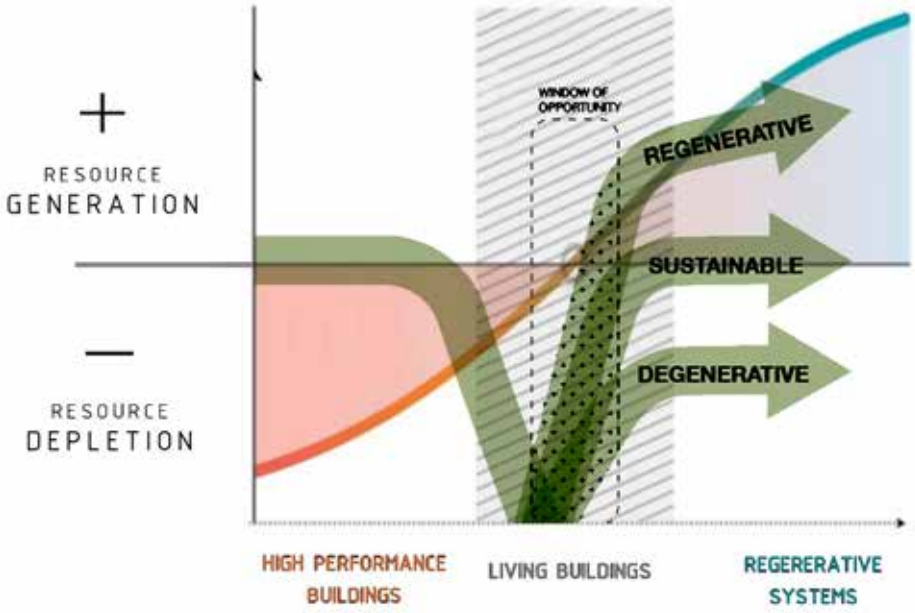


FIGURE 2.3
Diagram of regenerative design and development. (Author, 2016)

2.3 BIOREMEDIATION

We are living in an age of planetary consumption and environmental degradation where the risk of self-inflicted extinction has become a tangible reality. The continued existence of civilization has arrived at a crucial juncture between survival and decay. The practices of bioremediation are embedded in a **restorative paradigm** where the primary purpose is to return natural systems, with their inherent self-organizing capability, to their natural state (Batista & Matos 2013: 116). In the process of remediation, architecture is implemented as a regenerative tool, actively manipulating and reconstructing a contaminated environment. By proposing that **architecture can be a redemptive tool to reconstruct and restore landscapes** affected by extreme cases of man-made ecological decay, inhospitable landscapes can be replaced by a new 'Eden' to aid the diversion of our environmental crisis.

The process of restoring a given landscape involves different stages of intervention. First the traces of contamination from earlier industrial/ human activity should be examined and understood. It should also become clear which components of the landscape, such as soil, water, topography and vegetation, have been contaminated. The practices of bioremediation are thus more relevant on an **urban and site specific scale** than on a building scale. It is however important for structures to be designed to have little impact on subsoil and for architectural elements to cohesively operate within a given site to enable bioremediation and regrowth to take place (Batista & Matos 2013: 117). Finally, the toxic and degraded aspects of a given context such as dust, refuse and contaminated soil should provide new materials for conceptualization, elaboration and use, and rather be seen as avenues of opportunities (Borasi & Zardini, 2012: 25).

A significant example of bioremediation is provided by a theoretical thesis project by Thomas Grove, tilted Engineered Ecologies (President's Medal, 2013). This project proposes the implementation of a geo-engineering research facility amidst the contaminated ruins of the Aral Sea in Kazakhstan, an area that has become a barren, torturous landscape littered with decaying bio-weapon laboratories and nuclear test sites. These ruins and the entire island are to be repurposed into an experimental site for the large-scale testing and investigation of restricted geo-engineering and environmental modification technologies. The architectural intervention serves as a self-contained habitat inserted into the contaminated landscape to function as both a habitable research facility and a regenerative machine, actively manipulating and reconstructing the wasteland into a new resilient landscape.

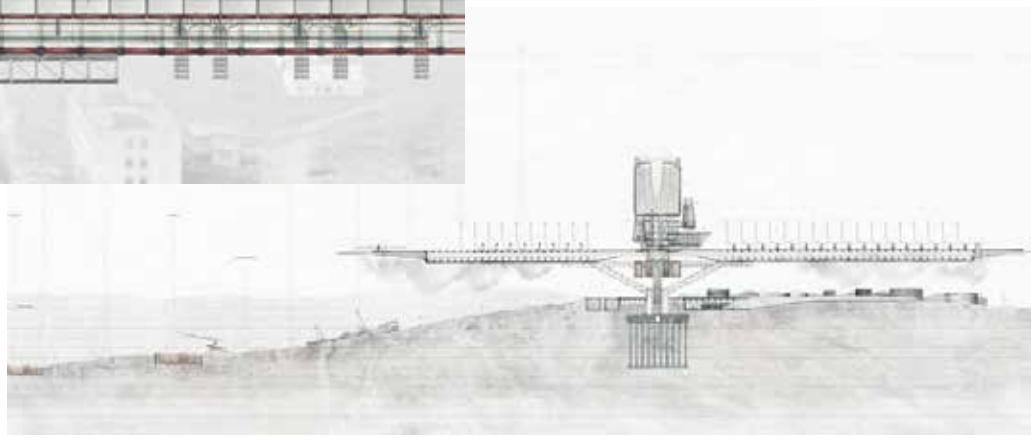


FIGURE 2.4

Engineered Ecologies, Thomas Grove (President's Medal, 2013)
(Adapted by Author, 2016)

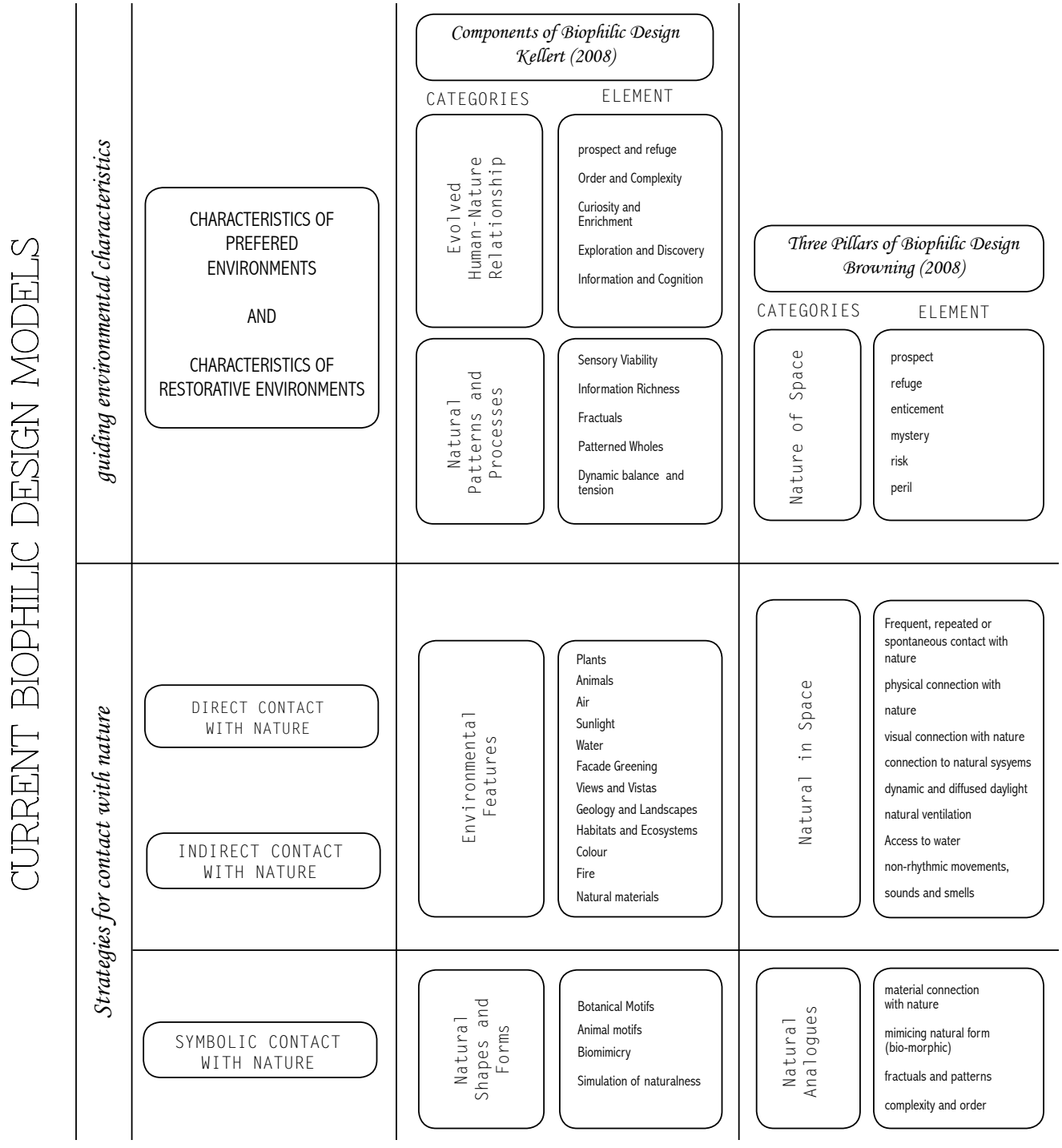
Bioremediation Precedent

Engineered Ecologies, Thomas Grove

FIGURE 2.5

Table of current biophilic models.

(Author, 2016)



2.4 BIOPHILIA & BIOPHILIC DESIGN

According to Wilson (1986: 7-9) the definition of Biophilia is **"an urge to affiliate with other forms of life."** The Biophilia hypothesis suggests that there is an instinctive bond between human beings and other living systems. Human beings are members of all natural systems and therefore we have an inherent longing to be surrounded by life, whether it is plants, animals, botanical qualities or other human beings. Biophilia stresses that although we live in urban conditions that separate us from nature, we need to recognize that our contact with natural states is an important part of our overall health and well-being. Biophilic design is the practice of designing environments that allow human beings to be affiliated with other forms of natural life, that have **tremendous benefits for our psychological health and well-being** (Kellert & Calabrese, 2008: 12) Through design it seeks the interconnection between life, nature and the built environment in order to create architecture that enriches our daily lives.

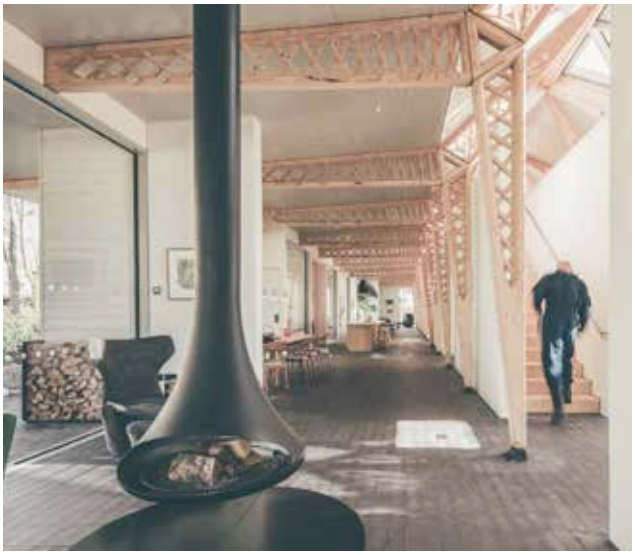
The following table depicts characteristics, elements and strategies of **existing biophilic design models** from multiple sources, which will be synergized to formulate a design framework to inform the design on a building and detail scale.

Strategies for Biophilic Design Wilson (2006, 2008)	*Characteristics of Biophilic Design Heerwagen & Hase(2001)*
STRATEGIES	ELEMENTS AND STRATEGIES
adress both spaciousness and refuge in building design create a sense of complexity, yet order in building design	Enticement: Information richness that encourages exploration, discovered complexity prospect: Visual distance, horizontal imagery, strategic viewing conditions, view corridors refuge: Canopy effects, enclosing surfaces, permitable barriers and surfaces for viewing out sensory variability biomimicry: Fractual Characteristics Sense of Playfulness Biodiversity Water
provide plantings and pleasing natural settings around buildings provide green roofs and living walls Avoid interference with key sightlines blur the transition between interior and exterior spaces incorporate vegetation and interior planting provide high levels of daylighting provide views to nature configure spaces to enhance views of nature provide operable windows decorate with potted plants provide natural materials	Biodiversity: Outdoor and Indoor natural areas with rich vegetation (trees, plants, flowers) and animals Sensory variability: Natural rhythms and processes such as natural ventilation and lighting, Changes and variability in environmental colour, air movement, light, temperatures and texturess over time and spaces. Windows designed and placed to incorporate natural views Water; Glimmer or reflective surfaces, moving suggesting clean aerated water Biomimicry: Use of natural textures
incorporate organic forms provide nature art	Water: Symbolic forms of water Biomimicry: Design derived from nature. use of natural patterns and forms

Biophilic Precedent

Maggie's Cancer Centre, Foster + Partners, Manchester 2016

Maggie's Cancer Centre (Archdaily, 2016) is an example of how affiliation with nature can facilitate psychological health. The centre serves as a place of refuge where people affected by cancer can find emotional and practical support. Inspired by the blueprint for a new type of care set out by Maggie Keswick Jencks, great value is placed upon the power of architecture to help in the process of therapy.



Throughout the centre, there is a focus on natural light with greenery, garden views and landscaped courtyards that punctuate the rectilinear plan. The south end of the building extends to embrace a greenhouse-, a celebration of light and nature- which provides a garden retreat as a space for people to gather, to work with their hands and enjoy the therapeutic qualities of nature and the outdoors. The roof rises in the centre to create a mezzanine level, naturally illuminated by triangular roof lights and supported by lightweight timber lattice beams. The beams act as natural partitions between different internal areas, visually dissolving the architecture into the surrounding gardens.

FIGURE 2.6

Biophilic Precedent: Maggie's Cancer Centre, Foster + Partners, Manchester 2016. (Archdaily, 2016)

2.4.1 THE CHARACTERISTICS OF NATURE

The character of nature is not always tangible, physical or even visual. It is an experience, for it **entices our inherent connection to the natural.** These characteristics can be discussed in two sub-themes; the ***evolved human-nature relationship,*** and human connection to ***natural patterns and processes*** (Kellert, & Calabrese 2008: 16-17). These themes will be elaborated on within the Concept and Design Development chapters.

2.4.2 DIRECT CONTACT WITH NATURE

Multiple aspects can be defined as strategies for architecture to facilitate direct contact between humans and nature, through the implementation of ***environmental features*** (Kellert & Calabrese, 2008: 22). The interpretation of these qualities into architectural elements will be explored in the Concept and Design Development and Technification chapters.

2.4.3 INDIRECT CONTACT WITH NATURE

Strategies to suggest and facilitate indirect contact with the environment are rooted in the context of the surrounding natural, cultural, historical and social conditions, better defined as ***place-based and vernacular relationship*** (Kellert & Calabrese, 2008: 26). These strategies will be elaborated on in the Concept and Design Development chapters.

2.4.4 BIOMIMETICS & SYMBOLIC CONTACT WITH NATURE

Biomimetics looks to nature as inspiration for human design and development. It finds inspiration in ***natural shapes, forms and analogies*** and appropriately imitates them in order to produce built environments that suggest a clear and visually pleasing connection to nature (Kellert & Calabrese 2008: 35). The contact it thus facilitates between nature and humans is of a symbolic and visual nature and will be further explored and delimited in the Concept and Design Development chapters.

An example of Biomimetics is RebildPorten (Archdaily, 2013), located within a northern Denmark nature reserve at Rebild Hills and Rold Forest in Jutland, and is a new visitor's center and exhibition space that creates a new gathering point. "The project's distinctive expression and character are derived directly from Nature's own formal language and elements, which make the building stand out from its surroundings and blend in with nature's scenery at the same time" (Archdaily, 2013). The distinct characteristic of the building- the 'graphic' strength of the timber structure and the visual reference to trees and branches- acts as a matrix for logos, communication elements, media and guiding landscape elements in order to create an appearance and a guiding concept which tie landscape, building and user experience together in one consecutive story.

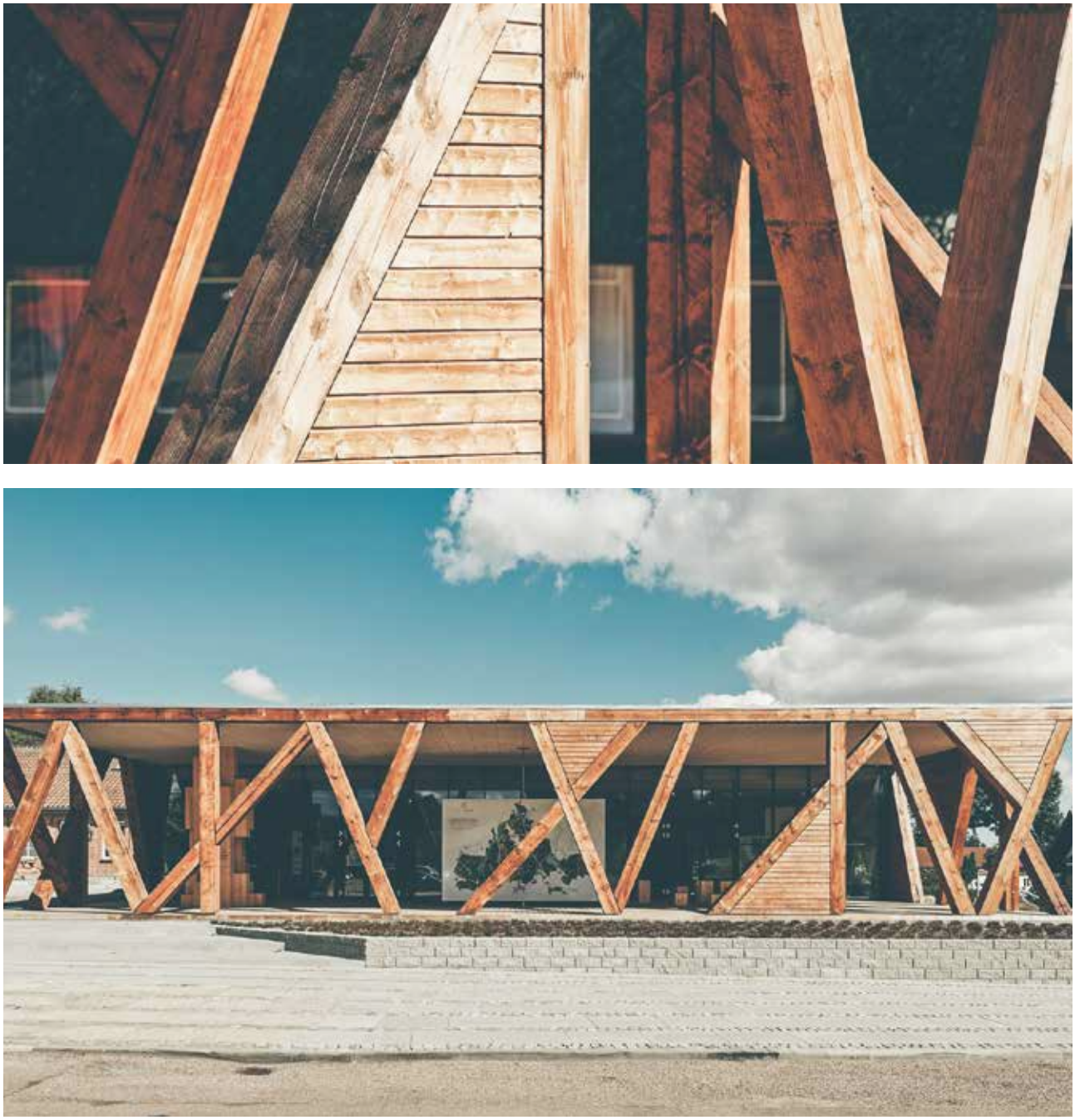


FIGURE 2.7

Biomimetic Precedent: RebildPorten, CEBRA, Denmark 2015. (Archdaily, 2015)

Biomemetic Precedent

RebildPorten, CEBRA, Denmark 2015.

2.5 BIOMIMICRY

Biomimicry is the bridge between biology and design that provides the path to measuring the **beneficial services** provided by the local ecosystem to influence the built environment to do at least as well (Benyus, 2002: 12). These insights are derived from an understanding of how nature works. Biological elders within local ecosystems, whether plants, insects or animals know how to be sustainable and even more importantly have learned how to do it in context. Biomimicry suggests that the best ideas are not ours, but have already been invented in natural living systems.

Within the built environment, biomimicry is in most cases applied to how we **design services and implement materials on a detail level.** Every ecosystem provides ecosystem services and if we **emulate nature's genius,** it can challenge the way we design buildings to meet and even exceed the level of ecosystem services that the local ecosystem in that biome provides. Strategies of how biomimicry (Benyus, 2002: 10) can be approached on a building and detail scale of design will be delimited in the Technical Development chapter.

FIGURE 2.8
Principles of Biomimicry
(Biomimicry Group, 2013)

Natural principle

Design principle

SURFACE TREATMENTS

PASSIVE COOLING

MOVEMENT OF WATER

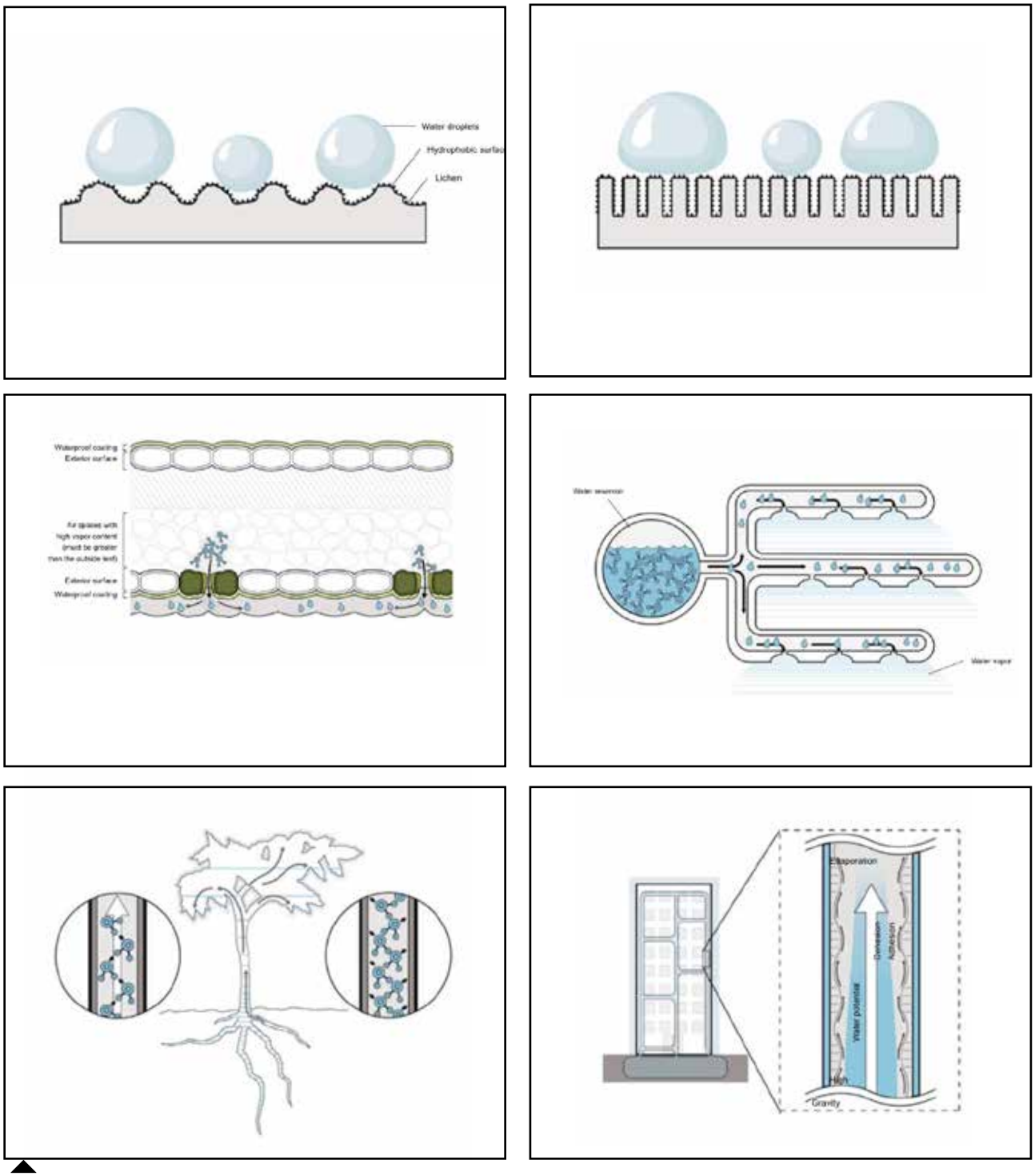
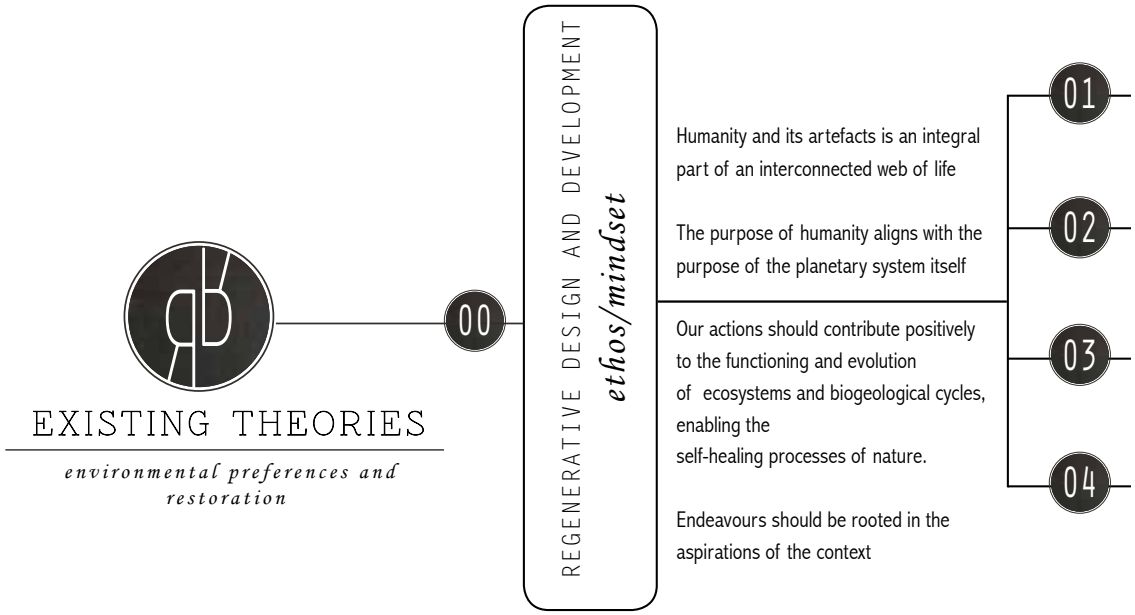


FIGURE 2.9

Services technologies inspired by natural service principles (Biomimicry Group, 2013)

2.6 SUMMARY

THEORETICAL DESIGN FRAMEWORK



Regenerative design and development roots all proceding theories in an **'ecological paradigm'** that seeks to reveal the reciprocal balance that needs to exist between humans and nature as a whole. It is thus an **ethos** that can't necessarily propose formalistic attributes and strategies to achieve this reciprocal relationship, but it does **encapsulate the mind shift** in which true sustainability is embedded. **Bioremediation** then proposes strategies to implement on an **urban and site scale to restore and heal** natural environments of decaying states. **Biophilic design** then proposes **characteristics, strategies and attributes** that can formulate the design on a **building scale,** and also address how it links with aspects on a **site scale.** Finally, **biomimicry** supports interventions and the applications of nature's genius on a **services and detail scale** that will support the overall functioning and management of a building in the truest sustainable manner possible. All these aspects that influence the design on different scales and levels will be translated into form-giving cues in relevant chapters, and **will guide the process of designing a building that seeks to heal nature and humans equally,** and restore the disconnected relationship between them to one of reciprocity. The following diagram is a synergized framework in which the design will be embedded.

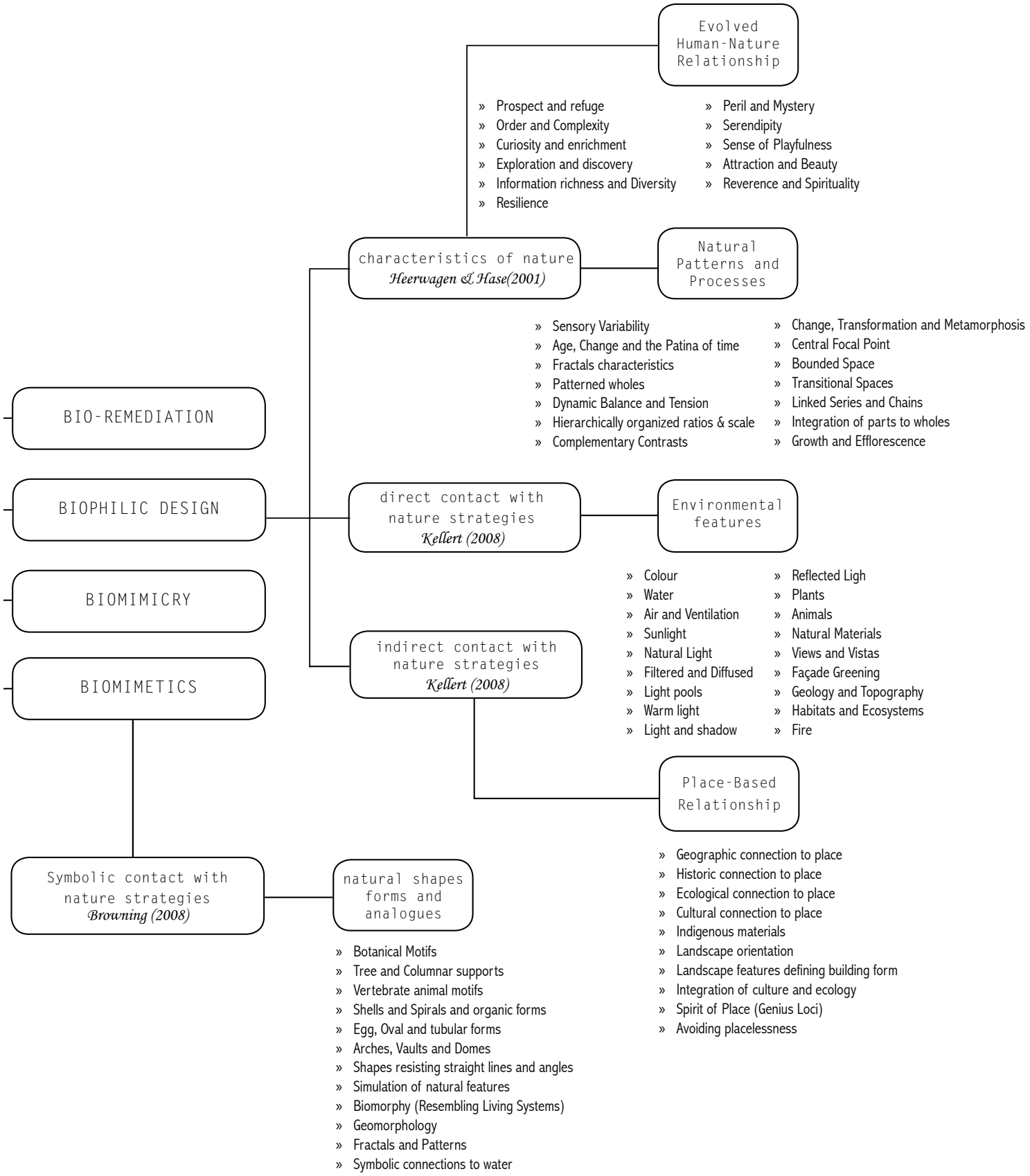


FIGURE 2.10

Theoretical Design Framework.

(Author, 2016)