

8 / CONCEPT

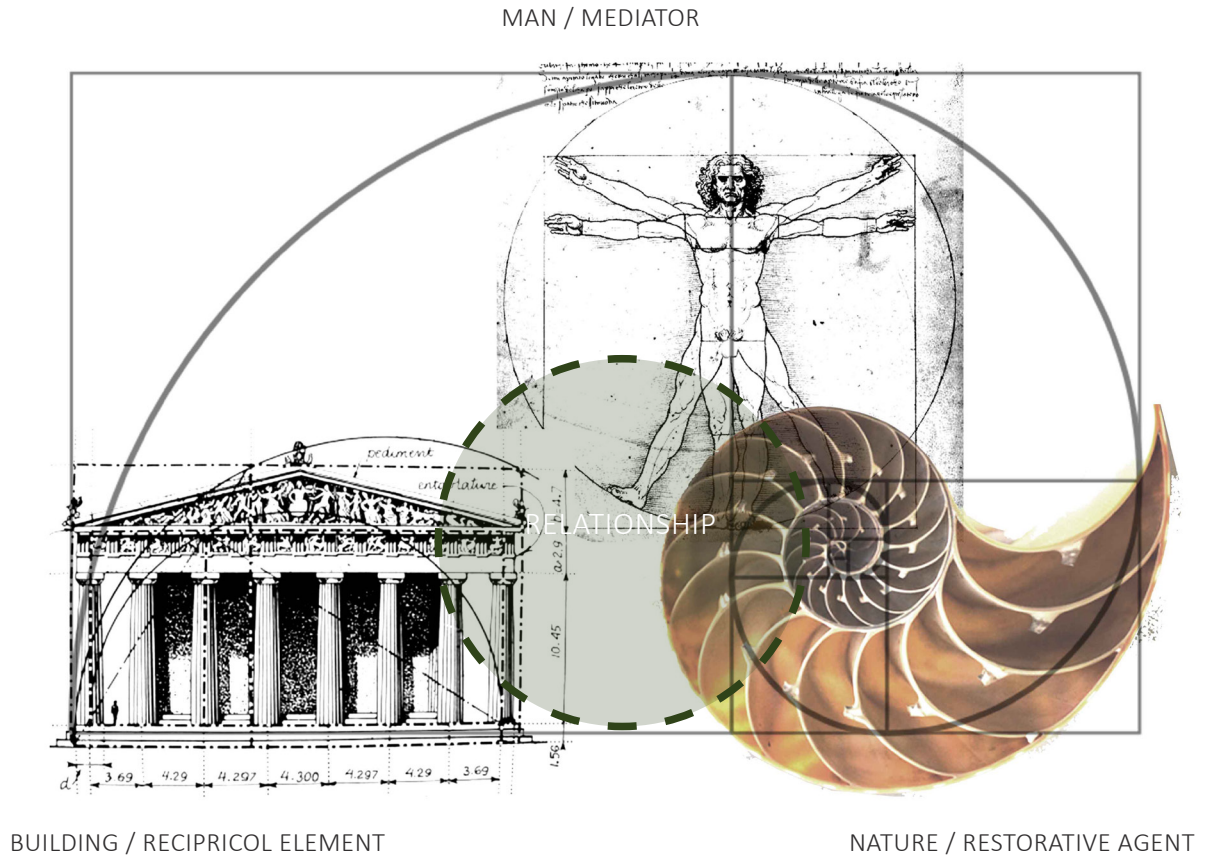
9 / DESIGN

DESIGN DEVELOPMENT

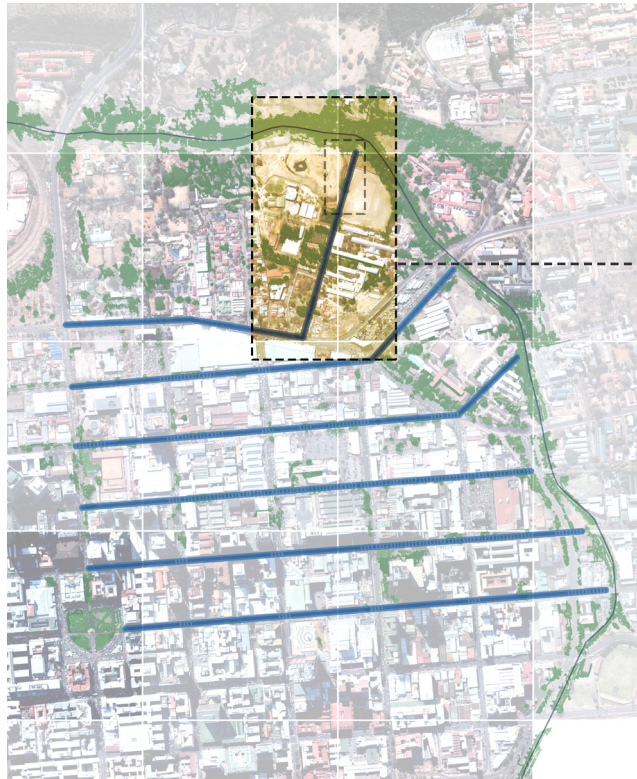
8 / CONCEPT

8.1 / INFORMANTS

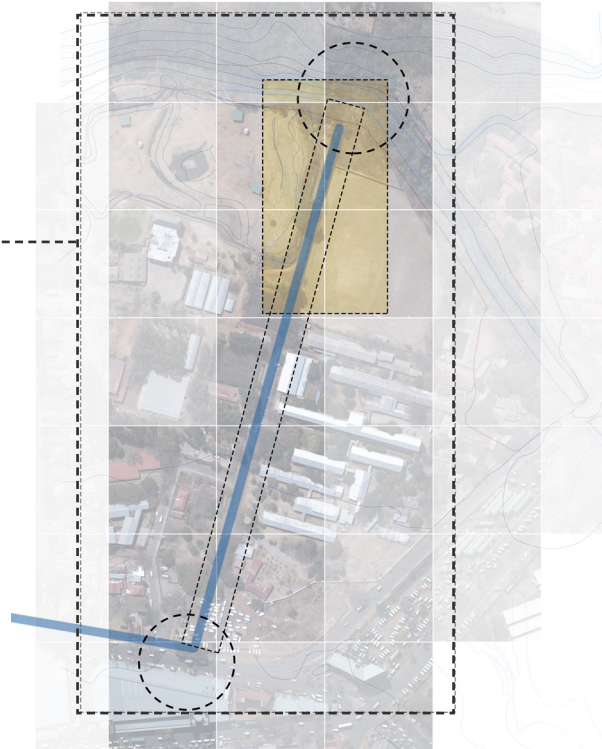
The design of the building was informed by aspects of the **urban vision, environmental strategies, regenerative theory, and programmatic factors**. The shift from conventional thinking to a co-partnered relationship between buildings and nature became a strong concept in the design development.



8.1_ The relationship between man, building and nature
(<http://www.soulsofdistortion.nl/images/vitruvia1.jpg>, <http://miguelmartindesign.com/blog/wp-content/uploads/2011/01/figure7.jpg>, edited by author, 2015)



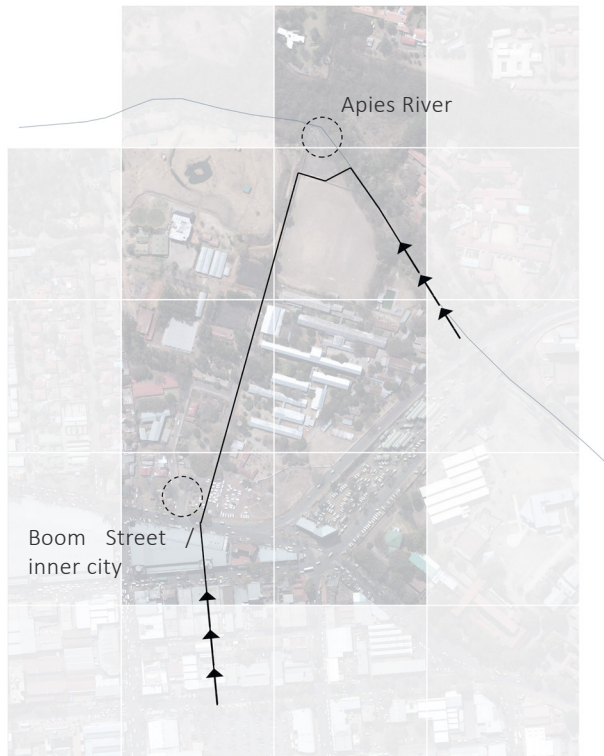
8.2 _ Diagram of Water channels leading to proposed site from group framework as an important informant (Author, 2015)



8.3 _ Proposed site, showing proposed water axis cutting through the site (Author, 2015)

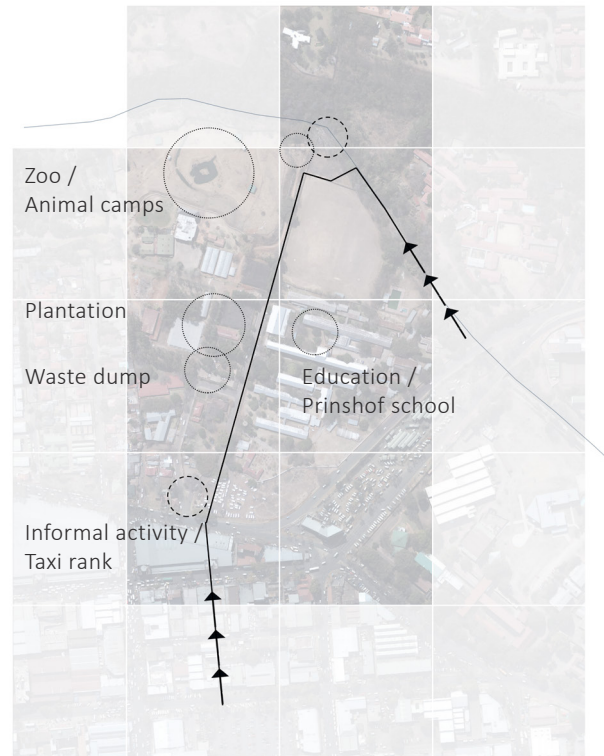
8.1.1 URBAN VISION /

The larger impact of the urban vision is the water channels, which collect and clean water from the city's hard surfaces, so that water runs into the Apies River in a cleaner state than its existing condition. The concept of "giving life back to the Apies River" is utilized. It also serves as an introduction to the proposed project site, where one of these water channels runs through the site to get to the Apies River. A strong axis line between the city and the Apies River is created, from which the building can develop.



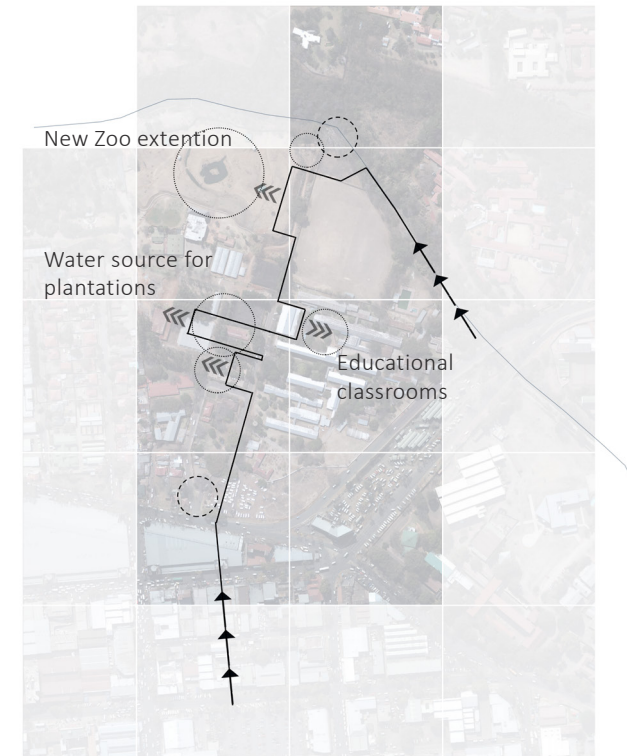
8.4 _ Diagram, connection axis between Apies River and city (Author, 2015)

This diagram illustrates the connection between the city and the Apies River. This connection forms a strong axis line from which the building can be formulated.



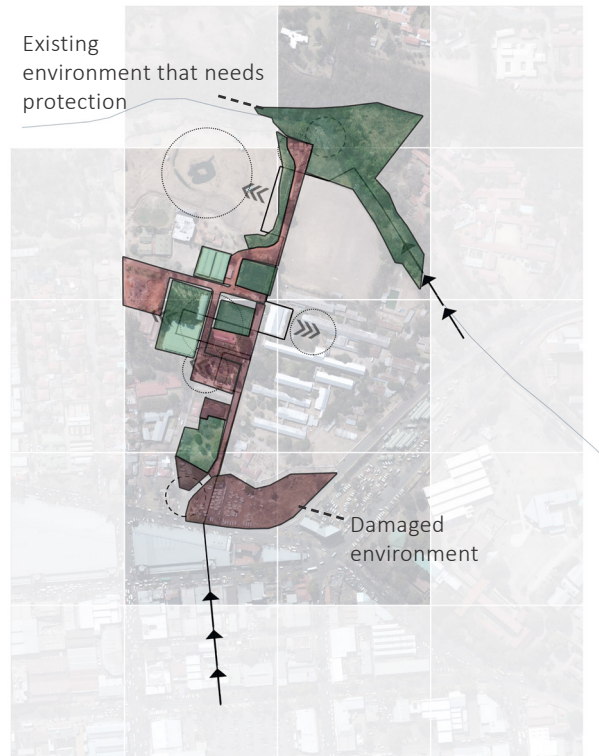
8.5_ Diagram, Existing site informants (Author, 2015)

The strong axis line runs through existing programs and functions. These existing programs influence the project in its functionality, as well as the way the new building responds to the surrounding environment. The response from the building needs to influence existing programs in a positive way.



8.6_ Diagram, Existing informants implications (Author, 2015)

The response of the new water axis to existing programs must enhance that which is pre-existing. The existing functions must benefit from this new insertion of the project.

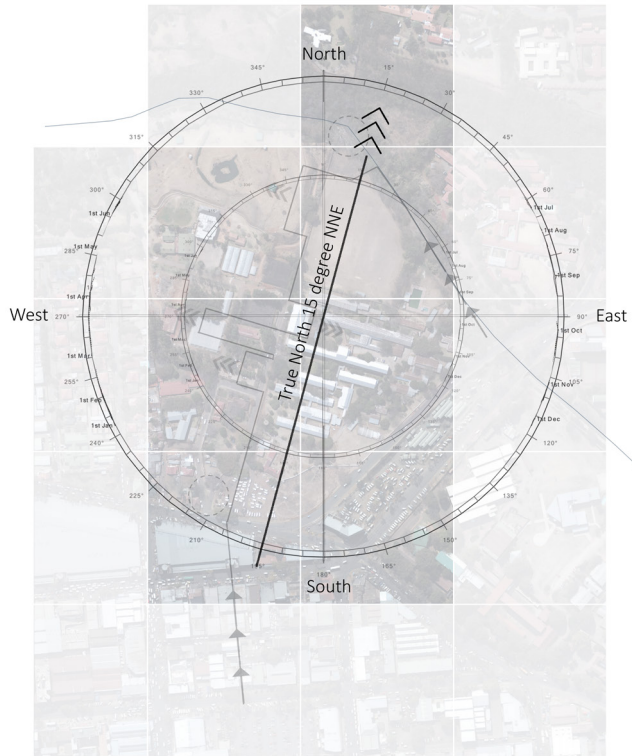


8.7 _ Diagram, conclusion of Eco-Mapping, condition of existing habitats (Author, 2015)

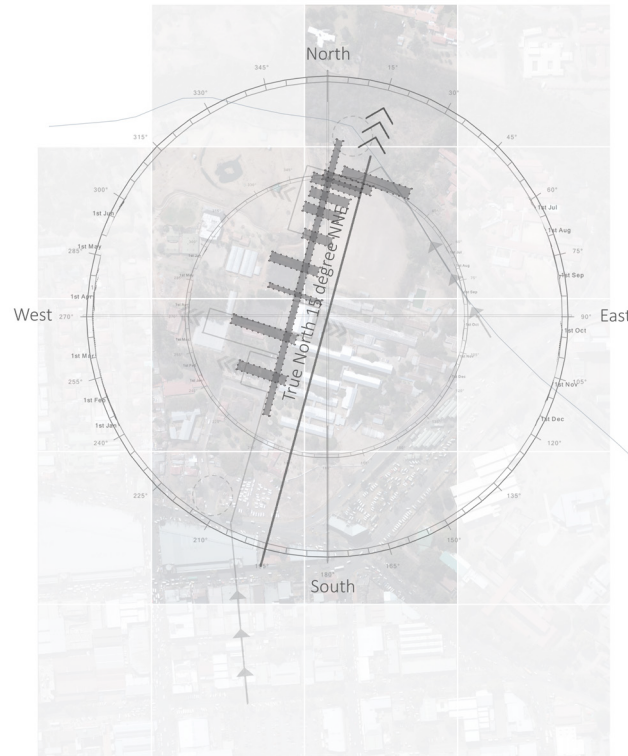
8.1.2 ENVIRONMENTAL FACTORS /

The placement of the new building resulted from the characteristics of the site (revealed in Chapter 5) and the conclusion of the Eco-mapping (showing the more sensitive environments and already destroyed habitat environments). The sun factor influenced the orientation of the building, with the larger façade designed for maximum sun exposure. The slope of the site towards the Apies River influenced the organization of water channels, water storage and roof angles. The site also requires a zone that is left undisturbed by human activities to allow nature the opportunity for continuous growth and expansion of the natural ecosystems that insects and other species inhabit. This zone is located at the northern edge of the site; where the site converges with the Apies River. The building is designed to gradually merge with nature.

The conclusion drawn from the Eco-mapping in the previous chapters shows the environmental response on this axis line. It clearly indicates destroyed habitats and habitats that need to be conserved.

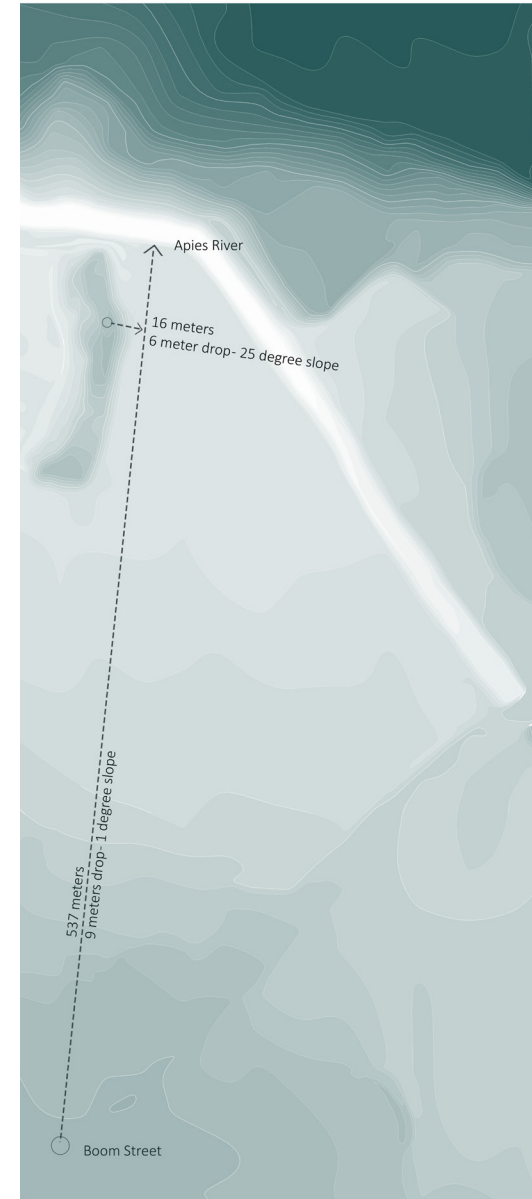


8.8 _ Diagram showing true north
(Author, 2015)

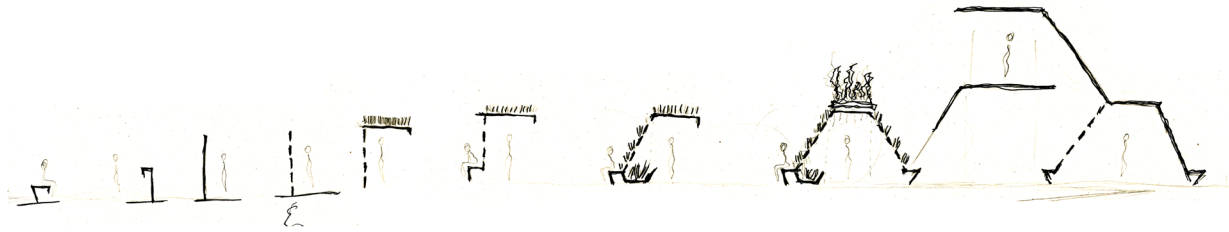


8.9_ Intuitive placement of building
orientated to true north (Author, 2015)

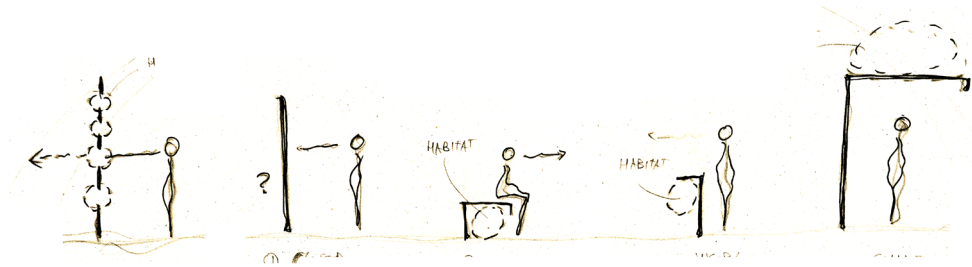
A principal environmental aspect considered of the building was the response to the environment in terms of placement and orientation.



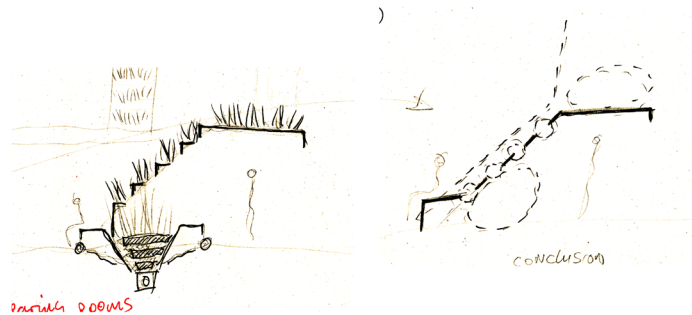
8.10_ Contour sloping from
Bloed Street to the Apies
River (Author, 2015)



8.11_ The different wall progression possibilities to create spaces with walkways and seating (Author, 2015)



8.12_ Different possibilities of a "wall" (Author, 2015)



8.13 _ Potential habitat spaces, with water channel and growing plants (Author, 2015).

The “Living-wall”: waterways should not be limited to gutters or pipes, but should rather be explored in the introduction of wetlands and buffer strips that hold ecologically functioning habitats (Yeang, 2008: 131). The water channel that intersects the site becomes part of a ‘living-wall’ or a ‘bio-wall’. Here water is cycled through a wall or supporting structure with the assistance of photovoltaic panels. It accommodates a growing medium that allows plants to grow on the wall, either using creepers or normal plant boxes. The purpose of this wall is to create both an awareness of the possibilities of water and habitats for bird life or insects. The wall structure can then become usable for the people in the area, through the creation of walkways, viewpoints or seating, depending on what is required. This wall conceptually becomes part of the proposed building, where it changes to adapt to the building’s program requirements. Waste water from the buildings is also collected ‘in’ the wall where filtering and cleaning takes place using John Todd’s Eco-Machine.

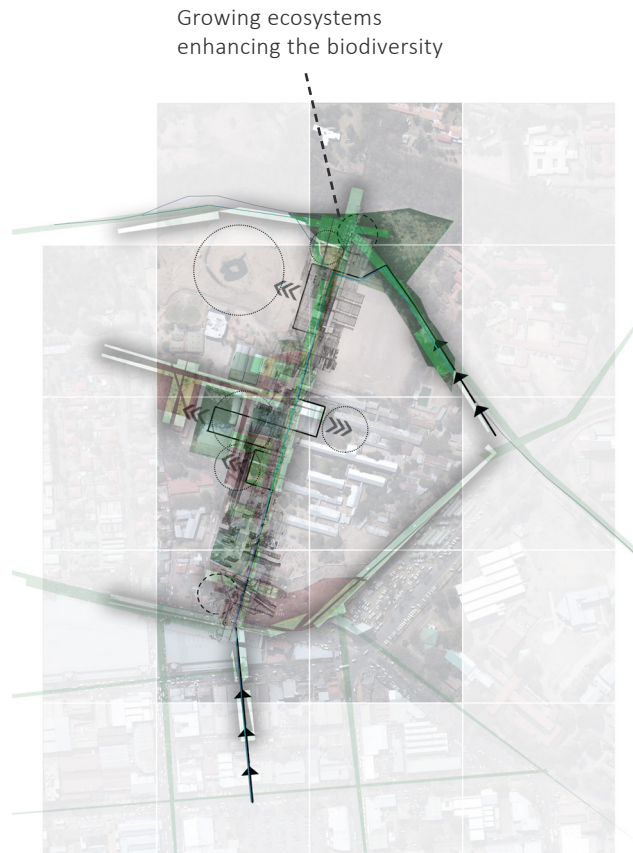
8.1.3 REGENERATIVE THEORY /

Regenerative Theory is defined as the relationship between humans and nature that creates a mutually beneficial environment in which to co-exist. Architecture should have a reciprocal relationship with nature.

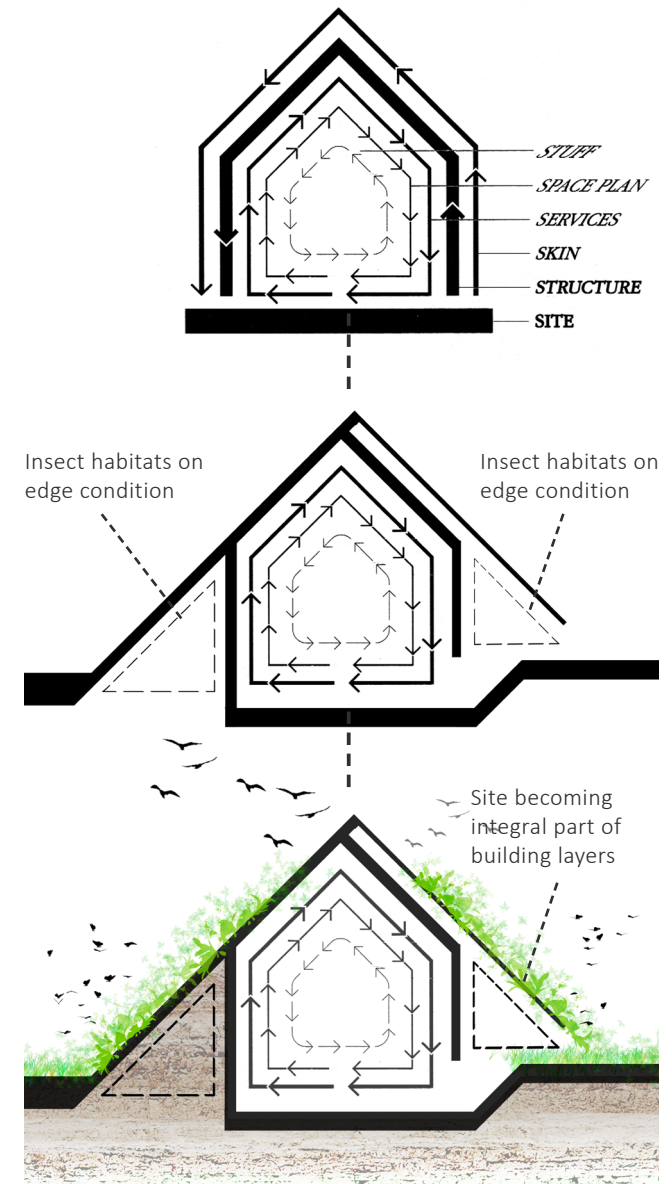
Image 00; The regenerative approach to design on the site is the identification of damaged and non-damaged habitats. The response is to restore the damaged ecosystems by creating new ones and to enhance the already existing ecosystems.

Steward Brand's 6 'S' approach can be utilized to create new habitats or enhance existing ones. It can be adapted to combine the 'site', 'skin', 'structure' and 'services' into one element. Thus, the building's skin becomes the reciprocal element between humans and nature. The form, shape and slope of the building skin/ roof are crucial elements in creating this relationship with nature. A few questions arose: how does the roof use rainwater? How can the skin adapt to natural elements? How can it become a habitable space for both humans and insects?¹

Vegetation on the building; the green spaces between the buildings; and plant life for the surrounding habitat all form part of an interconnected ecological nexus, which is the principle of an eco-design (Wells et al, 2010: 13).

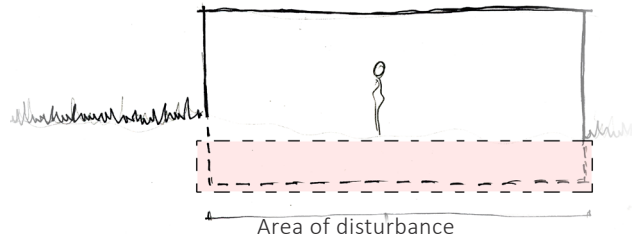


8.14_ Diagram illustrating the vision of the growing ecosystems (Author, 2015)

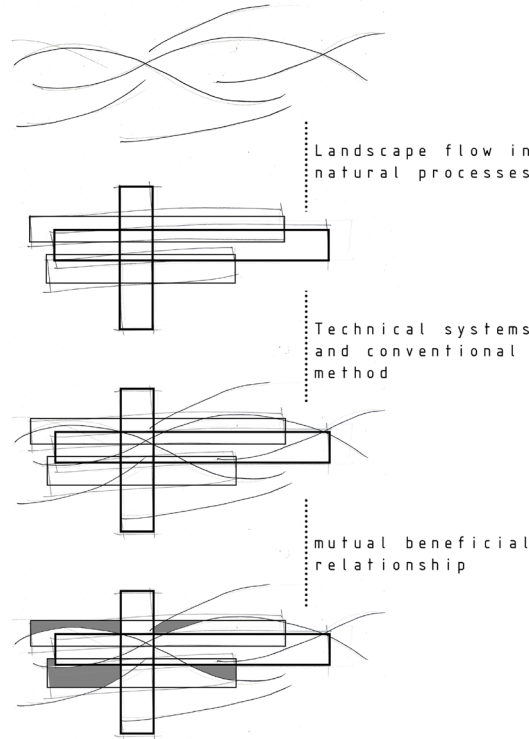
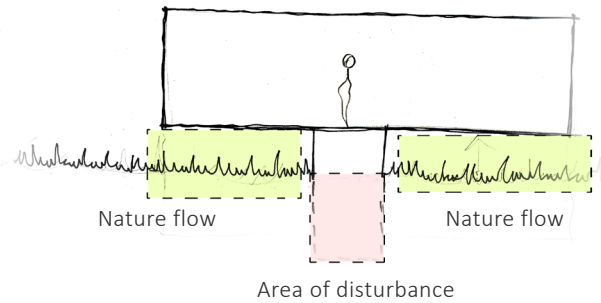


8.15_ Steward Brand 6 "S" adaption to integrate site (Brand, 1994: 13 edited by author, 2015)

¹These questions will be further developing in the design chapter



8.16_ Building elevated from ground to allow ecosystem flow on the site (Author, 2015)

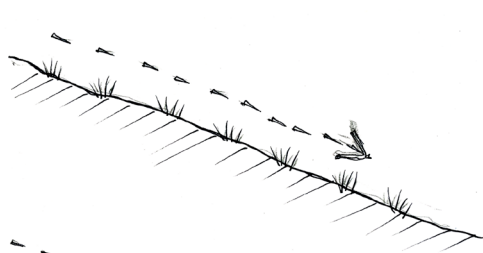


8.17_ Diagram, finding a balance between structure and the natural flow of the environment (Author, 2015)

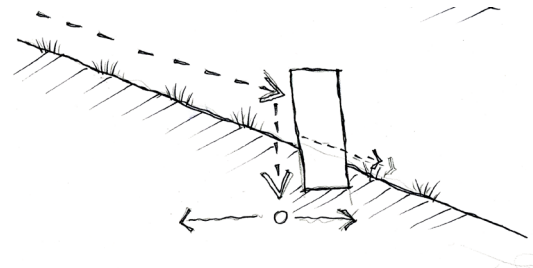
8.1.4 ARCHITECTURE

The study of Regenerative Theory led to the development of architecture where the relationship between buildings and site become very important. The architectural approach would be to find the reciprocal element between the natural systems and the technical systems. This is done by creating an overlay of the two elements and finding a balance between them. Elevating the building allows the environment to continue naturally on the site as there is minimal disturbance on the ground. The slope of the skin that makes contact with the ground allows plants and creepers to grow, and expresses the notion of the building merging with nature; it conveys the idea that nature grows and becomes the building.

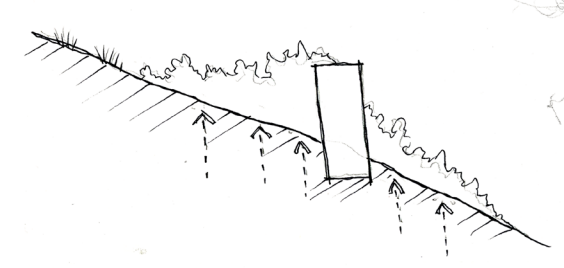
8.18_ From left to right; illustrating water flow from site creating a small ecosystem by adding structure (Author, 2015)



The site has a natural slope that permits water to flow over the surface, but does not allow it time to stop and seep down to create a water table.



By blocking the water flow on the surface of the slope, the water is given enough time to seep down and replenish the water table.



The stabilization of the water table provides vegetation enough time to grow.

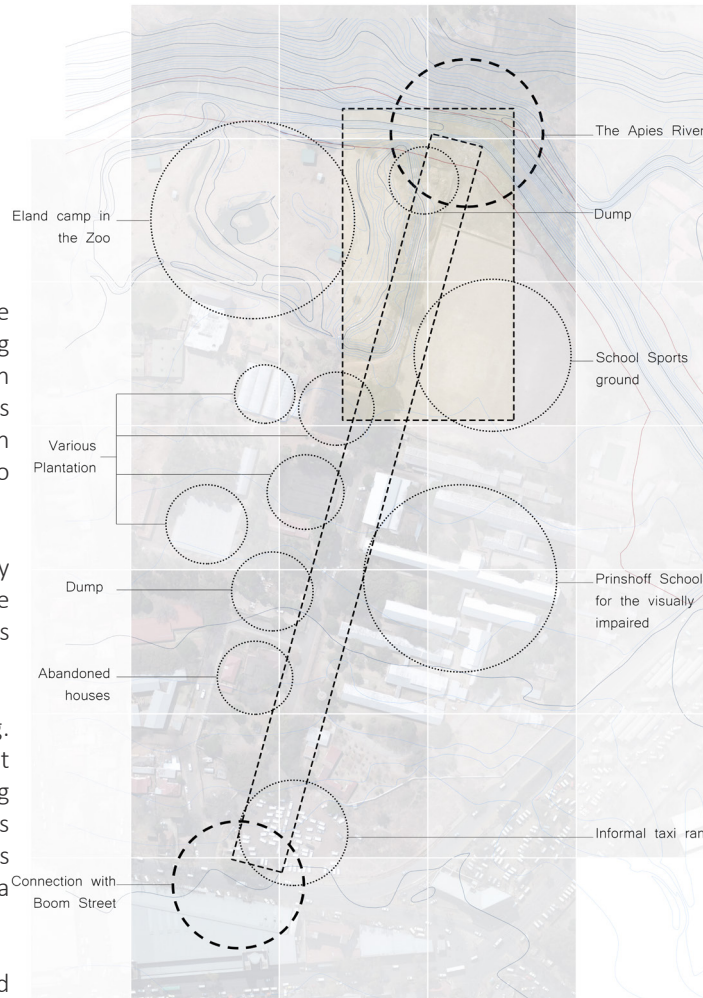
8.1.5 PROGRAM REQUIREMENTS

The program requirements became important in the layout of the building, which influenced the building design. The approach to the site requires an introduction to the function and program of the building. It is predominantly a public building because of its connection to the zoo. An administration building is thus required to control the access of people to the building.

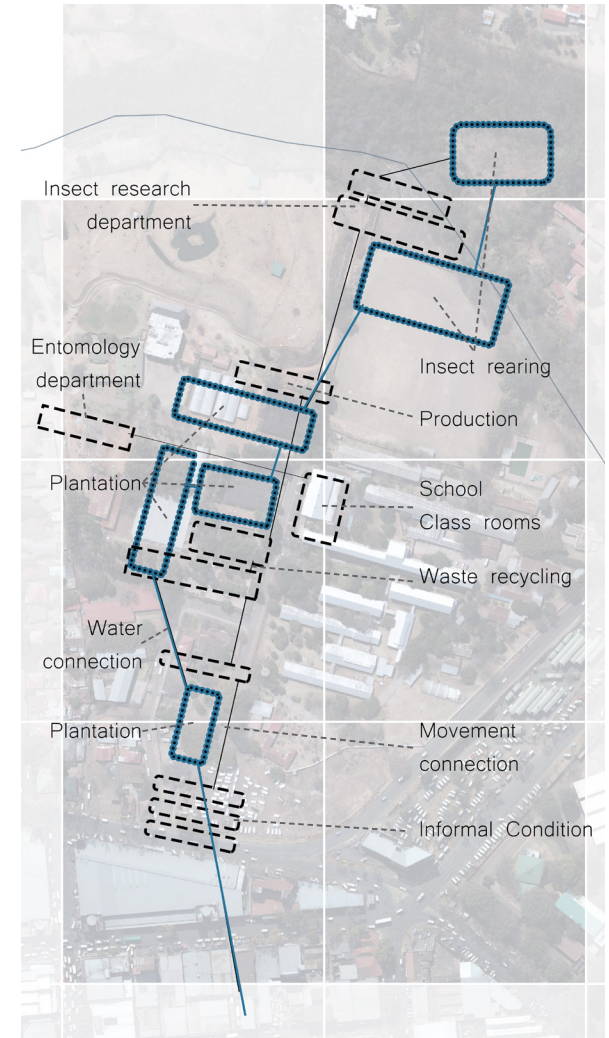
Therefore, the first building houses the entomology collection, a public library and a restaurant area. The information gathered from research in the laboratories is stored and viewed in the gallery and exhibition space.

The second building is the storage and deliveries building. No cars or delivery trucks are allowed beyond this point because of the natural zone. The purpose of this building is as repository of the facility's equipment and tools. As these are to be used often, there is a service route access to this building and deliveries to the restaurant area shares this route.

The third and last building is the main office and administration of the research facility. This is where the samples and insect species are gathered to be studied.

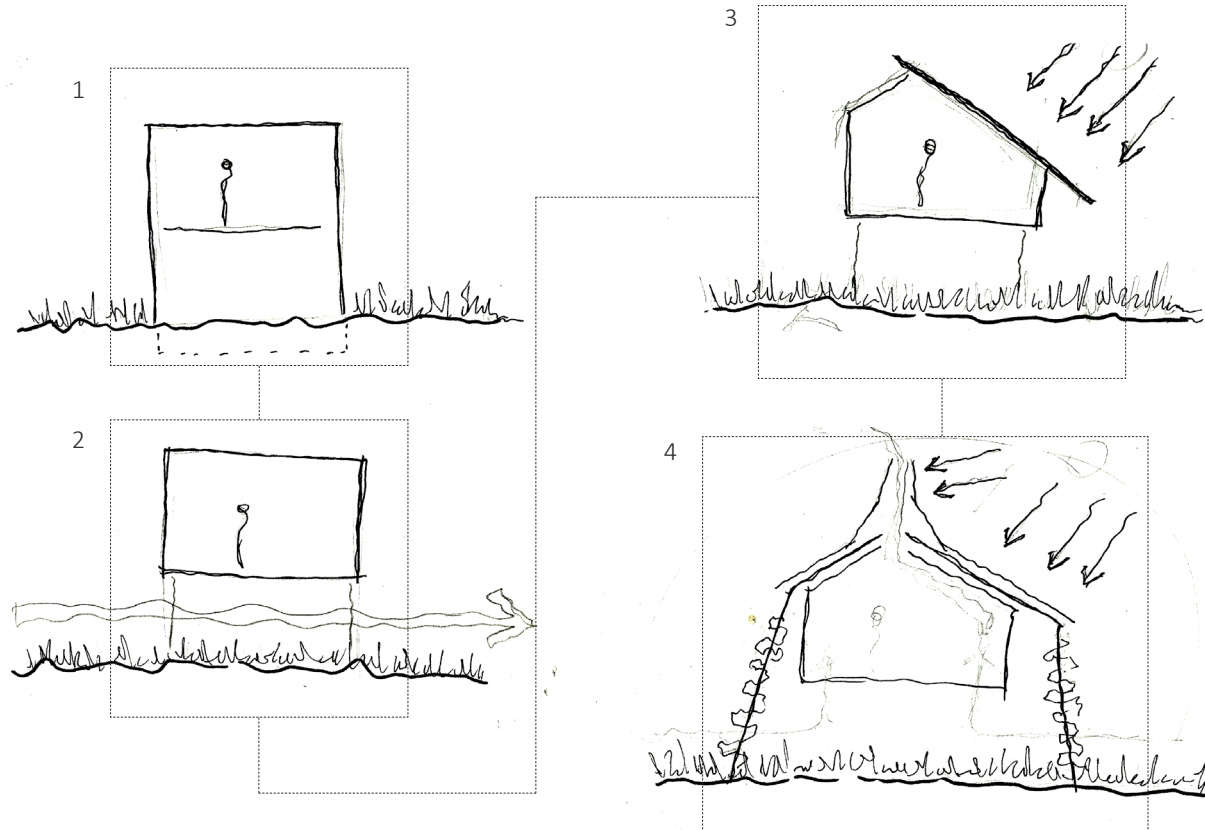


8.19 _ Existing Programs on site (Author, 2015)



8.20 _ Diagram, Water channel link influencing programs (Author, 2015)

This diagram reveals the implication of the new water axis and its functions and how it integrates with the existing programs; ensuring that a beneficial relationship is developed.



8.1.6 PASSIVE SYSTEMS

The basic shape of the building is informed by the climate. The pitch of the roof is angled for optimal sun exposure of the façade, enabling easy placement of photovoltaic panels for energy harvesting. It gradually slopes down onto the ground to maintain the concept of the building growing out of the site. To extract hot air from the building an outlet is requisite at the highest point in a building. The building is therefore shaped at an angle and the hot air flow rate is expedited by a solar chimney stack that extracts the hot air from the building. Rainwater is collected by gutters on the roof and delivered to the water channel axis route, which is situated on the western side of the building.

8.21_ Passive system informants; 1- Standard building orientated north, 2- Lifting the building from the ground allowing nature to grow, 3- Northern facade of the building slopes perpendicular towards the optimal sun angle, 4- The roof slopes down into the ground allowing the water to flow down and nature to grow on the side of the facade (Author, 2015)

8.2 / ARCHITECTURAL INTENTIONS / Creating habitat space

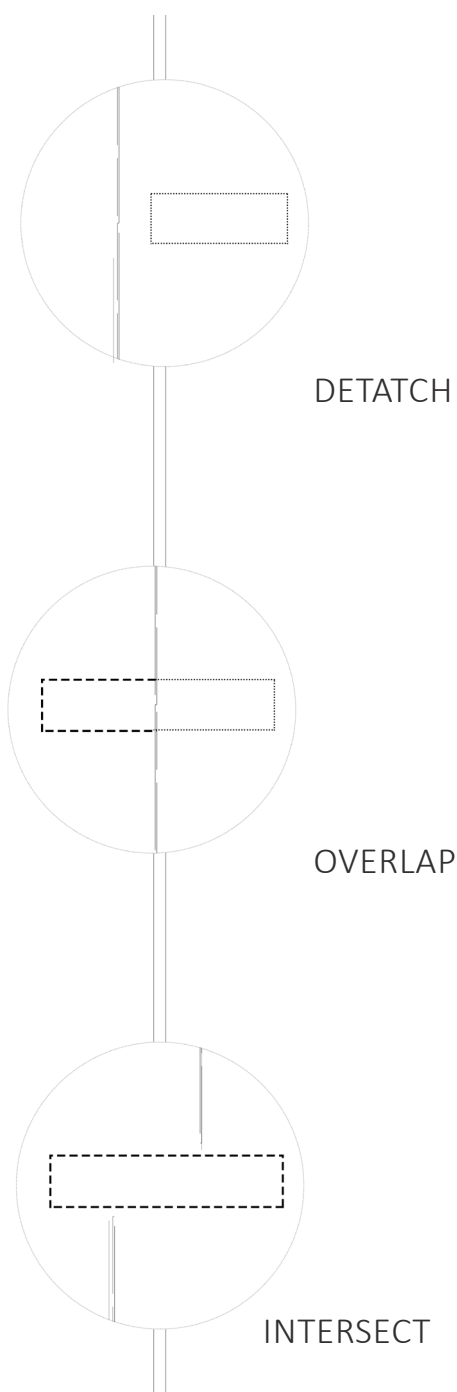
Creating habitable spaces for both humans and insects through the use of natural- and technical systems is the main focus of the building design. The use of plants on the building skin, operating as a sun shade to control the temperature inside the building, also functions as habitats for the insects. This development derived from the evolution of Steward Brand's 6 'S' layered principle to create an alternative building layer that is integrated with nature.

Transcending the simple way of just greening a building with a more biodiverse design calls for the use of diverse natural or semi-natural habitats in all aspects of the building design; nearby, on and within the building (Wells et al, 2010: 130).

The incorporation of the green infrastructure on the site with an artificial wetland, through the use of a water channel, allows the area to prosper as a natural habitat for a variety of wildlife and insects. It connects habitats across the landscape and permits animal and bird species to move freely (Yeang, 2008: 128). These continuous wildlife corridors connect larger areas with existing green spaces, creating new habitats.



8.22_ insect hotels, insect habitat architecture (<http://assets.inhabitat.com/wp-content/blogs.dir/1/files/2014/01/Bug-hotel.jpg>).



8.3 / CONCEPTUAL APPROACH / Shifting more into nature

The conceptual approach is an extension of the urban vision in that the water channel becomes the living wall that runs through the site. The buildings respond to the 'living-wall' and to the environment in three ways:

1. **BUILDING INTERSECTING** / The water channel that intersects the site represents the environment and ecosystems; the first building interrupts the ecosystems, thus illustrating the way humans perceive the ecosystems at first.
2. **BUILDING OVERLAPPING** / The second building still forms part of the water channel, but represents awareness that nature is a self-healing, self-regenerating entity; it therefore overlaps the natural flow of the environment.
3. **BUILDING DETACHING** / The last building is to the north of the site, which is zoned as the most natural area; it is released from the water channel and becomes integrated with nature.

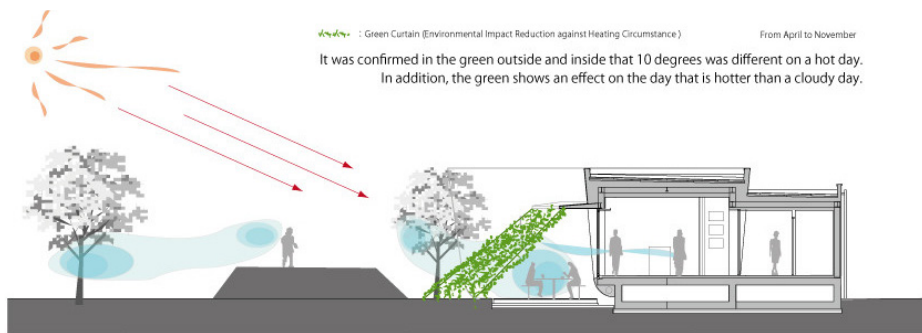
8.23_ Building responding to water channel axis
 (Author, 2015)

8.4 / DESIGN PRECEDENT STUDY

8.4.1 GREEN SCREEN HOUSE/ Hideo Kumaki Architect Office

Location: Saitama, Japan
Area: 130m²
Project Year: 2012

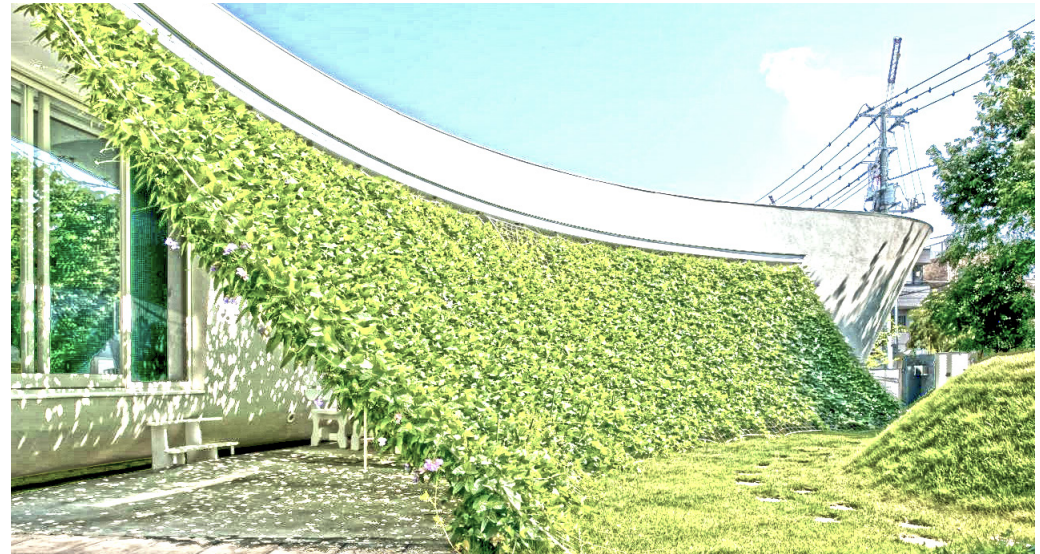
It is a minimalist house that deploys a green screen to protect the interior spaces from direct sunlight. The green screen functions for thermal comfort and reduces the electricity cost of air conditioning. According to Hideo Kumaki (Director of Hideo Kumaki Architect Office) there is a 10 degree difference between the inside and the outside of the house (Chang, 2012: 1). The relevance of this project as a design precedent lies in the fact that Kumaki used nature as a service device to create a comfortable space underneath the green façade.



8.24_ Diagram illustrating the passive design (<http://www.archdaily.com/421607/green-screen-house-hideo-kumaki-architect-office/521e4e27e8e44ed7fc00003a-green-screen-house-hideo-kumaki-architect-office-diagram> edited by author, 2015)



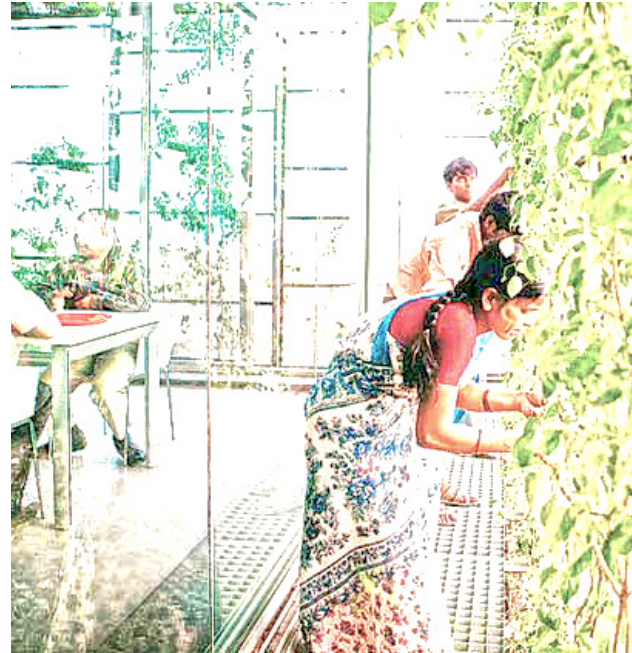
8.25_ Interior view towards outside green screen (<http://www.archdaily.com/421607/green-screen-house-hideo-kumaki-architect-office/521e4d5de8e44ef64000003d-green-screen-house-hideo-kumaki-architect-office-photo> edited by author, 2015)



8.26_ Exterior view of the green screen (<http://www.archdaily.com/421607/green-screen-house-hideo-kumaki-architect-office/521e4d8ce8e44ef64000003f-green-screen-house-hideo-kumaki-architect-office-photo> edited by author, 2015)



8.27_ Exterior view of the outer skin green facade
(<http://rmaarchitects.com/architecture/kmc-corporate-office> edited by author, 2015)

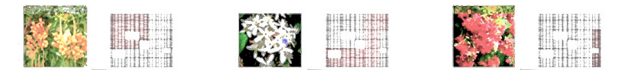
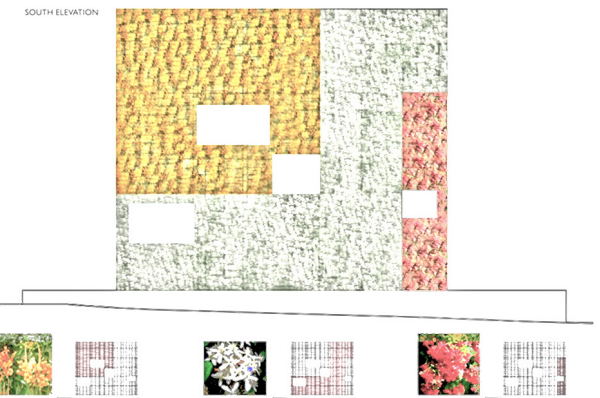
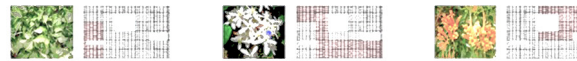
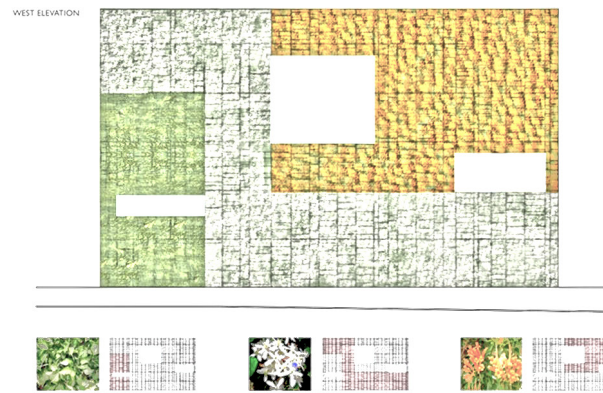


8.28_ View between the building and outer skin
(<http://rmaarchitects.com/architecture/kmc-corporate-office> edited by author, 2015)

8.4.2
KMC CORPORATE OFFICE/ RMA Architect

Location: Cyber City, Hyderabad, India
Project Year: 2012

The architects adapted the use of a double skin for a corporate building to save energy and to be visually striking. The outer skin of the building contains a custom casted aluminum trellis with hydroponic trays that contain growing medium for a variety of plant species. The inner skin is reinforced concrete frames with typical aluminum windows (Archdaily, 2013). The façade of this building serves an aesthetic purpose as its abundant plant species bloom in the various seasons. The façade hence changes in color depending on which season it is.



8.29_ Elevations designed with plant palette patterns
(<http://rmaarchitects.com/architecture/kmc-corporate-office> edited by author, 2015)