

# true colours of green

Engaging architecture with nature and society with sustainability...

Expressing a transforming contemporary green culture





*I, Lomile Mokoka [0309101k] am a student registered for the course Master of Architecture (Professional) in the year 2010. I hereby declare the following:*

*I am aware that plagiarism (the use of someone else's work without permission and/ or without acknowledging the original sources) is wrong. I confirm that the work submitted for assessment for the above course is my own unaided work except where I have stated explicitly otherwise. I have followed the required conventions in referencing thoughts, ideas, and visual materials of others. For this purpose, I have referred to the Graduate School of Engineering and the Built Environment style guide. I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my unaided work or that I have failed to acknowledge the source of the ideas or words in my own work.*

.....

Lomile Mokoka

.....

Date

*This thesis is dedicated to my family; mama, papa, Neo and Kgo. I love you and thank you for your unwavering support. It wouldn't have been possible without guidance from the following people: Dr Daniel Irurah, thank you for your insight and for pushing me to do better. The Activate Architects team, especially Michael Magner, thank you for your constant support. Nick Plewman and the Nicholas Plewman Architects team for your input and assistance. Thank you Qefate for your creative input and for keeping me sane; and Bakang for your support. Finally Gerald Chungu, thank you for your encouragement and always being available to assist me.*

investigation

|                                                  | Page |
|--------------------------------------------------|------|
| Methodology.....                                 | ii   |
| Abstract.....                                    | iv   |
| Introduction.....                                | vi   |
| Chapter 1: The fragmented profession.....        | 1    |
| The bifurcation in the architectural profession  |      |
| The different fragments                          |      |
| Chapter 2: The architectural profession.....     | 10   |
| Understanding architecture                       |      |
| What is good architecture?                       |      |
| Chapter 3: Communication in architecture.....    | 22   |
| How architecture communicates                    |      |
| Chapter 4: Sustainability.....                   | 32   |
| Understanding sustainability                     |      |
| The importance of sustainability in architecture |      |
| Sustainability practices and tools               |      |
| Chapter 5 Society.....                           | 50   |
| Society's values and cultures                    |      |
| Chapter 6: Summary.....                          | 63   |

# design

Page

68.....Chapter 7: Program

78.....Chapter 8: Context

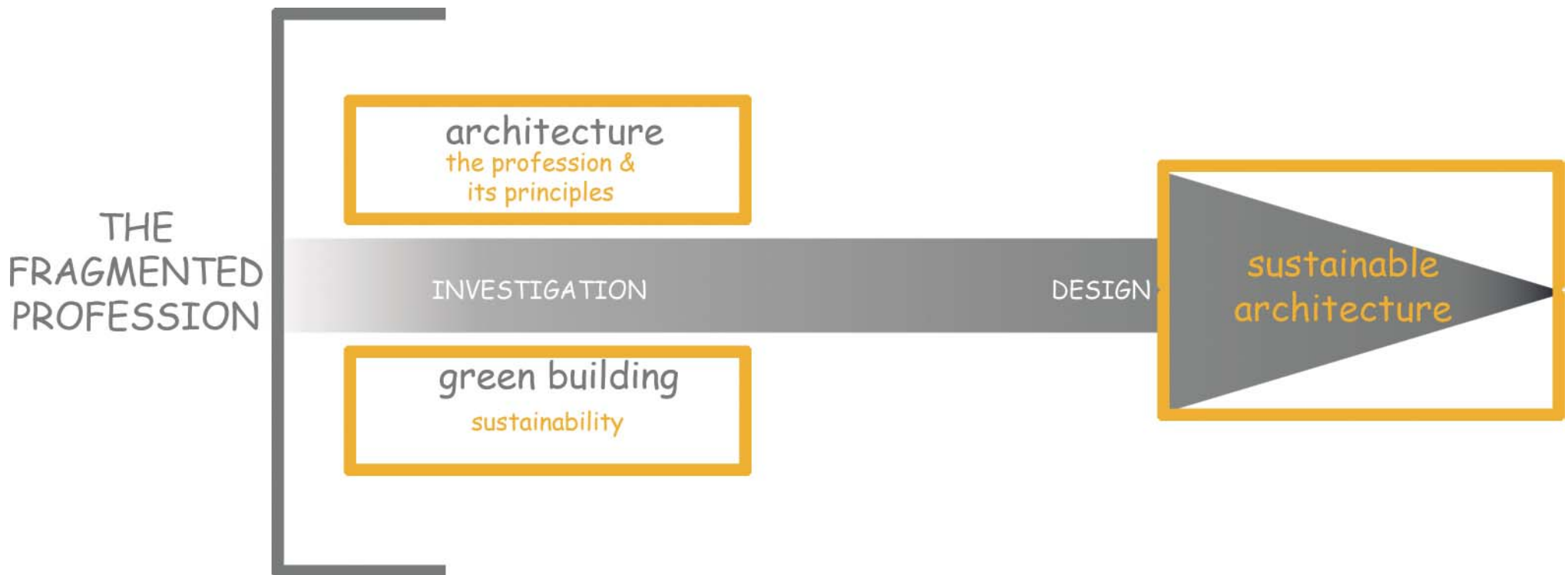
102.....Chapter 9: Design development

108.....Chapter 10: Final design

123.....Bibliography

## methodology

The strategy this thesis employs is to group green building theories into one category and award-winning architecture into another category in attempt to extract architecture's principles from the latter group and sustainability principles and strategies from the former group. This will then guide the design process of sustainable architecture.



Each chapter begins with an examination of different literature concerning the topic then proceeds to examine case studies in relation to the topic. The findings are then culminated with a conclusion.



MVRDV Architects, Herzog de Meuron Architects, Nouvel, J. (un-  
built). *The Search for the Image of the New Apartment Building*.  
(Cited 2010-10-24.  
[http://archidialog.com/2010/08/20/search-of-typologyimage-of-  
the-new-green-apartment-building/](http://archidialog.com/2010/08/20/search-of-typologyimage-of-the-new-green-apartment-building/))

The modernists believed in the heuristic of “form-follows-function”, loosely explained to mean that a building should take its shape and form from its program or intended use. The intention then was to unshackle architecture from its historical-style moorings and start manifesting a new order more attuned to the emergent industrial age of that time.

In the emerging practice of green architecture guided by green rating tools, “form-follows-performance” seems to be evolving as the new ethos. In the pursuit of recognition through maximum ratings under the green rating tools, some critical fundamentals of architecture seem to have been side-lined and has thus resulted in buildings which are an exhibition of green technologies or the characteristic “glass box” with no real cultural, philosophical or artistic meaning that architecture represents.

Green architecture does not have to become a division of the techno-science or a specialisation removed from architecture. Green architecture can be considered architecture, or even good architecture, when it embodies the principles that are embodied in good architecture such as spaces that inspire society as well as express contemporary culture through form and aesthetics.

This thesis is a study of communication and meaning in architecture in order to apply these principles in the design of a green building.



## Introduction

*“The practice of sustainable architecture is often described as one of trying to serve two masters within the fields of art and science respectively... The green elite are wary of co-option, yet unless they play the aesthetic game they will be excluded from the field. The art elite are secure at the core of the field, although unsettled by the realisation that if the game does not turn green then the field will turn brown” (Owen and Dovey 2008:9).*

This thesis is inspired by the emerging fragmentation in the architectural profession as architecture becomes the target for environmental reform which has brought about new concepts such as green architecture.

Green architecture is the physical manifestation of environmental responses in architecture (Dean 2008:25). It is often associated with the application of green technology to architecture to make buildings energy efficient and to manage their waste and resources more efficiently. These technological applications, to name a few, often come in the form of technical systems such as photovoltaic cells, solar panels, wind turbines and rainwater tanks. These solutions have evolved in response to the discourse within the environmental sciences which deduced that

the production and operation of buildings is largely responsible for the deterioration of the natural environment. This realisation has brought about the emergence of environmentally sustainable architecture. There are several different definitions for sustainability all of which resonate with the dictionary definition which is the capacity to endure. In the case of this thesis, sustainability will refer specifically to the long-term maintenance of well-being of the natural world, society and economy. Sustainability is grounded in the relative certainties of ecological science and has unsettled the architecture field because it has forced architects to produce new ways of thinking about architecture.

This has resulted in a bifurcation within the architectural profession with regards to aesthetics into two major groups of architects. The first group of architects, which I will refer to as ‘environmentally-driven’, value the quantitative aspects of green architecture which often manifests in buildings with a technological appearance. The second group of architects, which I will refer to as art-driven, prefer the familiar shapes and forms which stand for creativity without exposing any technological innovation in fear of being labelled environmentalists. Further research may reveal more ideologies and interpretations of green architecture.

Architecture as a tool of inquiry serves to communicate contemporary sociological issues as well as to facilitate a particular program. In both these cases of the art-driven and the environmentally-driven approaches, the architecture does a disservice to society because the environmentally-driven architects' exhibition of green technologies as an aesthetic tool could be unintentionally understood as implying that sustainability is a question of clever technology, while the art-driven approach to conceal environmental technologies could unintentionally serve to assuage people's unease about nature.

My thesis is an investigation into communication and meaning in architecture in the wake of environmental sustainability with the aim of bringing about a resolution between the competing ideologies of the environmentally-driven architects and the art-driven architects. In light of the role of form and aesthetics with regards to society, I will attempt to bring about this resolution on a social dimension by using green architecture as a tool to engage society in environmental sustainability and communicate environmental sustainability to society; an important issue in contemporary discourse. Using aesthetics to contribute towards a sustainable society offers rewards to the art-driven approach as well as

the architectural profession as a whole because familiar forms and aesthetics are becoming untenable in the wake of environmental concerns. What does sustainability look like? What does culture look like? What does freedom look like? These are some of the questions architects are faced with when designing a building and attempt to express them in the building's form and aesthetics. These questions are often answered in many different ways which are usually unique to a particular project. I plan to use aesthetics, form and technology to express and provoke society's awareness of environmental sustainability. The end result for my thesis will be an understanding of how form, aesthetics and technology can be used as sociological tools in the pursuit for sustainable architecture.

Architect Mick Pearce has successfully achieved a 'middle-ground' between green architecture and architecture which is driven by concepts and is aesthetically provocative. An example of his success in achieving this middle-ground is Council House Two in Melbourne Australia. Case studies of his work will be an investigation into his approach, his concepts, their impact or contribution to society and if this methodology can be applied globally. Other architects such as Sauerbruch Hutton,

who use polychromy to express environmental sustainability, offer valuable insight into the study of sustainability, aesthetics and society.

My chosen program is a public building such as a library, because of its symbolism as an information store-house as well as for the reason of the shortage of libraries in schools throughout the country. I have chosen to design a new library instead of retrofitting an existing library due to the constraints of already existing design decisions that impose specific form and aesthetic propositions and may require more energy and resources to change thus defeating the purpose of making it environmentally sustainable and aesthetically provocative. An aesthetically provocative building requires maximum exposure in order for it to be appreciated by a bigger audience on a site where it will be used by those who most require its program.

This investigation comprises of two parts. The first part, Section A, of the investigation will comprise of literature and case studies in each chapter to formulate a design tool in each chapter and will be carried out as follows:

#### Section A:

1. Chapter 1 will discuss the fragmentation in the profession and the resultant aesthetics. This chapter seeks to gain an under-

standing of the reasons for the fragmentation and the ideologies on which they are based.

2. Chapter 2 will seek to define the concept of architecture. I will source and discuss architecture's aims, the architectural profession and what good architecture means.
3. Chapter 3 investigates architecture as a tool of communication and how this has been successfully achieved.
4. Chapter 4 defines sustainability and investigates its impact on the built environment. This chapter also interrogates tools that have been put in place by authorities within the built environment in response to the ecological crisis.
5. Chapter 5 interrogates architecture's target - society. What their role is in architecture's production and operation and how society would be able to gain awareness of sustainability through architecture.
6. Chapter 6 summarises the findings and clarifies the approach to the new design.

#### Section B

This section will then convert the tools extracted from section A and use

them as design strategies as follows:

1. Chapter 7 discusses the library as a program for provoking sustainability awareness and identifies the ideal platform or site. This chapter addresses the triple bottom line: people, planet, profit and how these three issues will be addressed in the new design. Technical strategies for achieving environmental sustainability will also be explored.
3. Chapter 8 begins the design process and identifies ways of communicating the sustainability message to the Berea community in terms of metaphors.
4. Chapter 9 is an in depth analysis of the design development and considers all aspects of the design from the concept to the technical resolution.
5. Chapter 10 will conclude the study.

# chapter 1

## what is the issue?

*Sustainable architecture, it can be argued, does not rigorously form part of architecture as a discipline. Rather, it is a concern in the building construction industry as a whole and given the dominance of construction techniques and building subsystems, it should be considered a part of civil engineering as a discipline...*

Wikipedia. 2010. Sustainable architecture. (Cited 2010-08-15. [http://en.wikipedia.org/wiki/Sustainable\\_architecture#Social\\_sustainability\\_in\\_architecture](http://en.wikipedia.org/wiki/Sustainable_architecture#Social_sustainability_in_architecture))

## The Fragmented Profession

### *The bifurcation in the architectural profession*

Architects' tacit knowledge of aesthetic practice has earned them the exclusive right to be called architects and gives rise to symbolic domination – “the power to frame the field or profession and to establish legitimacy within it” (Owen & Dovey 2008:9). It is this exclusivity and struggle for symbolic domination that is largely responsible for the fragmentation in the profession which is awakened by architecture becoming the target of environmental reform in the global quest for sustainability.

The boundaries between the field of architecture and the field of sustainability are relatively weak and often overlap. Architecture's exclusivity as a profession and how architecture is differentiated from mere

buildings is based on the profession being largely an aesthetic practice which depends on the architect's tacit knowledge of aesthetics. Sustainability on the other hand is based on scientific knowledge about the environment and is not a field with institutional boundaries but rather "a field of discourse and practice which straddles multiple professions and disciplines including architecture" (Owen & Dovey 2008:12). These weak boundaries between the two have left architecture vulnerable to co-option and have awakened the need by most architects to defend it against such co-option and maintain symbolic authority within the field of architecture. The tool that these architects use to defend the profession is based on aesthetics. They claim that sustainability is like a "text book" and architecture is like a "novel" with the former referring to architecture as an art and the latter to sustainability as a science (Owen & Dovey 2008:14). There's a tendency to marginalise architects who achieve legitimacy in the sustainability field. Owen and Dovey quoted one architect as saying, "There is a big stigma attached to being an ecologically sustainable architect in architectural circles, either you take architecture seriously or you take ecology seriously" (Owen & Dovey 2008:14). This statement clearly spells out a fragmentation in the profession but another was quoted as saying "My first product is a

work of architecture, it just so happens that I can explain it in terms of sustainability. I never want to be chosen for that; I want that to be part of the choice but I want to be chosen as an architect first". The second architect puts architecture above sustainability and does not want to be recognised for sustainability, this may have something to do with the stigma attached to sustainability as unattractive and a lesser achievement. Some architects wear the sustainability label as a badge of honour because they see the quest for sustainability as a moral obligation. These architects are of the mindset that aesthetics are far less important than preserving the natural environment. This view implies that 'green architecture' is less attractive than 'architecture' or that an aesthetic agenda shouldn't be a priority over sustainability.

### ***The different fragments***

In chapter 8, 'Environment', of Penelope Dean's PhD dissertation entitled 'Delivery Without Discipline', she expresses a deeper concern for the architectural profession that goes beyond the implications of sustainability practices on the aesthetics of buildings. She argues that the values that guide architecture as a sociocultural project have been marginalised in pursuit for sustainability through technology. "Sustainability

has become an overzealous building-science problem, one often devoid of disciplinary concern, and one that has begun to subsume architecture” (Dean 2009:25). She criticises Malaysian architect Ken Yeang’s research into bio-climatic skyscrapers which respond to tropical climate conditions through a combination of integrated vegetation in buildings, deep air zones and wind-leeward facades and various strategies that create environmentally interactive walls. She argues that Yeang’s design principles “expose technology reduced to a wall application and architecture to a specialisation indebted to climatology” (Dean 2009:26). She goes on to describe the views and strategies by William McDonough, co-author on ecologically intelligent design book *Cradle to Cradle*, as “marginalising architecture’s role as technological surfaces and performance criteria no longer serve the discipline per se, but rather the uber-category of ‘environment’” (Dean 2009: 26). McDonough’s strategy is to place explicit attention to the micro-technical properties of building materials and Dean argues that McDonough collapses architecture and technology into a veneer. His concern is, for example, for volatile organic compounds that might cause indoor air quality problems or multiple chemical sensitivity in its users.



Figure 1a: McDonough, W. GAP Headquarters, San Bruno, USA.  
<http://www.greenroofs.com/projects/>. Cited 30 May 2010.

Dean used the above two architects to motivate her view that “the problem engendered by the techno-science trajectory is one that has seen a dimension of architecture privileging applied scientific solution over sociocultural projection or formal innovation” (Dean 2009:27). Her solution is to re-visit architecture’s aims and ambitions before the introduction of technology for the pursuit of environmental sustainability. This “reorientation of architecture’s disciplinary concerns would seek to ask the politically incorrect question ‘What can green do for architecture?’ rather than asking ‘What can architecture do for green?’” (Dean

2009:27). Dean's premise to re-visit architecture's aims and ambitions aligns with this thesis' goals to re-align green architecture with architecture's goals to create environmentally, socially and economically sustainable architecture which doesn't compromise aesthetics.

In her 2007 article for the publication *Interdisciplinary Science Reviews*, Ursula Seibold-Bultmann discusses German and English architects Matthias Sauerbruch and Louisa Hutton's opinion of the consequences of sustainability on architecture. They believe that the profession has split into three aesthetic groups: the first group places emphasis on "quantifiable rather than qualitative aspects of building" (Ursula Seibold-Bultmann 2007:4) which is a result of rating tools such as BREEAM, LEED, Green Star and HQE. This group places no emphasis on beauty but rather aims to achieve the best environmental performance from the building. The second group prefers the familiar shapes which characterised modern architecture and unintentionally assuaged people's unease about nature. The third group of architects try to give their buildings a technological appearance that signifies progress and innovation. Sauerbruch and Hutton, on the other hand, have a different approach towards aesthetics. They operate on this premise: "Of what exactly is a building's appearance a symptom?" (*Interdisciplinary Science Reviews*, Vol 32, No

1 2007:4). Their approach to design aligns perfectly with architecture's aims to create actual and possible environments that stimulate the user and are aesthetically pleasing. Their buildings, such as the German Federal Environmental Agency in Dessau, are emblematic of "clean surfaces and often flowing volumes with sensuality, visual resonance and optical layering that aims at engaging the user to the point where he or she starts to react creatively to the experience of visiting or inhabiting them" (Ursula Seibold-Bultmann 2007:4).

Although they take full advantage of technical innovation, this approach, however, doesn't provoke the user on the concept of sustainability. Their aim is to create architecture which people will love and enjoy that is environmentally sustainable. They have employed technological innovations in the quest for sustainability but are against strategies such as biomimicry and claim that it is "pure chauvinism of feasibility" and an attempt to consolidate power over nature (Ursula Seibold-Bultmann 2007:5).



Figure 1b: Sauerbruch & Hutton. German Federal Environmental Agency. Dessau. <http://www.bruteforcecollaborative.wordpress.com>. Cited 30 May 2010.

life-cycle flexibility and cost-benefit analysis (Guy & Farmer 2001:142).

In their paper, *Reinterpreting Sustainable Architecture: The Place of Technology*, Simon Guy and Graham Farmer from the School of Architecture, Planning and Landscape in Newcastle Upon Tyne suggest that there are six different ideologies regarding sustainable architecture which are a result of contradictory certainties and interpretations of sustainability. The first ideology, called the 'eco-technic' is recognisable by its "modern, high-technology" buildings whose strategy is to use science and technology to solve environmental problems. This approach is practiced by architects such as Ken Yeang, Norman Foster, Richard Rogers and Renzo Piano. The success of this strategy is achieved in the numerical reduction of building energy consumption, material-embodied energy, waste and resource-use reduction, and in concepts such as



Figure 1c: Yeang, K. (2002 & 1994). Hitechniaga Tower & Nara Tower, Tokyo. <http://www.aiany.org-eOCULUS-newsletter-wp-content-uploads-2007-04-eddittower.jpg>. Cited 30 May 2010.

The second ideology is called 'eco-centric'. It is based on the idea that human beings are the custodians of the earth and extends moral considerations beyond anthropocentric concerns. The logic is that buildings go against nature and therefore are a contribution to nature's deterioration because a building's footprint prevents the interaction between sun, soil and water (Guy & Farmer 2001:142).



Figure 1d: Reynolds, M. (Mike Reynolds' own house in Taos New Mexico. <http://www.independent.co.uk/environment/green-living/earthship-enterprise-the-ultimate-ecohouse-869591.html>. Cited 30 May 2010.

An eco-centric building utilises low and intermediate technologies such as those employed in Mike Reynolds' work on domestic "Earthships" in

New Mexico. These self-sufficient homes are made from used tires, bottles and other waste material filled and plastered with earth.

The third ideology, eco-aesthetic, believes that "The solution to the environmental crisis requires a shift from utilitarian values to a view in which aesthetic and sensual values play a prominent role" (Guy & Farmer 2001:143). This premise expresses itself in buildings which express ecological models and prioritise the development of a new paradigm in the building arts above the physical performance of the building.

This new architectural language which will express current ecological conditions will be possible through advances in technology, building methods, structural advances and computer modelling.



**Figure 1e: Ghery,F. Hotel Marques de Riscal. [www.danmihalache.wordpress.com](http://www.danmihalache.wordpress.com). Cited 30 May 2010.**

“A language of building design close to nature, of twists and folds and undulations; of crystalline forms and fractured planes” (Guy & Farmer 2001:144) has its beginnings evident in the work of Frank Ghery, Santiago Calatrava and Future Systems.

The eco-cultural ideology is the fourth of the six ideologies that Guy and Farmer have identified. This ideology prioritises context and is based on the premise that “truly sustainable buildings need to more fully relate to the concept of locality and place” (Guy & Farmer 2001:144). To remain sustainable, humanity needs to respect the boundaries set by nature in the relevant bioregion. A bioregion is defined by “a combination of natural, biological and ecological characteristics and by a cultural context” (Guy & Farmer 2001:142). Traditional building forms are believed to be emblematic of the evolution of cultures and appropriate lifestyles which are adapted to their physical environment and need to be an example or inspiration for sustainable architecture. Examples of this ideology can be seen in the work of Glenn Murcutt in Australia and Hassan Fathy in Egypt.

The fifth ideology, the eco-medical logic, relies on medical certainties that link user health to issues such as air quality, water and urban space.

User health is conditioned by external environments and buildings imply a disconnection with nature and create artificial environments.



**Figure 1f: Murcutt,G. Magney House, Australia. <http://www.theage.com.au/news/house--home/murcutt-the-heavyweight/2006/12/05/1165080945902.html?page=fullpage>. Cited 30 May 2010.**

Chemical pollution from synthetic building materials and sick building syndrome are of critical focus.

This ideology believes that what is needed is healing environments, ones in which we feel balanced, relaxed and at one with the world – an architecture that can honour the senses (Guy & Farmer 2001:142). This ideology is exemplified by the work of Peter Schmid in the Netherlands,

Floyd Stein in Denmark and the Gaia group in Norway. Their work is characterised by the use of natural and tactile materials and traditional building methods utilizing organic treatments and finishes, natural light and ventilation.



Figure 1g: Gaia Group. Kvadraturen School. Netherlands. (1992). [www\\_gaiagroup\\_org-Research-TF-Norway-Slide1\\_JPG.mht](http://www_gaiagroup_org-Research-TF-Norway-Slide1_JPG.mht). Cited 30 May 2010.

The final ideology identified by Guy and Farmer has inspired communities such as the Findhorn Community in Scotland, Christiana Free City in Denmark and Arcosanti in Arizona. This ideology promotes a strategy of combining technical, aesthetic and social issues to provide architecture

or whole communities that facilitate a democratic society that uses appropriate technologies to meet their needs.



Figure 1h: Architect and location unknown. ( Cited 2010-05-30 [www.kakwaecovillage.com/development.php](http://www.kakwaecovillage.com/development.php))

This is derived from the premise that “human domination and degradation of nature arises out of social patterns of domination and hierarchy, patterns of social life in which some humans exercise control or domination over others” (Guy & Farmer 2001:142). It is when human beings have technological domination over nature or are more technologically advanced than other human beings that exploitation occurs and thus

non-sustainable environments are achieved. Renewable and recycled materials and especially local ones are used wherever possible to create the buildings and the architects adopt participatory design processes such as those utilized by Lucien Kroll in Belgium and Ralph Erskien in the U.K. or the self-build projects of Peter Hubner in Germany.

There are those architects who are disinterested in taking part in creating a sustainable environment. Gradually governments are enforcing policies and minimum environmental sustainability standards for buildings and these architects will be forced to join in and design sustainable architecture. What will inevitably happen with these architects is that they will design in a manner that they have always designed and later insert elements that are required by law in order to have their designs approved. One has to wonder if this, indeed, is architecture; one that does not take cultural concerns into consideration and does not inspire its society nor does it aspire to an ideal environment. The term 'green-wash' has been coined to describe the tendency to employ meaningless elements in an attempt to be labelled green.

These three papers have identified several competing ideologies regarding sustainable architecture which manifest in different aesthetics. Each of these ideologies have merit or certainties based on medicine, sci-

ence or other discourse and differ only marginally from the premise of this thesis. The premise of this thesis is based on the Brutlandt report for sustainability and does not seek to re-define sustainability. It does, however, seek to re-define green aesthetics. This thesis seeks to engage society in sustainability by using aesthetics to provoke interest on the topic with the aim of making the first step towards making society aware of the quest for a sustainable environment and eventually including them in this quest. Architecture's aesthetic role as a form of expression is the tool in this thesis to include society as one of the role-players in the quest for sustainability. This thesis does not, however, prioritise aesthetic symbolism over environmental performance.

# chapter 2

## architecture's principles

*"Architecture's great purpose - to make places that elevate and engage the whole of human life, from the most everyday activities to the most profound..."*

*Cooke 2010: 1*

## What is Architecture?

The design of buildings has been practiced for centuries but the establishment of the architectural profession in the nineteenth century legitimised the design of spaces using three things: "The first was a reliable and exclusive body of knowledge acquired through substantial education, the second was the promise to use such knowledge in the service of society and finally the profession guaranteed the competence of its members" (Owen & Dovey 2008:11). These are the institutional boundaries that protected the profession from any colonisation and kept it exclusively for those who have earned the title of architect. Architecture has been seen as a combination of art and utility but most architects

consider the aesthetic or art dimension as the core of the discipline with the technical or rational knowledge as subsidiary (Owen & Dovey 2008:11). Architecture's exclusivity depends, partly, on the tacit knowledge of aesthetics which cannot be taught and thus earns an architect symbolic authority in the profession. One distinguished architect quoted by Roger Scruton (1979:25) said: "Beauty is a consequential thing, a product of solving problems correctly. Preoccupation with aesthetics leads to arbitrary design, to buildings which take a certain form because the designer 'likes the way it looks'. No successful architecture can be formulated on a generalized system of aesthetics." Pierre von Meiss (1990:180) supports the premise that an architect's motives cannot be purely aesthetic and explained: "Architecture can never be merely an image. It would be deprived of its foundation, of its role in organizing territorial space into private places for accommodating human life". Many critics, philosophers and architects separate architecture from buildings and have different reasons for doing so, with the latter seen as lesser or mediocre. In his introduction to his book titled 'What is Architecture', Andrew Ballantyne explained that what differentiates architecture from buildings is that architecture has some cultural content (Ballantyne 2002: 10). This premise suggests that architecture says

something by its form and/or overall aesthetic. It can be a hut or like Cynic philosopher Diogenes's kennel-like dwelling which signified simplicity and modesty but for it to be architecture it has to be expressive of some values or culture. Ballantyne (2002) further explained that, unlike buildings, architecture has an interpretive quality. "[Architecture] has a linguistic aspect different from the practice of building" (Ballantyne 2002:3). He considered the act of designing as an interpretive act which is realised in application; it is only in the end result of application that understanding is achieved. Philosopher Ludwig Wittgenstein described architecture as a 'gesture'. In their essay titled Fields of Sustainable Architecture (1974 Vol. 13 No. 1), Ceridwen Owen and Kim Dovey explained, "The distinction of 'architecture' as a subset of 'buildings' is a key part of an ideological structure that enables an art to become a profession."

### ***Understanding architecture***

It is the aesthetic dimension of architecture that this thesis aims to address but the urgent question is philosophical when attempting to answer the question of aesthetics in architecture. Architecture addresses, among others, elements such as order, space, balance, percep-

tion, culture and form. To understand the philosophy of architecture, we need to study its history in order to have an understanding of the past and how the past engages with the present (Conway 1994). Architecture has evolved over time and was influenced by external factors such as social and religious factors; economic, cultural, political; rational, technological, constructional or purely the spirit of the age (Conway 1994). Each of these factors is reflected in the buildings of their time but in each building and in each period the balance of influences varies. We study and analyse buildings in history to unearth the principles that they embody. "The history of theories of architecture since Vitruvius in 80BC is characterised by the search for universal principles likely to remain valid without reference to their position in history," (Meiss 1990:7). This statement aids to justify the choice of case studies, MAXXI Museum and Centre Pompidou, which belong to different times in history. One example of the evolution of architecture is the evolution of Neo-Classicism which began with a search for a true style through a precise appraisal of antiquity. This search was sparked by the over-elaboration of architectural language in the Rococo interiors of the Ancient Regime and the secularisation of Enlightenment (Frampton 1992:12). This search was an attempt to find a set of previously used principles which they

could obey. A political catalyst in the evolution of Neo-Classicism was the Napoleonic code which was drafted in 1804. This code forbade privileges based on birth, allowed freedom of religion and specified that government jobs go to the most qualified. This is the code that inspired architects such as Jean-Nicola-Louis Durand to seek the establishment of a universal building methodology by which "economic and appropriate structures could be created through the modular permutation of fixed plan types and alternative elevations" (Frampton 1992:15). There was later a need to find an appropriate expression for the triumph of Prussian nationalism after the defeat of Napoleon. "The combination of political idealism and military prowess seems to have demanded a return to the Classic," (Frampton 1992:17).

Intense development in reinforced concrete occurred between 1870 and 1900 and allowed for new forms which were previously unimagined. This development of reinforced concrete found its roots in the development of iron as a building material in 1779. The middle of the nineteenth century is when Neo-Classical heritage divided into Structural Classicism and Romantic Classicism. These two styles differed in their representative qualities. Structural Classicism emphasized structure and Romantic Classicism stressed the 'façade' (Frampton 1992:18). As men-

tioned before, throughout the evolution of architecture, the different styles were influenced by external factors such as politics, technological innovation and culture, unequally, to produce the principles that shaped the forms.

### ***What is good architecture?***

In his book, *Understanding Architecture*, Conway (1994) suggested the study of masterpieces of the past in order to understand how they achieved their beauty. He analysed the principles of composition of these masterpieces in terms of the disposition of planes, masses, form, proportion and treatment of materials. The aim here is to understand what makes architecture good and so an analysis of award-winning architecture makes sense. A comparison of the architecture, regardless of the time or age in which it was produced, will help us see what they have in common and what principles are relatively stable.

Meiss (1990) explained that a work of architecture attains its true greatness from the synthesis of multiple constituents into a unique final design. These constituents are visibility or perception; socio-psychological and cultural considerations; geometric and dimensional properties of the objects and spaces to be built; the design of light and view to the

design of place and path. The relative emphasis of these ingredients cannot be subjected to a rule of general validity. It must find its own balance according to the brief and the site in the wider sense of these terms (Meiss 1990:167). The two case studies chosen were built in two different times in history and are of different styles. One designed by relatively unknown architects at the time and the other by a famous, award-winning architect. Both buildings were commissioned as competition entries and serve similar functions in terms of program. As Conway suggested, we will analyse the principles of composition of these buildings in terms of the disposition of planes, masses, form, proportion and treatment of materials.

### ***Centre Pompidou, Paris by Renzo Piano and Richard Rogers***

During the few decades preceding 1969, the culture of French society was divided. The new president of the republic, Georges Pompidou, used architecture as a way of unifying and representing the values of the state (Blundell Jones and Canniffe 2007:177). He put forward a competition for the design of a new cultural centre in the heart of Paris. “This provided a chance to appropriate the apparel of contemporary pa-

tronage, while the choice of site in the Marais would neutralise a troublesome working class quarter,” (Blundell Jones and Canniffe 2007:177). One of the administrators revealed after the opening that the intention behind the commission for a new cultural centre is “the meeting of tastes and preoccupations of a president and the aspirations, still latent, of the French people,” (Blundell Jones and Canniffe 2001:178).



Figure 2a: Piano & Rogers. Centre Pompidou. Paris, 1977. ([www.math.psu.edu/grutzman/ParisTravel.html](http://www.math.psu.edu/grutzman/ParisTravel.html). Cited 10 May 2010)

Relatively unknown architects, Renzo Piano and Richard Rogers, won the competition for the design of the Centre Pompidou with their radical decision to divide the site into two – a public open square in front of the building and the other half to the other elements of the programme. Ove Arup & Partners were the engineers commissioned for the job. The competition brief requested a new library, temporary exhibition facilities, a new National Museum of Modern Art, a centre of industrial design, a cinema and performance spaces and IRCAM (the Institute for Research and Coordination in Acoustics and Music). The brief called for an “architectural and urban complex which will mark our century” (Bachman 2003). Piano remarked, “A taste for the polemical prevailed, and form was used symbolically to destroy the typical image of a monument and replace it with that of a factory. The factory as a place for making and, therefore, also for making culture – that was the aim,” (Blundell Jones 2001:179).

The west, elevation which is in front of the public square, is occupied by walkways and escalators and the east elevation was occupied by the grand servicing elements required to air-condition the deep plan. These servicing elements, which made up the east facade of the building, were

painted in bright colours and their large size is reminiscent of classical architecture especially the monumental representation in the façade in a public square. “The proliferation of tubes led to comparisons with oil refineries and the nickname ‘Pompidolium’,” (Blundell Jones and Canniffe 2001:179). The escalators on the western façade became a recognisable feature of one of the most visited viewing points in Paris and became the sign of the building. The escalator as a viewing point distracted from the building’s cultural purpose. The public square was very successful because it invited spontaneous and informal activities. It was populated by entertainers and salespeople. Blundell Jones and Canniffe (2001:182) wrote: “The strong diagonal lines of the main public escalator suggest that the life of the plaza has been lifted up to form the public elevation and signals the building’s function as a cultural institution.”

An important requirement for the building was flexibility in a fully convertible building. The architects designed the complex as a large open framework into which individual elements of the brief could later be inserted. The structure was a neutral trellis into which the various changing parts of the program could be inserted as required. It was divisible vertically and horizontally by frames into smaller rooms when required.

The aim for flexibility was somewhat unsuccessful because the building needed to be closed whenever refurbishments were taking place. The style of the building is high-tech with steel frames. The architects were interested in exploring the possibilities of new lightweight materials, their production and assembly and the creation of more flexible forms of building (Blundell Jones and Canniffe 2001:178). Blundell Jones and Canniffe, however, say that the building could be considered historicist, for its exaggerated expression of industrial elements is reminiscent of Russian constructivism. “The programme of the building was similar to the constructivist idea of the social condenser, involving a mechanical encounter between cultural production and its audience in a great alembic,” (Blundell Jones and Canniffe 2001:186).

In terms of its purpose, the building did not function well as a museum. The interiors of Centre Pompidou took away some attention from the art. The large structural members were distracting and were the reason that another architect was commissioned to design conventional, white plaster rooms with concealed lighting within the structure that act as a plain canvas like that of a traditional gallery space. The framework, ironically, did not allow for free creation and any manipulation of the build-

ing form. The building also failed as a functional cultural centre. The viewing point distracted the visitors from truly appreciating the art and some of the visitors came only for the viewing point.



Figure 2b: Piano & Rogers. Centre Pompidou. Paris, 1977. ([www.midireiser.com/.../html/fransk\\_matfest.htm](http://www.midireiser.com/.../html/fransk_matfest.htm). Cited 10 May 2010)

The centre was a great viewing point and the square allowed for social interaction and made for a great urban space. It's a good example of technical innovation and a memorable aesthetic language. The centre seems to have worked well outwardly instead of inwardly. The internal space lacked the flexibility that it was supposed to achieve and even

though it did not function well as a museum space, the square and the viewing point were a much greater success.

### **MAXXI: National Museum of XXI Century Arts, Rome by Zaha Hadid**



Figure 2c: Hadid, Z. MAXXI: National Museum of XXI Century Arts. Rome, 2009. ([http://www.yatzer.com/2021\\_maxxi\\_national\\_museum\\_of\\_xxi\\_century\\_arts\\_by\\_](http://www.yatzer.com/2021_maxxi_national_museum_of_xxi_century_arts_by_)

zaha\_hadid. Cited 5 April 2010)

The name MAXXI stands for Museum of Art for the XXI Century. Instituted by the Italian Ministry for Cultural Heritage and Activities, it is Italy's first national public museum dedicated to contemporary creativity. Construction of this museum was completed in 2009 and only opened to the public in April 2010.

Located in a “drowsy neighbourhood of early 20th century apartment buildings and former army barracks called Flaminio” on the outskirts of Rome’s historic quarter, MAXXI Museum is a jolt of energy needed to revive the area. Like Georges Pompidou had done with Centre Pompidou, the Italian Ministry of culture organised a competition in 1999 for the design of a new Museum of contemporary arts and architecture to revive the historic quarter as well as the architecture scene which lacked new cultural projects for the last half of the century.

As with Centre Pompidou, flexibility of spaces was a key component along with easy and guided movement through the space. The architect, Zaha Hadid, who is known to be only about glamour, used curved and projecting forms to “make architecture, which is about static objects, more dynamic by capturing the energy of moving bodies charging through space”. The form of the building is concrete interweaving strips that follow the directions of the streets and the lake – this is a way of weaving the building into the urban fabric. Inside the building there is a feeling of mystery and intrigue as the slight curves of the spaces lure the visitor forward in anticipation of what’s around the next bend. The exposed concrete walls inside the building create the perfect background

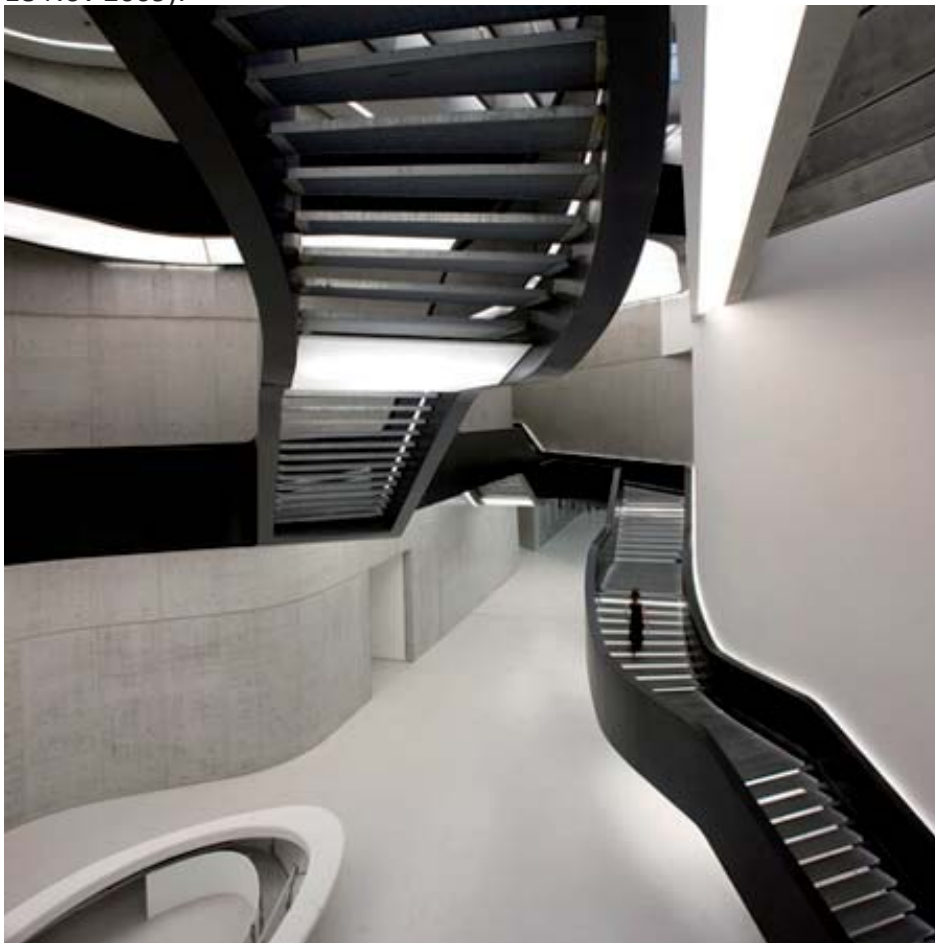
to promote the arts and the different levels are connected by suspended black staircases. Beams, staircases, a linear lighting system and the curved forms of the building guide the visitor through the spaces and are evident when entering the atrium. By these elements Zaha Hadid intended ‘a new fluid kind of spatiality of multiple perspective points and fragmented geometry, designed to embody the chaotic fluidity of modern life’ (arch daily 2009:16).



Figure 2d: Hadid,Z. MAXXI: National Museum of XXI Century Arts. Rome, 2009. (<http://www.archdaily.com/43822/maxi-museum-zaha-hadid-architects/maxi-rome-zha-9740/>. Cited 5 April 2010)

The architectural elements are geometrically aligned with the urban grids that join at the site. The curved smooth walls dialogue with the neo-classical symmetrical facades of the surrounding buildings.

“Its sensual lines seem to draw the energy of the city right up into its belly, making everything around it look timid,” (www.e-architect.co.uk 18 Nov 2009).



**Figure 2e: Hadid,Z. MAXXI: National Museum of XXI Century Arts interior. Rome, 2009. ([http://www.dezeen.com/2009/11/12/maxxi\\_national-museum-of-the-xxi-century-arts-by-zaha-hadid/](http://www.dezeen.com/2009/11/12/maxxi_national-museum-of-the-xxi-century-arts-by-zaha-hadid/). Cited 5 April 2010)**

This 27000 square meter building houses two museums (MAXXI art and MAXXI architecture), an auditorium, library, media library, bookshop, cafeteria, temporary exhibition spaces, open spaces for live events, commercial activities, workshops and spaces for study and recreation.

The building stands out among the historic buildings, as it was intended, will become a central point for Rome by the economic activities, public and media attention as well as the exhibitions that will be held there.

Zaha Hadid stated: “I see the MAXXI as an immersive urban environment for the exchange of ideas, feeding the cultural vitality of the city.

It’s no longer just a museum, but an urban cultural centre where a dense texture of interior and exterior spaces have been intertwined and superimposed over one another”, (www.e-architect.co.uk 18 Nov 2009).

This building has been described as the epitome of “form-follows-function”.

The structure of the museum is achieved with reinforced concrete, steel and glass. The transparent roof also functions to allow light in to illuminate the exhibition spaces.

Zaha Hadid is the 2004 Laureate for Pritzker Architecture Prize. She has won numerous awards for her work and has gained huge symbolic authority within the field of architecture. She constantly aims to explore new spatial concepts which are evident in her experimental forms.

The form for this building is unique and provokes a feeling of intrigue to the user as well as to the passing audience. The minimal number of windows adds to the mystery of the building and, for me an architecture student, a feeling of excitement to enter and satisfy my curiosity.



Figure 2f: Hadid,Z. MAXXI: National Museum of XXI Century Arts. Rome, 2009. ([http://www.dezeen.com/2009/11/12/maxxi\\_national-museum-of-the-xxi-century-](http://www.dezeen.com/2009/11/12/maxxi_national-museum-of-the-xxi-century-)

[arts-by-zaha-hadid/](#). Cited 5 April 2010)

The many different programs are manifested by the many different intersecting volumes. The building is informed by the concept of intertwining programs thus producing different intersecting cantilevering forms and volumes that flow through one another. To achieve cantilevers at different levels requires reinforced concrete and steel structures and other sophisticated technology. The design of this building won first prize in an International Design Competition in February 1999. Zaha Hadid's symbolic authority in the field of architecture certainly allows her to explore complex shapes and forms without fear that they may be considered ugly. Infact, Zaha Hadid's name on the building indirectly implies that it is a beautiful building in the world of architects but for everyone who is not part of the profession appreciates it for its sense of intrigue and suspense. Very little has been said about the public's opinion of MAXXI except Arch Daily's report that the public as well as the critics' response has been positive especially in its context with its curved smooth walls in relation to the surrounding context of symmetrical neo-classical facades. This could imply that the public were excited about something new and refreshing from the ordinary shapes

and facades they had been exposed to. One architecture critic from the Observer said, "The important revelation is that these works, do not, as some predicted shrivel and die in the mighty volumes of Hadid's architecture." Another critic explained how the spaces give the curators a wonderful freedom to mix art and architecture, to place work in intriguing juxtaposition and use the walkways to grandstand large works or moving pictures. Zaha Hadid succeeded in creating a landmark to embody contemporary culture by its aesthetics, form, programs (contemporary art and architecture) and the technology used. She also succeeded in creating the mystery that is required in a museum and directs movement throughout the exhibition.

### ***Conclusion***

Throughout the different architectural periods, the principles that influenced or created architecture were born out of the issues of the time. It is the gradual innovation in technology and construction that has allowed forms such as those in Centre Pompidou and MAXXI Museum of art. Forms, technology and aesthetics go hand-in-hand to express the attitude and concepts that went into designing a building. This study which examined two very different buildings in their method of con-

struction, their forms and their aesthetics firstly establishes very clearly that there is no one form or one type of aesthetic that is considered beautiful or even considered good architecture. Ballantyne went a long way to explain this phenomena where two very different buildings are enjoyed and rewarded by two different cultures when he said, "There are all sorts of utilitarian aspects to the building which would have to be considered...a balance must be struck and it is not always possible exactly to explain how the balance was struck. Often it is a matter of experience and judgement. Such judgements are influenced by culture and tradition...It is a matter of asking ourselves: what feels right? Which is plainly a question that belongs to ethics" (Ballantyne 2002:35). Culture dominates in the forms that are produced and the creation of a new identity. The question of good architecture seems to lie in architecture that transcends cultural boundaries by giving our culture an architectural identity and giving us a glimpse of new cultural horizons. It takes advantage of technology and provokes emotion in us. Le Corbusier best described good architecture by saying: "An architect, by his arrangements of forms, realizes an order which is a pure creation of his spirit; by forms and shapes he affects our senses to an acute degree and provokes plastic emotions; by the relationships which he creates he

wakes profound echoes in us, he gives us the measure of an order which we feel to be in accordance with that our world, he determines the various movements of our heart and of our understanding; it is then that we experience the sense of beauty.”

The issue that is critical in this study is the environmental crisis, especially in an age of imagery. This issue has encouraged the establishment of ‘new’ principles in architecture. Some may argue that architecture has, as opposed to buildings, always embodied the principles that preserve the environment. According to the case studies and the investigation through history and what makes good architecture, the preservation of the environment played a minute role, if at all, in architectural representation or aesthetics. This thesis has identified some of the forms and aesthetics embodied in architecture that has resulted from the new principles which consider the impact of buildings on the environment. Have any of the other constituents that make good architecture been compromised? Has the aesthetic practice in architecture been ignored?

# chapter 3

## architecture's language

*"Interpretation is the means by which architecture is distinguished from building. Architecture has a linguistic aspect different from the practice of building" (Snodgrass 2006:3).*

## Communication in Architecture

### *Architecture's mode of communication*

Hazel Conway (1994:22) tells us that some architectural writers argue that there is a building syntax with words, phrases and grammar and that they imply that buildings speak a language comparable to that which we speak. Language is about communication and expression, buildings do indeed embody ideas which they express and communicate by a variety of means. Charles Jencks (1994:50) concurs but explains that [architectural] language is much more malleable than the spoken language and subject to the transformations of short-lived codes. It is

often experienced inattentively or with the greatest prejudice of mood or will.

The primary focus of this thesis is to communicate sustainability through architecture in a manner that does not compromise architecture's other goals. It is important to understand how architecture communicates in order to avoid, as far as possible, any erroneous implications. The manner in which we will communicate sustainability is through aesthetics and we will further address the issue of green buildings looking wrong and that some of these green projects are merely buildings.

There is no doubt that architecture should not communicate messages in an explicit manner that is obvious and requires no interpretation.

Because architecture is partly an art, it is open to interpretation but it is successful when the idea is received, inspires its audience and stays in their mind. Charles Jencks (1991:44) explained: "Wit has been defined as the 'unlikely copulation of ideas together' and the more unlikely but successful the union, the more it will strike the viewer and stay in his mind. A witty building is one which permits us to make extraordinary but convincing associations". The most explicit buildings such as a hot-dog stand which is shaped like a hot-dog is not considered architecture.

Architecture's linguistic aspect is in the form of metaphors which one can associate with a particular image or experience.



Figure 3a: Tail o' the pup hot dog stand. Los Angeles, USA. (<http://latimesblogs.latimes.com/lanow/2010/04/tail-o-the-pup-the-landmark-la-hot-dog-stand-still-homeless-.html> Cited 2010-07-01)

According to Jencks (1991), the strength of the metaphor is in its subtlety. "A mixed metaphor is strong but a suggested one is powerful. In architecture, to name a metaphor is often to kill it, like analysing jokes," (Jencks 1991:45). The message in the hot-dog stand is too explicit and

'kills' any metaphor. The example that Jencks (1991) gave of a mixed metaphor is the Sydney Opera House as it has provoked many metaphorical responses because of the unfamiliarity of the forms in architecture and that they are reminiscent of other visual objects.



Figure 3b: Utzon, J. Sydney Opera House. Sydney, Australia, 1973. (<http://www.sauer-thompson.com/junkforcode/archives/002297.html> Cited 2010-07-01)

The architect, Jorn Utzon, related the shells of the building to the wing of a bird in flight, while some critics say it resembles the growth of a flower over time, architectural students of Australia caricatured it as 'turtles making love' but the building has been affectionately described by Australians as a 'scrum of nuns' (Jencks 1991:43). I have heard many

times of buildings being likened to the Sydney Opera House and this is because it has since achieved its iconic status. It is important though to understand that not all conventional visual codes are the same metaphorically across cultures.



Figure 3c: le Corbusier. Chapel Ronchamp. Ronchamp, 1954. ([www.wayfaring.info/tag/ronchamp/](http://www.wayfaring.info/tag/ronchamp/) Cited 2010-07-01)

Jencks (1991:48) described Le Corbusier's chapel Ronchamp as "the most effective use of suggested metaphor". This chapel is saturated with many metaphors which have caused, among others, feelings of awe, fascination and confusion. Jencks found it enigmatic and said, "How frustrating, how enjoyable it is to experience this game of signification,

which we know rests mostly on imaginative brilliance” (Jencks 1991:48). Critics such as Pevsner and Stirling have found it upsetting because of this over-saturation of metaphors while others such as Jencks found the intrigue and uncertainty of what it suggests and especially the iconic statement it makes, to be where its beauty lies.

Architecture is at the mercy of the perceiver than poetry: because of our experiences and knowledge, we draw different ideas and feelings about a building’s character. A building could easily be misread and likened to well-known icons or objects of the time. Jencks’ suggestion to remedy this is, “The architect must over-code his buildings, using a redundancy of popular signs and metaphors, if his work is to communicate as intended and survive the transformation of fast-changing codes”, (Jencks 1991:50).

### ***Communication in green architecture***

Matthias Sauerbruch and Louisa Hutton are green architects who strive to communicate sustainability in their architecture and Renzo Piano has also designed some green buildings. James Wines described one green project as “an achievement of sheer visual poetry” and a successful symbolic connection of the building to its cultural context. This building is the Jean-Marie Tjiabao Cultural centre in New Caledonia designed

by architect Renzo Piano. Let us study their technique or approach and try to understand their mode of communicating sustainability. Has their architecture provoked any emotion, inspired its audience or left a lasting impression and ideally become an iconic metaphor?

### ***The German Federal Environmental Agency, Dessau, Germany***



Figure 3d: Sauerbruch & Hutton, Axonometric view of German Federal Environmental Agency, Dessau, 2005. (Cited 2010-05-30 [bruteforcecollaborative.files.wordpress.com/](http://bruteforcecollaborative.files.wordpress.com/))

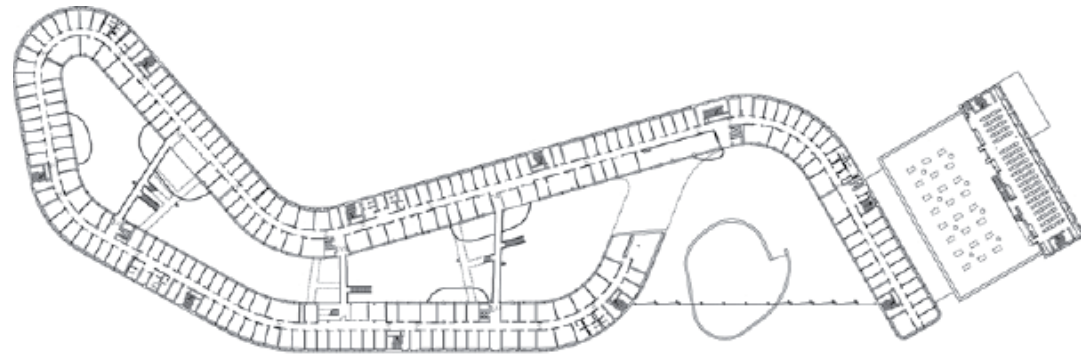


Figure 3e: Sauerbruch & Hutton, Plan of German Federal Environmental Agency.

Dessau, 2005. (Cited 2010-07-06 epaper.konradin-relations.de/xella/2006002/en/pdf/format\_e.pdf)

Sauerbruch and Hutton won the competition held in 1998 to design new offices for the German Federal Environmental Agency in the city of Dessau. One of the important ecological decisions made was to locate the offices in a contaminated brownfield site instead of a Greenfield development. Like Renzo and Rogers at Centre Pompidou, the architects proposed to divide the site in half, place the building on the east of the site and allocate a public park on the west side of the site. This snake-shaped building wraps around a landscaped atrium and accommodates 780 employees in offices, a lecture theatre, canteen, library, exhibition and seminar rooms. A small existing railway station and a former gas appliance factory were integrated into the complex. Part of the building is accessible to the public while the rest is closed off and accessed only by the staff.

The federal authorities' priority was to make this building an example of sustainable design. According to Kurt Schmidt, former vice-president of the authority: "After all, meeting these demands with our own new building is also a matter of credibility," (Konradin Relations 2006).



**Figure 3f: Sauerbruch & Hutton, Corner of German Federal Environmental Agency. Dessau, 2005. (bruteforcecollaborative.files.wordpress.com/. Cited 2010-05-30).**

The building's environmental performance is calculated to be 30% below the value prescribed for comparable buildings which is achieved through a large geothermal heat exchange and solar panels. The façade is clad in strips of insulated timber, which is prototypical in Germany and is 40% glazed. The timber elements prevent thermal bridges in the ceiling area. "The colour concept supports the intention of the urban style of never showing a building in its entirety, but only in parts – bit by bit, not giving that impression of intimidating size, primarily suitable for historical, official buildings," (Konradin Relations 2006). One critic from Xella, a building materials firm based in Germany, wrote, "The facade colours always react with their respective locations: The blue tones of the foyer are an echo of the pond outside and the sky, which can be seen through

the glass roof. Nearby trees are reflected in the green tones of other parts of the building's appearance. The facade sections, opposite existing old buildings, take on the darker red tones of the walls of these buildings," (Konradin Relations 2006).



**Figure 3g: Sauerbruch & Hutton, Roof of German Federal Environmental Agency. Dessau, 2005. (Cited 2010-05-30 brute-forcecollaborative.files.wordpress.com/)**

These 33 tones of enamel-finished safety glass are inserted randomly and no regular pattern was followed. In my mind, it is far-fetched to make the connections between the colours used and the surrounding natural elements. It is highly unlikely that an observer would associate the colours with the elements of the surrounding environment, especially inattentively, which makes the success of this strategy questionable. The internal atrium is naturally lit and covered with a steel and glass roof that has polycrystalline photovoltaic cells. More photovoltaic cells and solar water collectors can be found on the green roof over the offices.



**Figure 3h: Sauerbruch & Hutton, Atrium of German Federal Environmental Agency. Dessau, 2005. (brute-forcecollaborative.files.wordpress.com/. Cited 2010-05-30)**

The form of the building is not the usual monumental size and classical style which is often associated with government or other authority buildings. They chose to communicate a new

start in Dessau of environmental consciousness. The problem is none of the strategies that they have employed communicate sustainability adequately. I showed a few strangers on the street a picture of this building and asked what they thought of this building is used for and one lady thought that it was a school and did not think that such colour should be applied in any building other than a primary or nursery school. The metaphors are easily associated with playfulness and it is difficult to associate them with ecology because such use of colour has been used in many societies to signify activities which relate to children. A convincing association between colour and sustainability has not been achieved.

**Jean-Marie Tjibaou Cultural Center, Noumea, New Caledonia**

A competition was held for the design of a new cultural centre for the Kanak people in Noumea that would be built on a piece of land which extended south-east into the Pacific Ocean. The Agence de Développement de la Culture Kanak received this land as a donation from the municipality of Nouméa. The project embodied the history of the Kanak people and their struggle to independence. The design had to embody the culture and history of the people. The architect, Renzo Piano, was quoted as saying, “It was not just a tourist village that I had to build. I

had to create a symbol: a cultural centre devoted to Kanak civilization, the place that would represent them to foreigners and that would pass on their memory to their grandchildren.

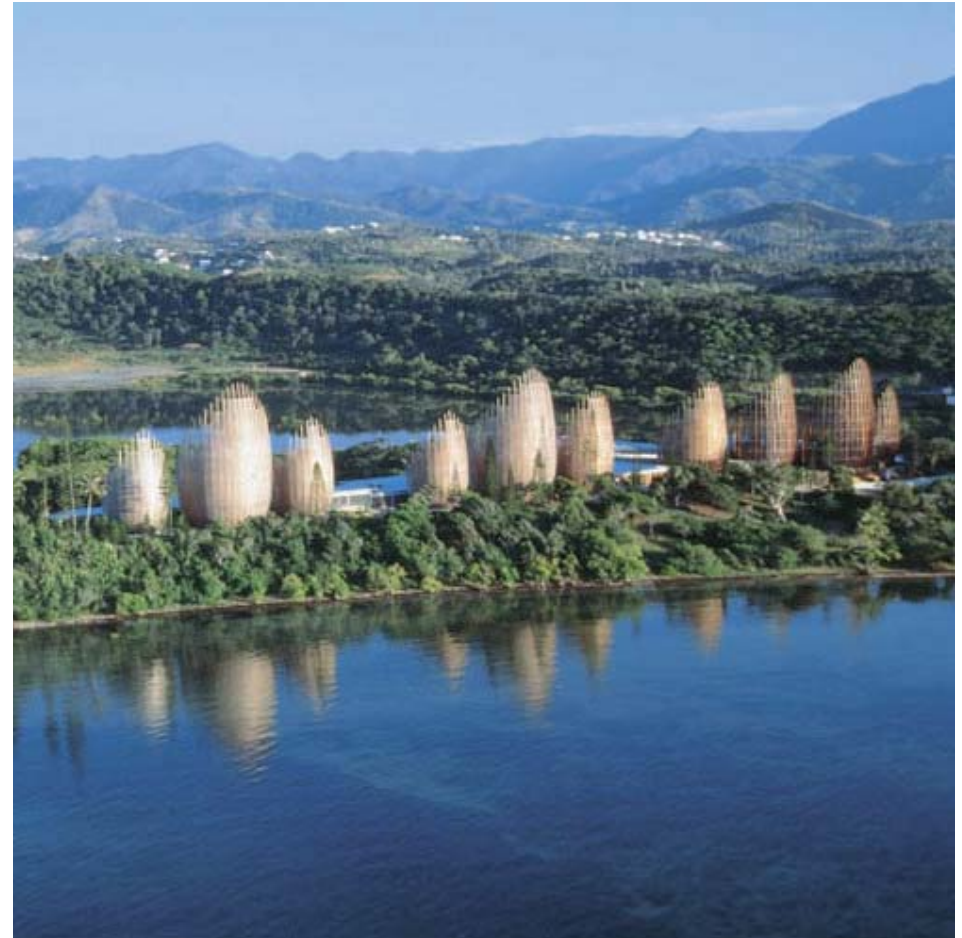


Figure 31: Piano, R. Jean-Marie Tjibaou Cultural Center. Noumea, New Caledonia, 1998. (Cited 2010-07-06  
<http://aedesign.wordpress.com/2009/08/31/jean-marie-tjibaou-cultural-center>)

Nothing could have been more loaded with symbolic expectations.”

Piano’s philosophy in designing globally is, “True universality in architecture can be attained only through a connection with the roots, gratitude for the past, and respect for the *genis loci*.”

This project was designed to celebrate Melanesian culture and create a formal contemporary architectural identity for the Melanesian people. Therefore, Piano integrated regional materials, traditional construction methods, contemporary technology and ecological design. Green (2000:126) quoted Piano as saying, “It was not feasible to offer a standard product of Western architecture with a layer of camouflage on top, it would have looked like an armoured car covered with palm fronds.”



**Figure 3j: Piano, R. Jean-Marie Tjibaou Cultural Center. Noumea, New Caledonia, 1998. (Cited 2010-07-06 [www.slate.com/id/2111102](http://www.slate.com/id/2111102))**

Piano studied the long legacy of conical architecture in the South Pacific and expressed this in the form of the individual structures.



Piano’s use of bamboo, the world’s most easily erected and rapidly regenerated raw material, addressed the ecological and climate control aspect of the structures and echoed the cultural element of Melanesia.

**Figure 3k: Piano, R. Jean-Marie Tjibaou Cultural Center. Noumea, New Caledonia, 1998. ([www.pbase.com/tanetahi/tjibaou](http://www.pbase.com/tanetahi/tjibaou). Cited 2010-07-12)**

Piano used iconic familiarity as an aesthetic language that recalls the pattern and form of typical rural village development. This he achieved by the beehive-like pavilions that look like the traditional Kanak hut and are connected along a back-bone ridge.

There are ten beehive structures, all of different dimensions, covering

a total area of 7650 m<sup>2</sup> with the largest towering over the rest at 28 meters high. These structures are orientated in a manner which takes advantage of prevailing winds.

less the colour must be retained, but it weathers to an even grey which Piano hoped would eventually match the colour of the bark of the palms that surrounded the site. These giant beehive structures have louvers

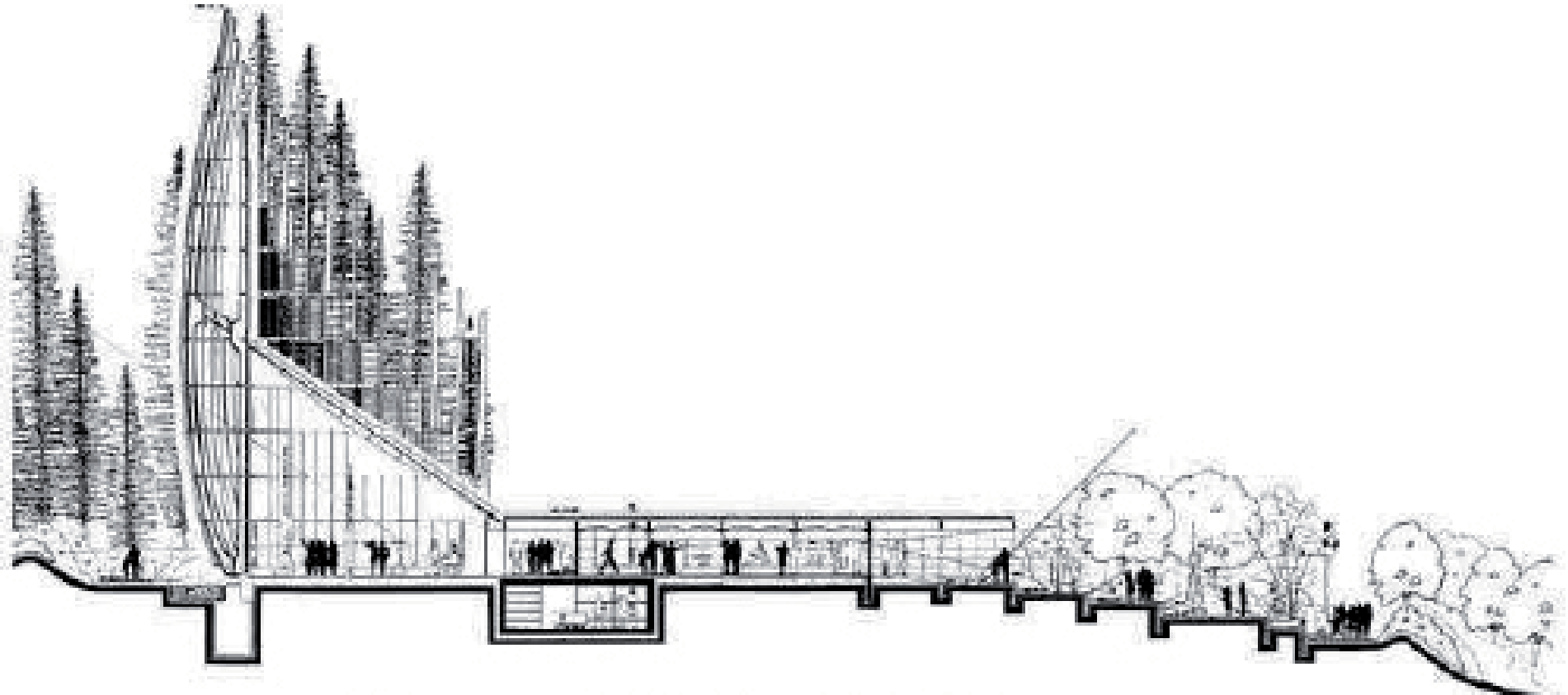


Figure 31: Piano, R. Section through Jean-Marie Tjibaou Cultural Center. Noumea, New Caledonia, 1998. (Cited 2010-07-06. [http://www.architecture.uwaterloo.ca/faculty\\_projects/terri/125\\_W03/irwin\\_Tjibaou.pdf](http://www.architecture.uwaterloo.ca/faculty_projects/terri/125_W03/irwin_Tjibaou.pdf)).

Piano used a type of wood that required no preservative treatments, un-

which are mechanically operable and have a double roof system which allows air to pass through and cool the rooms below.

The construction techniques are far too advanced for the New Caledonia

construction industry and thus had to be pre-fabricated in France and assembled on-site. This increased the embodied energy in the materials, the opportunity for jobs in manufacturing the components was taken away from the local industry and Piano's choice of non-indigenous wood, Iroko, along with the choice of aluminium as one of the materials distracted from the vision of sustainable construction. In the end it seems that the embodied energy in this project is not of sustainable standards. The structure uses little energy because it is naturally air-conditioned but the choice of material compromised the level of sustainability of the project.

### ***Conclusion***

Metaphorically, Jean-Marie Tjibaou Cultural Centre is striking and provokes one's attention. The forms and aesthetics connect closely to culture and history and make these messages easily understood. These forms communicate the intended purpose of the building and are unlike any existing architectural metaphor, which makes them iconic and memorable. Nature and culture are the first words that come to mind at first glance and I think Piano communicated the intended purpose effectively and leaves the observer inspired and intrigued. If architecture

has a language and communicates metaphorically with the intention of provoking emotion in the observer this building certainly does so and is worthy of being called architecture. The German Federal Institute sends somewhat confusing messages. Despite this building's accolades, I fail to understand the message of sustainability in its scheme. The playful use of colour is certainly memorable but it takes a lot of analysis, and maybe a walk through the building, to relate it to nature. It would, however, have been far more successful if the messages about nature were received inattentively. Maybe the snake-shape wrapped around greenery and clad in timber gives some clues but in this case the metaphor is mixed with notions of playfulness and is not easily understood.

Jencks could be correct in saying that a suggested metaphor is far more powerful than a mixed one and the key may be to create forms that generate intrigue and guessing games about what it could look like yet effectively communicating culture and the purpose of the building. For a sustainable building to communicate sustainability it should not only look sustainable but be sustainable, that is the most powerful statement a building can make regarding sustainability.

# chapter 4

**rating tools & sustainability  
in architecture**

## Sustainability

In the past, the earth's resources were able to cater for the human economic subsystem because it was small. The increase in human economic subsystem, which is due to numerous reasons such as over-population, pollution, waste and a general increase in the need for natural resources for technology and human lifestyles, is gradually eroding the earth's capability to cater for life on earth.

The issue of a sustainable environment affects all of mankind and future generations. Humanity has come to realise that the earth's resources are finite and may not be able to support future generations and therefore current generations need to be careful about our use of natural resources in order to allow future generations to meet their needs with

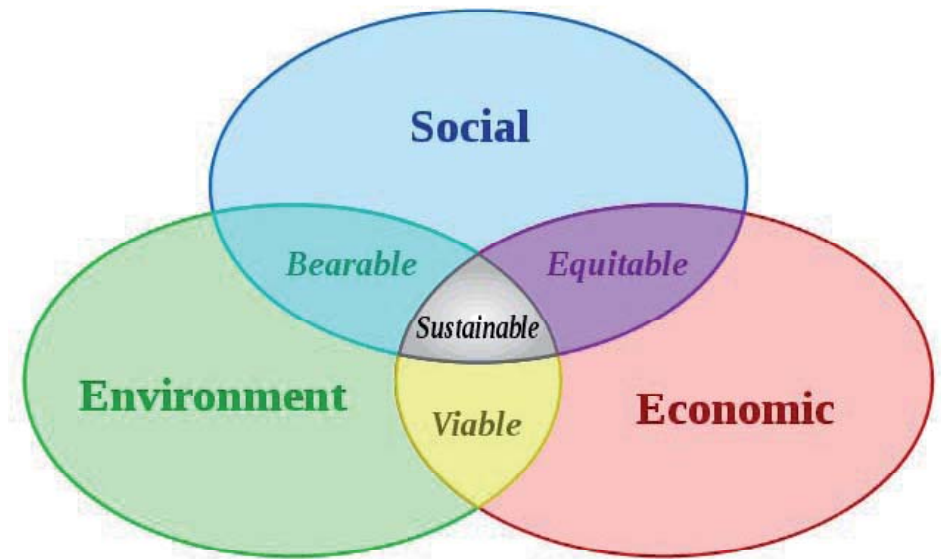
the available resources.

### ***What is sustainability?***

There are several definitions for sustainability, all of which refer to the dictionary definition which is, “The capacity to endure” (Oxford). The United Nations Commission on Environment and Development (UNCED) released a report called ‘Our Common Future’ which defines sustainable development as follows: ‘Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (Sustainability 2010).

The report also noted that for sustainable development to occur there must be a reconciliation of social, economic and environmental demands – this is also known as the triple bottom line. Each of these three components is interdependent and cannot be mutually exclusive for sustainability to occur. Figure 4a illustrates the three pillars of sustainability and where they intersect sustainability is achieved. Each of the three pillars of sustainability encompasses a large spectrum of issues and will not be investigated in depth as they go beyond the scope of this thesis and are too broad to be applied usefully. According to environmentalist and economist John Elkington “We need to bear in mind that it is not possible to achieve a desired level of ecological or social or economic

sustainability (separately), without achieving at least a basic level of all three forms of sustainability, simultaneously”.



**Figure 4a: Wikipedia. 2010. Sustainability. (Cited 2010-03-02. [http://en.wikipedia.org/wiki/File:Sustainable\\_development.svg](http://en.wikipedia.org/wiki/File:Sustainable_development.svg))**

The aim of this thesis is to further the environmental sustainability agenda and maintain our natural environment or prevent it from further deterioration through architecture. Most of society, especially in developing countries, is currently unaware of the deterioration in the natural environment. Architecture is the ideal vehicle to drive this agenda by communicating sustainability to society and it will serve as a platform

to involve society in ecological or environmental sustainability. A study done by RICS, a professional body for qualifications and standards in land, property and construction, revealed that businesses in South Africa, China and Japan place considerable importance on sustainability. This study was done in 2009 and revealed that 56% of Chinese respondents to the survey rated sustainability as very important to their clients and the same number rated sustainability as average importance in Japan. Figure 4b shows that the main reasons for sustainability adoption among businesses is more for financial gain and less about protecting the environment.

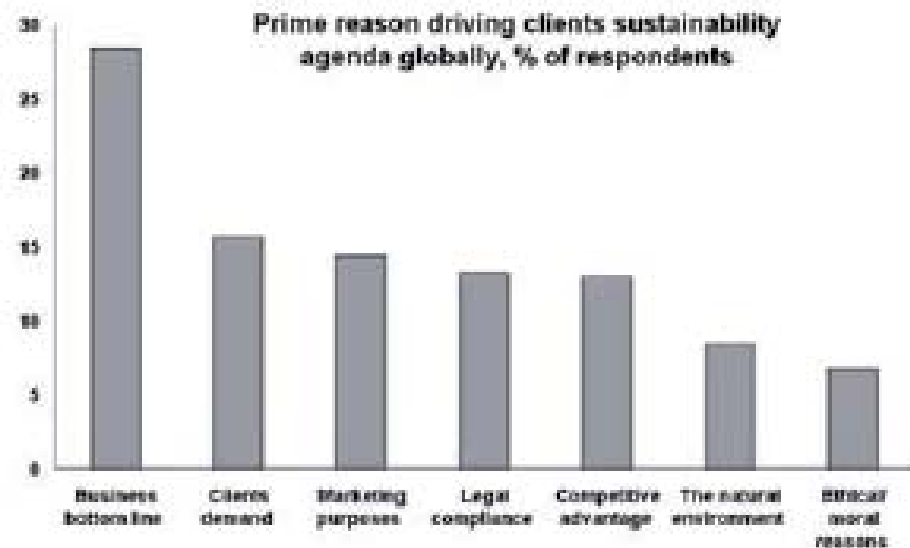


Figure 4b: Sustainability drivers. <http://www.ricsasia.org/newsDetail.php?id=174>. Cited 2010-05-15

Among the clients, energy efficiency was deemed as the most important aspect of sustainability and the least important or the one clients knew the least about is habitat or biodiversity loss. South Africa was one of 26 countries that were surveyed and the figure 4c shows the result. This data further proves that those that are aware of the sustainability issue understand it in terms of its financial implications. Most are not even aware that they have a part to play in maintaining the environment in which we live. What about those under privileged South Africans who have never heard the word sustainability?

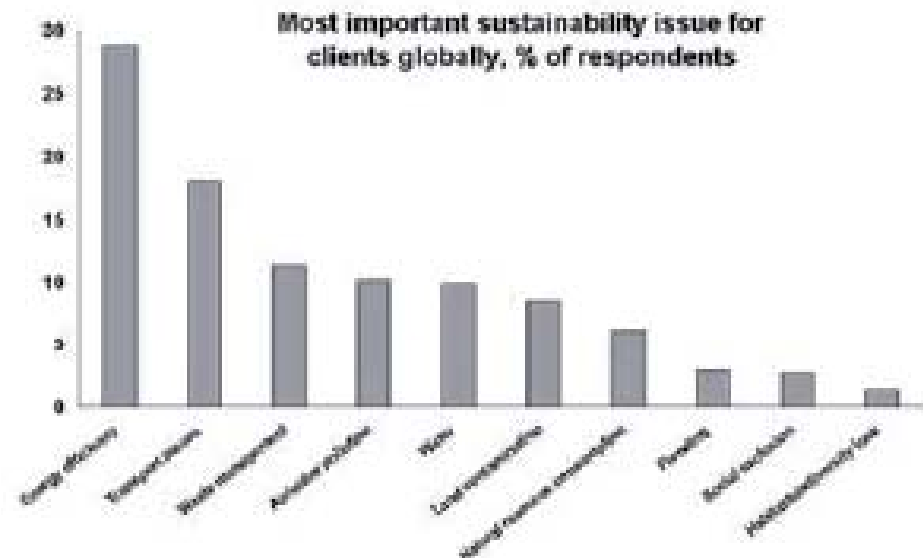


Figure 4c: Sustainability issues. <http://www.ricsasia.org/newsDetail.php?id=174>. Cited 2010-05-15

Social sustainability has been marginalised in the study of sustainability as a whole. Its role has been unequally exercised in comparison to the roles played by economic sustainability and environmental sustainability. Social sustainability is: “a positive condition within communities and a process within communities that can achieve that condition” (McKenzie 2004:23). Most social sustainability definitions contain indicators by which it can be measured (McKenzie 2004: 15) such as education, health, culture, transport, housing and recreation. In the case of this thesis, education will be the focus and will be the driver towards achieving environmental sustainability. Employment will be featured marginally but the main aim will be directed at upliftment and the promotion of self-sustenance. Attention will also be directed at improving the level of numeracy and literacy in students. In 1980, the World Conservation Strategy was released by the International Union for the Conservation of Nature which defines the ‘main agents of habitat destruction and environmental degradation as poverty, population pressure, social inequality and the terms of trade’ (McKenzie 2004:2). According to The Star newspaper (29 March 2010), the level of numeracy and literacy among scholars in South African schools is below acceptable levels. A lack of education can sometimes have a direct link to poverty which is one

of the agents of ‘habitat destruction’. More detail on education as the choice of focus will be discussed in later in the thesis.

The widely accepted definition of economic sustainability is maintenance of capital, or keeping capital intact (Goodland 2002). Thus Hicks’s definition of income, “the amount one can consume during a period and still be as well off at the end of the period”, can define economic sustainability. Economic development includes growth, equity and efficiency. When development includes the efficient use of resources, costs are cut down by implication. Construction costs and maintenance costs are cut down when solar energy or other forms of sustainable resources are used instead of burning fossil fuels.

Environmental sustainability has been commonly defined as “The responsible or efficient use of natural resources for human use and the maintenance of natural capital”, (after Goodland and Daly 1996:1003). Environmental sustainability is concerned with protecting natural resources for the good of life on earth and especially for human welfare. These natural resources include water, land, air, minerals and animals. Environmental sustainability includes ensuring that nature is capable of handling the amount of resources taken from it by human beings as well

as nature being capable of absorbing the amount of waste that gets put into it by human beings. Cobb and Daly (1989) have also defined environmental sustainability as a two-part concept consisting of the 'output rule' and the 'input rule'. The output rule refers to "waste emissions from a project or action being kept within the assimilative capacity of the local environment, without unacceptable degradation of its future waste absorptive capacity or other important services". The input rule refers to harvest rates of renewable resource (e.g. Forest, fish) inputs being kept within regenerative capacities of the natural system that generates them and the depletion rates of non-renewable resource inputs being set below the historical rate at which renewable substitutes were developed by human invention and investment (Goodland 2002: 1). Therefore, human beings need to cut down on the amount of waste we produce and the resources we consume.

### ***Why is sustainability important in architecture?***

The US Green Building Council published in their 2008 Building Impact Report that buildings account for 40% of the world's energy use, 17% of fresh water use, 25% of wood harvested and 40% of material used. When architects design, they are more inclined to start thinking about

the embodied energy in their choice of materials, operational energy in the building, water conservation systems and waste management systems. Green architecture has other added benefits for the user, according to the US Green Building Council, green buildings have lower operational costs, the occupants are much healthier, more productive and in most cases cost far less to construct. It has become harder for the natural environment to absorb the increased carbon emissions produced by the burning of fossil fuels to provide electricity to buildings. This inability for nature to handle the load is also due to the cutting down of trees and other foliage for the purpose of building. Carbon Dioxide is a direct product of the burning of fossil fuel. The sun's energy gets trapped by the accumulation of green house gases in the upper atmosphere thus contributing to global warming. According to the International Energy Agency, South Africa has the largest Carbon Dioxide emissions in Africa (City of JHB: 2009).

Sustainable architecture is architecture that is conscious of the environment and lessening the impact of the building on the environment. It takes into account the following:

- Energy efficiency
- Waste management

- Water efficiency
- Sustainable materials

### *Energy efficiency*

This is usually considered to be the single most important goal of sustainable buildings. Throughout a building's life cycle, from construction to operation and eventually to demolition, a building uses a lot of energy. Most of its energy is used for operations such as heating, cooling and ventilation. Geysers also require a lot of energy to heat their water. Renewable energy; energy from natural sources such as the sun, wind, rain, tides and geothermal heat; is the most ecologically sustainable and greatly reduces the load on energy providers such as Eskom who rely on the burning of fossil fuels to generate electricity. Strategies such as the building's orientation coupled with adequate insulation are some of the strategies which lessen the energy requirement of the building. Renewable energy technologies such as solar panels and photovoltaic cells which harvest the sun's energy are becoming the preferred way of generating energy for the operation of a building. Renewable energy technologies are "any technology that exclusively relies on an energy source that is naturally regenerated over a short time and derived directly from

the sun, indirectly from the sun, or from moving water or other natural movements and mechanisms of the environment" (Renewable Energy Technologies website 2010). Let us look at a few renewable energy technologies.

### Geothermal energy

The term ground source heat pump best describes this technology because it is significantly different from geothermal power which uses a high temperature heat source to generate electricity. Ground source heat pumps harvest a combination of geothermal power and heat from the sun when heating, but work against these heat sources when used for air conditioning. Geothermal energy technologies use the heat of the earth for direct-use applications, geothermal heat pumps and electrical power production. The sources of this heat come from shallow ground, hot water, hot rock found a few kilometres below the earth's surface and deeper to extremely high temperatures closer to magma. The upper 3m of the earth maintains a constant temperature of between 10 degrees celcius and 16 degrees Celsius. A geothermal heat pump system consists of a heat pump, ductwork for air delivery and heat exchanger. In winter the heat pump removes heat from the heat exchanger and pumps it into the indoor air delivery system. In summer the process is reversed and

the indoor air can also be used to provide a free source of hot water.

Figure 29 illustrates a domestic geothermal pump system.

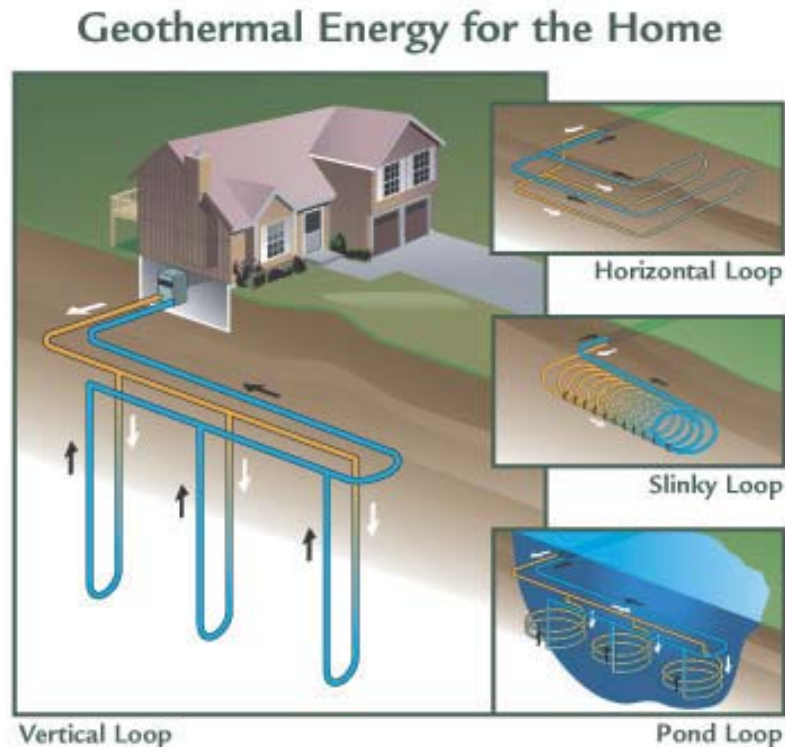


Figure 4d: Georgia Air Contractors. Domestic geothermal heat pump system, 2010. (Cited 2010-08-26.<http://gaci.biz/geothermal>.)

Geothermal energy, unlike wind or solar energy, never varies. Unfortunately, geothermal heat pumps in domestic applications only serve to provide heating and cooling but only industrial-scale geothermal power plants can produce electricity.

The system can be one of vertical coils which go far deeper into the ground and use less total HDPE pipe than horizontal loops or slinky loops, in which loops of pipe fill shallow trenches exposed to constant heat just below the frost line. In a pond loop systems, a blanket of water insulates coils anchored on racks.

### Bioenergy

Biomass, which is a plant derived organic matter available on a renewable basis, includes wood, plants, residue from agriculture or forestry, organic component of municipal and industrial waste, animal wastes and aquatic plants. It contains stored sunlight in the form of chemical energy; this energy is called bioenergy. This energy can be used to provide heat and generate electricity. Bioenergy technologies are seldom used at a domestic level and are commonly used on industrial projects; they are therefore of little relevance for this study.

### Hydropower

This is also referred to as hydroelectric power and is the largest source of renewable energy in some countries. Hydropower is the energy captured from flowing water. This is done by a hydropower plant which

uses a dam on a river to store water in a reservoir or a small canal to channel river water through a turbine. In the case of a reservoir system, water released from the reservoir flows through a turbine, spinning it, which, in turn, activates a generator to produce electricity.

### Solar energy

The sun's light and heat can be used to generate electricity, to regulate a building's thermal comfort and to provide hot water. Solar technologies are the means by which the sun's heat and energy are converted into electricity or heating and cooling for buildings. Three commonly known strategies to achieve this are photovoltaics, concentrating solar power and passive solar heating, cooling and lighting.

Photovoltaic systems, which are sometimes known as solar cells, convert sunlight directly into electricity. How they operate is that when solar energy in the form of sunlight or heat is absorbed into the semi-conducting material, usually silicon, of the photovoltaic cells it reacts with the atoms and knocks electrons loose from them thus allowing the electrons to pass through the material to produce electricity. Common solar cells have a dimension of about 100mm x 100mm and they provide about 5% to 18% power efficiency (Green the world.net: 2010) . More

cells are required to provide enough electricity for part of a small house and are thus grouped into a module of 40 cells and for the whole building they are grouped into an array of about 10 modules. The number of modules in an array will depend on the size of the building or the required amount of electricity. Solar power is not the most reliable or consistent because the sun is not constantly shining and its intensity varies according to seasons, cloud cover or rain.



**Figure 4e: Solar panel system.** (Cited 2010-08-26. <http://www.apowersolutions.com/products-page/solar-pv-panels/>)

The bifurcation in the profession has resulted in architecture that falls short of a critical component that “defines it as a profession and gives its members the right to construct the value of ‘architecture’ autonomously” – the tacit knowledge of aesthetics (Owen and Dovey 2008:11).

This knowledge of aesthetic practice had previously taken into account all other aspects in the creation of buildings such as structure, services, spatial quality, etc and used them as part of the creation of the aesthetics of the building. Sustainable practices should also form part of the components that inform the aesthetics of a building.

#### *Waste management*

Sustainable architecture takes care in re-using materials and creating a less as possible construction wastes. It also takes into account the re-use of grey water for purposes such as irrigation. Waste is loosely categorised as municipal solid waste, construction and demolition (C&D) debris, and industrial or agricultural by-products.

#### *Water efficiency*

Sustainable architecture is conscious of using the least amount of water as possible. Grey water is re-used for purposes on site and in the building. Rain water harvesting is one of the central focuses of a sustainable building.

#### *Sustainable materials*

Re-using materials or using materials with low embodied energy is the aim in sustainable construction. Materials salvaged from other sites or from the demolition on the current site is ideal. Materials with low embodied energy are materials that cost less to manufacture, required little energy to manufacture and transport

#### ***Rating tools***

Rating tools have been established as a means to measure the impact of a building on its environment. Green rating tools set standards and benchmarks for sustainable building. There are several building assessment tools globally, namely, Green Star, BREEAM, HK-BEAM, CASBEE and LEED. Each of these rating tools are modelled on the other but each country has tailored the assessment tool to the particular conditions of the country, for example; the country's minimum building standards, climate and particular environmental concerns (Mitchell 2009:96). The green architect's goal or motives when designing has come into question: some green architects are believed to either be pursuing recognition through high ratings, others are believed to be pursuing environmental performance at the expense of form and beauty. The apparent argument by contemporary architects who are against green architec-

ture is that green architecture has become the domain of engineers and environmentalists and no longer the domain of architects. This therefore undermines the role of the architect to that of just an artist and disregards the architect's input on form and fundamentals of architecture. Another threat to the profession is believed to be green rating tools. These tools are being used by some architects as a step-by-step guide on how to design. Issues such as concept, metaphors and form are side-lined in pursuit of environmental performance.

Rating tools have become central to this discussion and have become the main focus in the design process of most green buildings thus turning the main focus into one of gaining maximum points or one of simply just the performances of the buildings.

This discussion is made up of a brief overview on one rating tool used in Australia – Green Star and if Green Star has a direct impact on the design process. This will establish a link, if any, between the rating tool and the resultant forms and aesthetics of a building that has been rated by Green Star. The case study in question is the Council House building 2 in Melbourne Australia. This building has been awarded the coveted platinum rating which is the highest possible rating of six stars and the

rating tool was used as part of the design process. A building which was given the highest rating implies strict accordance to the rating tool in terms of its overall design and provides us the perfect tool to assess the outcomes of architecture “inspired” by rating tools.

### ***Green Star Australia***

Green Star Australia was first developed by Sinclair Knight Merz and The Building Research Establishment in 2003 then later taken up and adapted by the non-profit Green Building Council of Australia, a member of the World Green Building Council (Mitchell 2009: 98). The Green Building Council of Australia (GBCA) is committed to developing a sustainable property industry for Australia by encouraging the adoption of green building practices. Its key objectives are to drive the transition of the Australian property industry towards sustainability by promoting green building programs, technologies, design practices and operations as well as the integration of green building initiatives into mainstream design, construction and operation of buildings (GBCA: 2010). Green Star was developed for the property industry in order to:

- Establish a common language;
- Set a standard of measurement for green buildings;

- Promote integrated, whole-building design;
- Recognise environmental leadership;
- Identify building life-cycle impacts; and
- Raise awareness of green building benefits

Green Star Australia is based on BREEAM but some of its operational elements are based on the LEED system but has been tailored to Australian conditions such as climatic conditions and local building standards and regulations.

Green Star covers a number of categories that assess the environmental impact that is a direct consequence of a project's site selection, design, construction and maintenance. The nine categories included within all Green Star rating tools are:

- Management: to encourage and recognise the engagement of professionals who can assist the project team with the integration of Green Star aims and processes throughout design and construction phases.
- Indoor Environment Quality: to encourage and recognise designs that provide ample amounts of outside air to counteract build-up of indoor pollutants.

- Energy: to encourage and recognise designs that minimise the greenhouse gas emissions associated with operational energy consumption and maximise potential operational energy efficiency of the base building.
- Transport: to encourage and recognise developments that facilitate the use of alternative modes of transport for commuting.
- Water: to encourage and recognise designs that reduce potable water consumption by building occupants.
- Materials: to encourage and recognise the inclusion of storage space that facilitates the recycling of resources used within buildings to reduce waste going to disposal.
- Land Use & Ecology: to encourage and recognise development on land that has limited ecological value and to discourage development on ecologically valuable sites.
- Emissions: to encourage and recognise the selection of refrigerants and other gases that do not contribute to long-term damage to the earth's stratospheric ozone layer.
- Innovation: to encourage and recognise pioneering initiatives in sustainable design, process or advocacy.

sustainable design, process or advocacy.

When a building is assessed, it is given points in each of the above categories, except Innovation, against the available points in each category. Because the Australian climate differs from region to region, each category is given different weighting depending on the state. Different states across Australia give priority to the pertinent issues in that state, thus awarding more points for addressing those more pertinent issues and less for addressing less important issues in that specific state (Mitchell 2009:97). For example, the sum of all eight categories is 100 percent but more points are allocated to some categories and less to others which will then add up to 100. This strategy eliminates careless design in order to score points and forces the architect to focus on issues that will make a sizeable difference. Innovation points are then added to the total score. The ratings are available from one to six stars, however, certification is only granted from four stars and upwards. Different types of tools are available for the assessment of different property types such as retail, residential, education, offices or health care. Even though rating tools are often used as marketing tools, they benefit the green building agenda enormously. For example, developers

advertise their buildings' ratings (which imply low running costs) to potential tenants or potential purchasers, developers then capitalize on their investment, awareness of the buildings' performance is increased on the property market and hence an increase in demand for high-performing buildings. One of the criticisms associated with rating tools being used for publicity and market value is that they are purely design tools that guide sustainable decision-making at design stage but offer no incentive for efficient management once the building is in use (Mitchell 2009:113) and are thus weak as tools for sustainable development. This is why performance tools have been introduced. Even though adopting a performance tool is mandatory, it helps mitigate the issue of efficient management in those buildings that choose to adopt the performance tool. The performance is different from the design tool because it calculates and rates the performance of an existing building, or part of one, on a particular environmental indicator at a certain point in time (Mitchell 2009:104). The National Australian Built Environment Rating System (NABERS) and Energy Star in USA are two such performance tools. The key differences between Green Star Australia, as a design tool, and NABERS, as a performance tool, are tabulated as follows:

| <i>Feature</i>              | <i>Green Star</i>                                                                                                | <i>NABERS</i>                                                                    |
|-----------------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Type of tool                | Design – rates potential of building                                                                             | Performance                                                                      |
| Supervising entity          | Private entity – GBCA                                                                                            | Government entity – the DECCW                                                    |
| Aim                         | To distinguish buildings with good environmental design features                                                 | To identify and enable comparisons of building performances                      |
| Factors assessed            | Broad: energy, transport, water, IEQ, materials, land use, management, innovation – all assessed for one rating. | Specific: energy/water/waste/IEQ – each are rated separately                     |
| Assessment method           | Accrue points for specific features in each category                                                             | Performance data compared to benchmark                                           |
| Main application            | Design phase                                                                                                     | Operational phase                                                                |
| When rating can be obtained | In design phase or within 2 years of completion of construction or refurbishment                                 | When building is completed and occupied – usually 12 months of data are required |
| Duration of rating          | Does not expire                                                                                                  | Expires 12 months after date of rating                                           |

**Figure 4f: Mitchel, L. M. (2009). Key differences between Green Star and NABERS. (after Mitchel 2009:112)**

### *Council House 2, Melbourne, Australia by Mick Pearce*



**Figure 4g: Pearce, M. Council House 2. Melbourne, Australia, 2006. (Cited 2009-10-29. <http://www.designinc.com.au/projects/ch2-melbourne-city-council-house-2.>)**

Ch2 is a visionary new project completed in Australia which is changing the way Australia approaches its sustainable design. With a six-star rating from the green star tool by the Green Building Council of Australia, it is considered to be amongst the greenest buildings in the world. The aim was to “create a demonstration building that broadly influences design and building practices” (Crist 2006:5)

In 2003 the city of Melbourne embarked on this new revolutionary project. The City of Melbourne was, and still is, determined to breathe

new life into a dying part of Melbourne.

The project allowed the council to exercise its environmental credentials by creating a building which is innovative, technologically advanced and environmentally sustainable. Heading up the team was architect Mick Pearce. The building aimed to draw the public's attention to sustainable issues, to be recognisable to the person on the street and show the direction of the council of Melbourne, predominantly in this case, by the use of the aesthetic. It is largely through the help of media representation that the public is aware of CH2's connection with sustainability.

The building is a 10-storey building which houses around 500 City of Melbourne staff, and some ground-floor retail space. The building was officially opened in August 2006 and occupied later that same year.

CH2 was conceived, designed and built with a substantial focus on setting a new standard for ecologically sustainable office buildings. It has a long list of sustainable technologies and design philosophies incorporated throughout the entire building, services and form. Key sustainability-related features of CH2 include:

- Low energy, passive cooling systems
- Low energy, integrated electric lighting and day lighting systems

- Co-generation, photo-voltaic cells, and wind-driven turbines
- Active louvers on West facade and vertical garden on North facade
- Sewer mining, water recycling, rainwater collection
- Use of recycled materials
- Extensive facilities for cyclists



Figure 4h: Pearce, M. Council House 2. Melbourne Australia, 2006. (Cited 2009-10-29.

<http://www.designinc.com.au/projects/ch2-melbourne-city-council-house-2>.



Figure 41: Pearce, M. Council House 2. Melbourne Australia, 2006. <http://www.melbourne.vic.gov.au/Environment/CH2/SeeCH2/Pages/ImageGallery.aspx>. Cited 2009-10-29.

Briefly in the nature of the space to be created the design was also intended to produce productivity benefits through increased communication and collaboration between staff. The form of CH2 is based on a modern open-plan philosophy, with no enclosed offices and low adjustable partitions between workstations. There are relatively unobstructed lines of sight throughout each floor, with the only enclosed spaces being the formal meeting rooms. Informal meeting and social spaces are provided throughout the building. Occupants also have access to external balconies, a winter garden, a summer terrace and a rooftop garden. Pierce employed a highly technical approach to design which has been described as, “expressive, has worked very well with green star Australia, possibly, the best so far in relation to the tool, to achieve good ratings” (Fortmeyer 2009). In light of all this, has the desire to achieve the rating sacrificed the aesthetic?

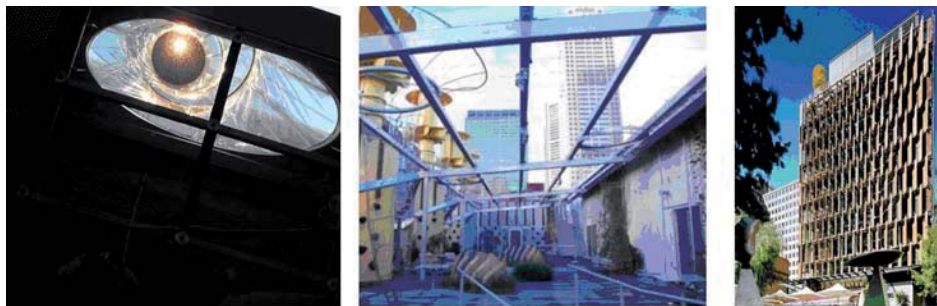


Figure 4j: Pearce, M. Council House 2. Melbourne Australia, 2006. (Cited 2009-10-29.

<http://www.designinc.com.au/projects/ch2-melbourne-city-council-house-2.>)

### ***Green Star as a design tool***

A major component of green star is innovation, which requires innovative design strategies that exceed green star benchmarks and environmental design initiatives. In the design of CH2, a new strategy was adopted to bridge the gaps between the various disciplines, called the charrette. This was an integrated design approach which involved all the professionals and artists working as a design team to resolve all formative design issues in a consensus-style manner. Design and technical issues were resolved together at the initial stages. For example, architects received technical advice at the moment of design propositions and the technical innovations by the engineers are tested against their aesthetic quality at the moment of their inception. The following information is sourced from a study of the design of Council House Two by Graham Crist and Darko Radovic, *Nature and Aesthetics in the Sustainable City*.

CH2's aesthetics are composed of three key aspects:

1. The technical issues which demonstrate the integration and application of a mix of technologies and design principles in order to communicate their viability and stimulate adoption.
2. The urban issues which respond to contemporary culture by defining a new urbanity and promoting an understanding of

sustainability issues.

3. The expressive issues which involves the use of signs and images as carriers of messages.

### **Technology**

One of the major roles of the CH2 building is for it to stand as an example for innovative construction, to demonstrate the integration and application of a mix of technologies and design principles in order to communicate their viability and stimulate adoption. The design team incorporated technical innovations in the façades and overall aesthetics of the building. Timber louvers, green roofs, thermal chimneys and shower towers and are technical innovations which act as metaphors that allude to nature while serving a functional purpose.



*Images showing the operable timber slats, wind turbines on the roof and the shower towers on the north elevation.*

**Figure 4k: Pearce, M. Council House 2. Melbourne Australia, 2006. (Cited 2009-10-02.**

<http://www.melbourne.vic.gov.au/Environment/CH2/aboutch2>)

### **Urbanity**

CH2 is an exemplary building which combines ecological sustainability with cultural sustainability. The bioclimatic principles expressed on the façade communicate contemporary issues of sustainability. How the building sits within its local and greater contexts is important because it refers to the building's spatial practice which is how we experience it everyday, for example when driving or walking past it. It also refers to its representation of space which is how CH2 occupies space in the CBD, how much space it occupies or how much of a shadow it casts on its neighbours. Acknowledgement and reference to its neighbours is also a key component and refers to spaces of representation.



*Clockwise from top left: (1) Spatial practice: CH2 in passing. (2) Representation of space: Ch2 in the CBD. (3) Spaces of representation: Ch2 framing historical neighbour.*

**Figure 4l: Pearce, M. Council House 2. Melbourne Australia, 2006. <http://www.melbourne.vic.gov.au/Environment/CH2/aboutch2/Pages/Research.aspx>. (Cited 2009-10-02)**

## Expression

The design of CH2 incorporated similes and metaphors that allude to nature or to the building as a living, breathing organism. “The ingenious way that air flows through, and temperature is controlled, within a termite nest to suit its occupants is cited as having conceptually informed the design of systems within Ch2” (Radovic and Crist 2006:7). The metaphors are functional and express externally the indoor environment. More directly visual but allusive and literal metaphors are the shower towers on one of the elevations that allude to evaporative cooling while cooling the building and the east façade which represents the bark of a tree. The use of timber on another façade shows the natural weathering of materials over time.



*Images above, clockwise from top left: (1) Diagrammatic east elevation and façade inspired by the bark of a tree. (2) A representation of the environmental elements of CH2. (3) Timber slats and wind turbines expressed externally.*

**Figure 4m: Pearce, M. Council House 2. Melbourne Australia, 2006.** <http://www.melbourne.vic.gov.au/Environment/CH2/aboutch2/Pages/Research.aspx>. (Cited 2009-10-02)

## Conclusion

The Green Building Council of Australia (2009) has reported CH2 to have achieved the following:

- achieved an 87 per cent reduction in greenhouse gas emissions, compared to buildings of similar size
- increased staff productivity by an impressive 10.9 per cent in the first year of operation, exceeding the forecast of 4.9 per cent
- realised annual cost savings of \$2 million, against a forecast of \$916,000, which has reduced the payback period from 10 to 7 years.
- achieved 5 points for innovation- the highest you can achieve in a Green Star Rating

Rating tools have been established to measure the performance of a building in terms of its impact on the environment (See appendix A

which is a summary of the strategies employed to address each component of the tool). Rating tools should not be used to create architecture but as an aid in the technical performance of the building because architecture, as opposed to buildings, embodies much more than just ecological performance and beauty cannot simply be calculated.

As a project which was aimed at causing an impact in the building industry and broader community, CH2's image and aesthetic values are central to its success. Mick Pearce and his team applied the tool accurately, used it as an aid to achieve architecture and achieved a manifestation, in built form, of sustainability, contemporary culture and aspirations for a sustainable environment for the future. Going into the design phase of this thesis, we will use Green Star South Africa, which is modelled on Green Star Australia, to guide some of the technical decisions we will make from the initial site selection and throughout the design phase. GSSA will provide the benchmarks for every aspect of the design in terms of the nine categories it has outlined.

# chapter 5

## **culture & perspectives**

*Architectural design can play a large part in influencing the ways that social groups interact. Buildings can be designed with the specific intention of controlling or directing the flow of everyday life to create 'socially equitable spaces'."*

Wikipedia, 2010. Sustainable architecture. (Cited 2010-08-15. [http://en.wikipedia.org/wiki/Sustainable\\_architecture#Social\\_sustainability\\_in\\_architecture](http://en.wikipedia.org/wiki/Sustainable_architecture#Social_sustainability_in_architecture))

## Society and architecture

The aesthetics will aim to provoke interest in sustainability and the overall form will find new ways for users to inhabit the space which will eventually translate into energy efficiency. The aim in this chapter is to examine society's role in architecture, how society perceives architecture and how society understands messages that architecture communicates – all this in order to emphasise the importance of society's involvement or an understanding of society's perspective for when architects make aesthetic and overall design decisions.

### ***Society's role in architecture***

Roger Scruton in his essay, *Architecture in an age of nihilism*, which was published in the book, *What is architecture*, reckons that all serious architecture must therefore give purchase to the claims of taste. It must offer a public language of form, through which people can criticise and justify their buildings, come to an agreement over the right and the wrong appearance and so construct a public realm in the image of the social nature (Ballantyne 2002:58). Architecture does impose itself because it is public. It is a public expression and takes up space for everyone to see. This makes society an important part of the design decisions that architects make. Gifford, Hine, Muller-Clemm, Reynolds and Shaw quoted Mehrabian and Russel as saying, "Among many personal and contextual factors that influence appraisals of the environment in general and of architectural beauty in particular are the observer's emotional responses to buildings" (Gifford, Hine, Muller-Clemm, Reynolds and Shaw 2000:164).

The fact that architecture expresses the culture of its time, as discussed in the previous chapters, also substantiates the concept of society as an integral part of architecture. It is therefore important as Scruton mentioned, "We must never cease to seek for the forms that display, as a visible meaning, the moral co-ordination of the community" (Ballantyne

2002:58). Sustainability is an issue that requires expression in architecture as it is one of the issues that have consumed many people's consciousness while many are completely unaware of the ecological crisis. Rapoport (1974:58) believes that built forms have a symbolic function and "symbols therefore help man to understand the world and to form it into a meaningful cultural pattern which is given physical embodiment through built form as well as being expressed through written records, graphic symbols, song, myth and many other symbolic structures". Observers need to have a moving emotional response that will leave them with some understanding or awareness of sustainability.

### ***How society understands messages in architecture***

As we have discussed in chapter three on how architecture communicates, we have established that metaphors are a key part of how society receives messages through architecture. Jencks (1991:52) explained that metaphors play a predominant role in the public's acceptance or rejection of buildings. We have also established that architecture evolves because of the spirit of the time or the cultural values of the time. Therefore, as Ballantyne (2002:34) has further explained, "Each tradition could be seen to have its own ethos, its own characteristic ethics; so,

from the point of view of the architect involved in determining the form of the building, there is indeed a close link between ethics and aesthetics". He further quoted Wittgenstein who said, "The way a building is shaped derives not from a strictly logical process working from premises to conclusions, but from a culture which has certain values, that work together to influence judgements" (Ballantyne 2002:34). Society's view of aesthetics is developed through culture as well as education and aesthetic judgement is based on experience, reason, and preference. In architecture the aesthetic is expressed through built form; the shape and arrangement of forms; space; light; and materials. This further motivates the importance of studying contemporary culture and ethics as a path to achieving architectural forms that society can understand and accept.

### ***Form and Aesthetics***

Mario Salvadori wrote in the foreword to Eugene Raskin's book, *Architecture and People*, "Beauty is a necessary, but not a sufficient condition of architecture...but structural correctness is" (Raskin 1974:2). Salvadori could be implying that structural integrity in architecture is far more important than its beauty and that if the building is considered ugly then

that would be far more acceptable than if it could not stand. The issue here is if this would still be considered architecture if it were ugly. What is beauty in architecture? Does it lie in the message that is conveyed or the manner in which it is conveyed? For example, can a beautiful building be one that conveys messages of evil, such as expressing prejudices on the house of a political party that advocates racism or expressing murder and death on the face of an abortion clinic, but are messages that are conveyed wittily. This asks the question: Does purpose influence beauty? The approach to aesthetics in this study considers beauty, composition, proportion, cultural relevance and the value of the messages. Louis Sullivan coined the term 'form follows function' and it has been reinterpreted in different ways in the architecture arena. Some have interpreted it as form being a direct result of structural rationality when enclosing spaces that are adapted to specified functions. Others define it more poetically by insisting that form is the language employed to express the culture and purpose of the building. Another school of thought links beauty to form by the idea that beauty is a result of an intimate connection between form and purpose (Holgate 1992:215). There are many principles and interpretations with regards to form and aesthetics with the latest one being – form follows performance. This

principle is grounded in the idea that a building's form is a direct result of its ecological performance and refers to rating tools as a guide to achieving that form. Taking all these principles into consideration, we will, however, concentrate on the implications of form and aesthetics on beauty. Roger Scruton (1979) wrote, "The philosophy of aesthetics is a continuing intellectual disaster and the concepts in aesthetic judgement seem to float free of any settled basis for the application."

It is true to say that we notice some buildings and others seem to fall in the background and go unnoticed. Those that we notice are in response to feelings that they prompt us to have, feelings that are rooted in our culture or values. The quickest way that architecture provokes our attention is by its aesthetics. Ballantyne (2002:18) describes a discussion on the aesthetics of a building as a discussion about the perceptions which buildings prompt us to have and an analysis of why it is we have them. Aesthetics, a word whose roots are grounded in the Greek word for perceptions and feelings, are the first expression of a design intention or cultural values. "The aesthetic experience is not an optional addition to our mental equipment. On the contrary, it is the inevitable consequence of our interest in appearances. I see things, but I also see the meaning of

things and the meaning may saturate the experience. Hence appearance becomes the resting place of contemplation and self-discovery" said Roger Scruton (Ballantyne 2002:58). Holgate (1991:19) supports Scruton by saying that beauty can be recognised because it gives rise to an aesthetic experience. Ballantyne quoted Wittgenstein as saying, "The way the building is shaped, derives not from a strictly logical process working from premise to conclusions, but from a culture which has certain values that work together to influence judgements" (Ballantyne 2002:34). How the audience or users perceive a building or their feelings about a building is influenced by their cultural values. Some cultures may find joy in certain buildings, be outraged by others or simply not notice some buildings but the same buildings may have the opposite effect on other cultural groups. Sometimes beauty crosses cultural boundaries. Beauty such as that which is found in nature is often appreciated by cultures around the world, it is then when the properties of this object of beauty can be analysed. The same can be applied in architecture, its beauty is inherent in both its physical properties and the aesthetic experiences it prompts us to have. Aesthetic judgement rests both on the beholder's experience and on the properties of the building. Some properties of a building are, of course, less provocative than others and it is these prop-

erties that are of interest to us. Holgate (1991:32) wrote, “There is a suggestion that those aspects of beauty perceived directly by the senses (such as colour and outline) are of a lower order than those appreciated by the intellect. Aspects of beauty which appear to be linked with the mechanism of the brain, such as the attraction of geometrical proportion and ‘pure’ forms of spheres and cubes, are considered to appeal directly to the soul, whereas aspects which appeal to what is illogical in us, such as fashion and taste, are considered to provide ‘mental’ delight.”

### ***How society perceives architecture***

Cultural perspectives on architecture need to be understood by the architect to be able to correctly convey messages in a manner that will provoke attention. We have mentioned before that metaphors in architecture play a critical role in a society’s understanding of the messages that architecture communicates and that different metaphors communicate different messages depending on the society. Charles Jencks (1991:52) said, “Metaphor, seen through conventional visual codes, differs from group to group, but it can be coherently, if not precisely, delineated for all these groups in a society”. Architects and laypersons’

interpretation of aesthetics in architecture differ and these differences “can result in severe mismatches between designer and layperson’s preferences. These differences are not trivial because part of the architect’s job is to understand the client” (Gifford, Hine, Muller-Clemm, Reynolds, Shaw 2000:167). It is for the above reasons that architects need to understand what architectural aesthetics mean to their clients and to society. A study by Gifford, Hine, Muller-Clemm, Reynolds and Shaw, Architects predict lay evaluations of large contemporary buildings: whose conceptual properties, proved that architects’ and laypersons’ aesthetic evaluations are unrelated and their emotional assessments of buildings are based on different sets of objective building features Gifford, Hine, Muller-Clemm, Reynolds, Shaw (2000). In a study by Graham Brown and Robert Gifford which was published in The Journal of Environmental Psychology, they examined the possible reasons why architects are unable to predict the public’s taste in buildings and they tried to improve architects’ level of understanding of the public’s taste. Included in their investigation is a study done by Nasar and Purcell (1990) of house styles where architects and laypersons thought about buildings similarly in terms of their goodness of example and familiarity. This study showed that objective and physical building features inspire abstract ideas

which are different in architects and the public. These abstract ideas are human constructs (Brown and Gifford 2001:98). Brown and Gifford suggest, “In order to understand what laypersons like and how they evaluate buildings, architects may wish to learn more about conceptual properties in the eyes of laypersons” (Brown and Gifford 2001:98). They further suggested that a good way of understanding the difference in building evaluation between architects and laypersons is by finding a link between the physical or formal properties of a building and the conceptual properties in the eyes of architects and laypersons.

**Seattle Public Library, Seattle, USA by Rem Koolhaas**

In the year 1990, the local government of Seattle decided that they needed to revamp the existing libraries as they were old and overstocked. They ultimately decided to renovate one library, the Seattle Public Library, and held a public forum where architects who were interested in designing the new public library presented their recent works. This strategy was an attempt to involve the public in the design process from the beginning until the end. John Pastier, a Los Angeles Times architecture critic, said, “It is the city, not the architect or city elites, that produce great buildings.



Figure 5a: Koolhaas, R. Seattle Public Library. Seattle USA, (Cited 2010-07-07. [http://www.yworkshop.com/2008/05/seattle-public-library\\_rem-koolhaas/&usg](http://www.yworkshop.com/2008/05/seattle-public-library_rem-koolhaas/&usg))

Making great buildings is a citywide enterprise, which means that everyone is entitled to participate in the design of these civic structures,” (Mattern ). The library was a tool to “engage and express the richness of Seattle’s public, cultural and intellectual life.

This richness implied plurality, inclusiveness and the engagement and concrete expression of the city’s diverse public, cultures, ideas and values,” (Mattern). Pastier argued that if the building is to do all these things then it is the entire city’s responsibility to make it work. The civic panel visited Pritzker Prize laureate, Rem Koolhaas’s, buildings after he had presented his work and were very impressed.

They then decided to appoint him as the architect. The ambition for the design was to redefine the library as an information store-house for all forms of media and present them legibly and as equally as the books. Koolhaas explained, “Today’s library must deal with commercialization, proliferation of new technologies, the multiplication of the library’s social obligations and the erosion of the public realm.



Figure 5b: Koolhaas, R. Seattle Public Library. Seattle USA,(Cited 2010-07-07. [http://en.wikipedia.org/wiki/File:Seattle\\_Public\\_Library\\_Main\\_Branch\\_Reading\\_RoomJPG](http://en.wikipedia.org/wiki/File:Seattle_Public_Library_Main_Branch_Reading_RoomJPG))

In this over-stimulated world, a world drenched in imagery, the high-minded architecture of the Carnegie era doesn’t convey the same image of goodness and morality that it once did. Today, an earnest presence like that of the library in its pure and traditional form would simply fail to register,” (Mattern). It is for this reason that Koolhaas did not design the Seattle Public Library to look like a traditional library. The Seattle Public Library had to evolve along with cultural and social transformations. Koolhaas paid particular attention to flexibility, making room to the ever-growing collection of books and preventing the deterioration or scaling down of interactive spaces over time. This would eventually be realised in a spiralling platform or floor where the entire book collection is housed. This spiral allows the entire collection to grow without

disrupting the logic or clarity of the stacking system and it also allows freedom of movement throughout the entire collection by both the abled and disabled. The library was divided into five 'stable' platforms and four 'instable' platforms. The instable floors are the more informal and interactive areas and the stable areas are the formal, structured areas. The five stable platforms are the spiral, the underground parking, the headquarters for administration, the staff level and the meeting rooms. The unstable platforms are the reading rooms, the children's section, the living room and the mixing chamber where patrons can go and speak to librarians about general questions or in-depth research. These platforms are not vertically aligned, instead they are pushed and pulled, creating a dynamic form "like a stack of books or hard drives, leaning out in places and recessed in others" ( ). Koolhaas justified this form by saying that the form and function of the 21st century library should be as dynamic as the technology within its walls and that libraries that resemble glorified fortresses send the wrong message (Kubo and Prat 2005:63). Part of the library cantilevers above the entrance and projects 12m from the door into Fourth Avenue. This creates an open space in front of the entrance and "keeps a dialogue" with Fourth Avenue Plaza across the street. Originally they had designed the exterior

to feature a tight mesh but the public criticized it and said it was reminiscent of a cage or cheese-grater so the architect decided to do a larger diamond grid. The glass skin wraps around a lattice-like system of steel tubing. The tubing acts like diagonal braces and provides lateral support to manage earthquake and wind loads. Form follows function is evident in the application of the seismic skin around the building. Wherever it is not needed, the steel is stripped out in one direction of the grid to leave only thin glass mullions which can span one diamond width by itself. In places where the façade has a tendency to buckle, the steel is doubled up (Kubo and Prat 2005:134). Koolhaas used the transparency of the glass skin to symbolise the ease with which the patrons will use the library but believed, "a generic modern box would be too austere for the Central Library program and it would not convey the complexity of the library as an information store".

Initially the design did not make sense for some people and they believed that "it should look like a library" and said that it should keep with the coherent style that was applied to the old Carnegies (Mattern). After construction, the public was amazed by the semitrapezoidal glass-and-iron-mesh structure and are left intrigued about what it could contain. Koolhaas began the design process with metaphors of public

service or commerce and enlightenment.



Figure 5c: Koolhaas, R. Seattle Public Library. Seattle USA, (Cited 2010-07-07. <http://plusmood.com/wp-content/uploads/2008/09/seattle-public-library.jpg&imgrefurl=http://plusmood.com/2008/09/seattle-public-library-rem-koolhaas-oma/&usg>)

These are the concepts that guided the design process, the program and especially the form of the building. Throughout the design process the public as well as the librarians were invited to give their opinions,

take part in debates and ask questions about the design but the public's commentary and criticism only played a minor role in the overall character of the design. Their input resulted in minor interior changes such as the shifting of programmatic elements and the reorganization of floor layouts while the core design scheme was left to the architects. Some external features such as the tight mesh which was eventually substituted by the diamond grid were the input of the public and later served a structural purpose. The architects being the professionals and experts on the design of spaces are best to be the ones with the louder voice in the design process and be the leaders from beginning until the end. The building aimed to gain a silver rating in LEED but this clearly did not inform any of the design decisions. Koolhaas' attempt to reorientate design culture in Seattle and create a new language that reflects the culture of the time is what makes the Seattle Public Library architecture and not just a building. He created a new metaphorical language for libraries and erased the traditional image of a library which dates centuries back. Generations from now, people will look at the Seattle Public Library and see glimpses of a technological and information culture in its infancy and gain clues about the society of the last decade of the 20th century.

**Nelson Mandela Interpretation Centre, Alexandra Johannesburg by**  
**Peter Rich Architects**

born out of a joint venture between the Gauteng Tourism Authority and the Alexandra renewal Project. In an effort to uplift the community by



**Figure 5d: Rich, P. Nelson Mandela Interpretation Centre. Alexandra, JHB, 2007.**

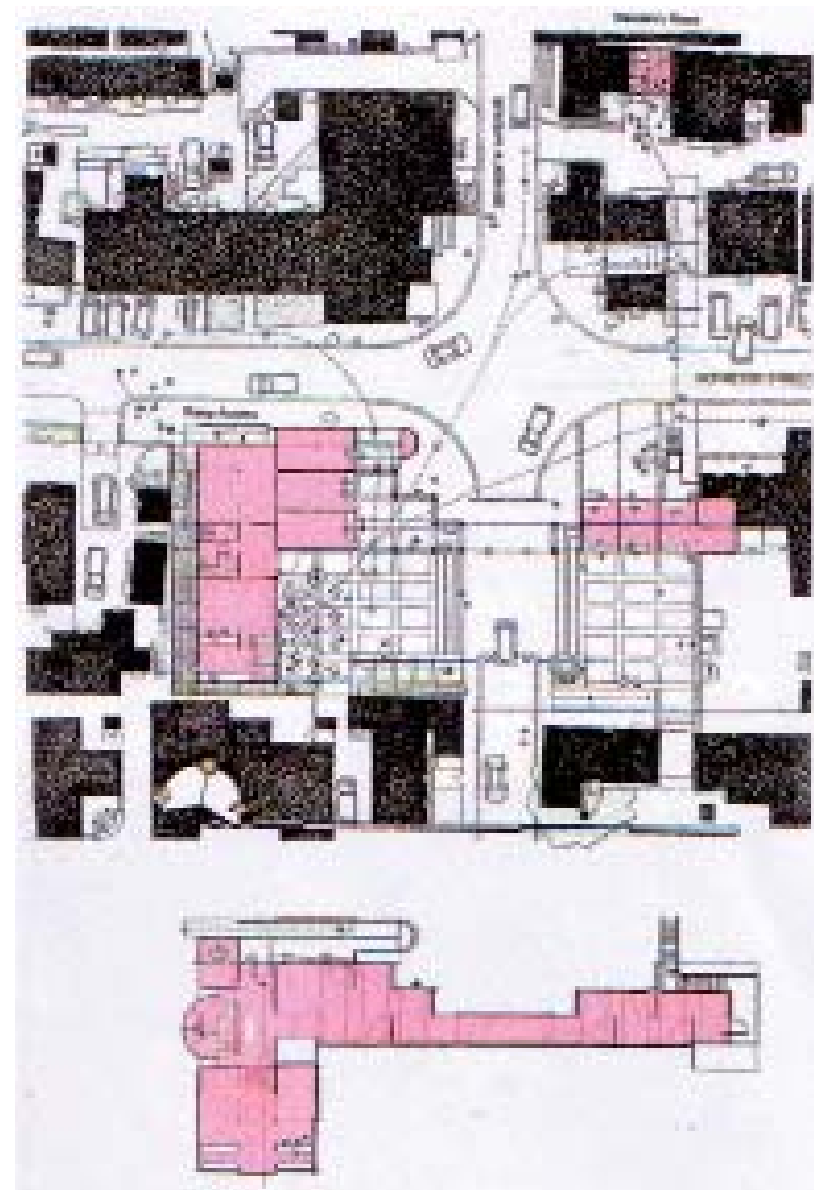
Inspired by the surrounding building fabric of Alexandra and the underlying cultures and traditions, Peter Rich designed a building of civic and regional stature. The Nelson Mandela Interpretation Centre was

relieving it of poverty through training inhabitants in tourism and heritage, arts and culture as well as through nurturing small enterprises, the building accommodates entrepreneurial activity and exhibiting art that narrates the past, present and future of Alexandra.

Ann Fitchett (2009:25) wrote in her article titled Mandela's yard and the Mapungubwe Interpretation Centre, "The architectural language of the Nelson Mandela Interpretation Centre has emerged as a synthesis of the close observation that characterises the process of measuring and recording the existing fabric'. By this statement, Fitchett describes the character of the built landscape of Alexandra and how it has informed the design.



Figure 5e: Rich, P. Nelson Mandela Interpretation Centre. Alexandra, JHB, 2007 (Fitchett 2009:23)



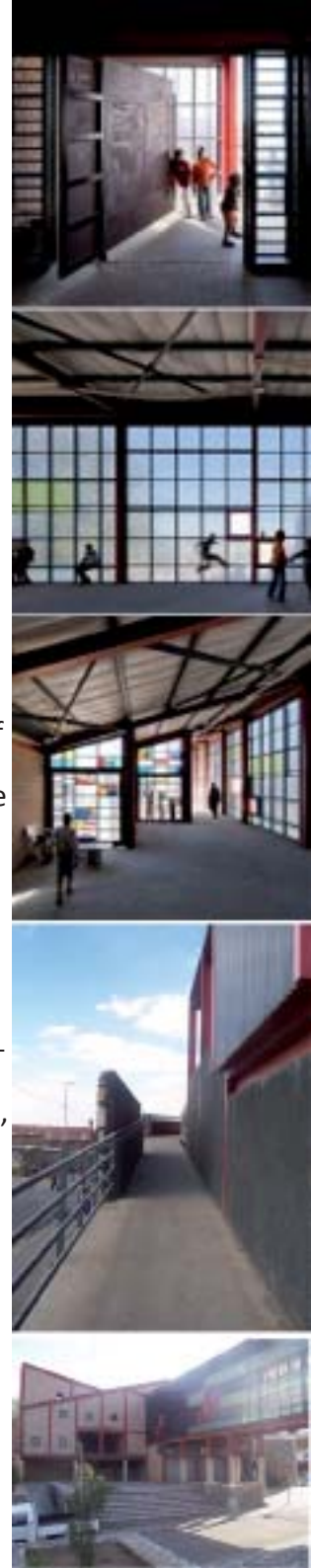
**Figure 5f: Rich, P. Nelson Mandela Interpretation Centre. Alexandra, JHB, 2007 (Fitchett 2009:23)**

Peter Rich studied the landscape through two methods; lengthy engagements with the community that distil the essence of Alexandra's history, present and future. This process was assumed by sixteen locals who were trained to map the heritage, tourism potential and existing historical resources through people, places objects and events. The second method was drawings which he continued throughout the design and construction phases. These were an exercise in conceptualising and revealing the underlying order and social meaning in Alexandra.



**Figure 5g: Rich, P. Nelson Mandela Interpretation Centre. Alexandra, JHB, 2007.**

Rich mapped and sketched several yards, the relationships between private and public spaces and how each were born out of complex social interactions that are unique to Alexandra. This informal development or growth of spaces has informed the premise from which Peter Rich has designed the Nelson Mandela Interpretation Centre in Alexandra. As opposed to rejecting the complexity of the cultural stands, Peter Rich used that as his muse to “reflect multiplicity and juxtapositions” (Fitchett 2009:25). The yards overlap and interact and leave no space unused. Rich replicated this use of space in the centre and left no space without a purpose. The two halls on the upper level are flexible and adaptable to many functions: the display screens used during exhibitions fold away to make room and open the hall for meetings and other community events. Aside from the entrepreneurial activities which take place and the art exhibitions by the locals, the locals also take part in the curatorship. The form of the architecture is symbolic; it expresses the ongoing heritage of Alexandra in its open-endedness and the visual linkages which are created in all dimensions and through the flow of



space.

**Figure 5h: Rich, P. Nelson Mandela Interpretation Centre. Alexandra, JHB, (Cited 2010-07-23. <http://www.archdaily.com/58495/alexandra-interpretation-centre-peter-rich-architects/>**

The primary materials used are steel and facebrick. The facebrick gives the architecture a civic scale. The coloured glass panels make it more inviting to the whole community, including the children, and the corrugated iron sheeting blends it in to the landscape in a more formal and organised manner.

## Conclusion

In South Africa society remains divided in terms of socio-economic standing. Those that have less are often impressed by the image of the other and those that have more would like to distance themselves from what they perceive to be associated with their lesser counterparts but are not necessarily moved by the images that are associated with their everyday lives. People's personalities, gender and many other factors influence their judgements. In a country that is in its democratic infancy, these issues are even more exaggerated. Some people like the familiar images that have been previously associated with a particular program. It is then when the architect needs to assert a new language that re-

flects the spirit of the time and reflects new ambitions and changes in society. Images that have been seen before in other buildings will not have the desired effect of intrigue; instead it will blend into either side and be easily missable or not be associated with sustainability because it will look like the many buildings that have been seen before. The solution would be to keep in mind that people are fickle, easily manipulated by imagery, especially in the culture that we live in. An attempt to have an image that will be loved by all is a futile attempt and will be met with many challenges, including mood, gender, taste, culture, economic-standing and many more. A better strategy is to create an image that has never seen before in architecture, a metaphor that suggests associations with nature and must attempt to be iconic because it will be the only one of its kind. Rem Koolhaas's strategy is exemplary and allows the public to accept the building even before it is complete by allowing them to take part in the design of a civic building which is designed for their use and enjoyment. This strategy needs to be applied carefully with a strong concept to guide the design decisions.

# chapter 6

---

## strategy

## Summary

We live in a society where imagery dominates, excess is symbolic of a higher social status and, incorrectly, ecology and sustainability is the concern of the professionals who are equipped to understand and deal with it. Gradually society is becoming aware of our ecological crisis but the process is slow and confusing for most. The confusion comes when everything around us symbolises a lack of concern for the environment and sometimes persuasive towards all that is detrimental for ecology. Our built environment is one that manifests the spirit of our time, our culture and communicates its priorities and aspirations. Studies of

vernacular and indigenous cultures show that “what finally decides the form of a dwelling and moulds the spaces and their relationships, is the vision that people have of the ideal life.” [Rapoport, 1969] Sustainability is presumably an “ideal” goal. But it must be a shared goal. It is architecture’s responsibility to make clear to society that sustainability is an issue that requires urgent attention, not just from professionals but from all of mankind.

Some architects have had the best intentions but not the best strategy, if any, to address sustainability. It seems that in the examples mentioned in chapter 1, green architects have missed the fundamental element that distinguishes architecture from mere building – architecture as communicator of contemporary culture, priorities and aspirations. Their priorities are performance driven and have all thrown the profession into disarray by using rating tools in an attempt to produce architecture or have adopted all sorts of principles, such as those mentioned in chapter one, in an attempt to produce architecture.

Form, aesthetics, beauty, culture, symbolism, delight and many other elements that architecture embodies have all been compromised. An examination of architecture and the principles that define the profession

have been unearthed in this study and will guide the design of ecologically, economically and socially sustainable architecture. Metaphors that allude to nature and sustainability, but are not explicit, will inform the aesthetics. The form cannot be one that can be easily associated or resemble another building. It will be a form that’s unusual, striking and leaves its audience intrigued. Associations to other buildings will not leave a lasting impression and may confuse the audience because of the lack of environmental concern in most existing buildings. The architecture will be one that engages art with science, the user with nature and society with sustainability: art referring to metaphors and science to building.

Peter Rich’s methodology of studying the landscape to unearth clues regarding order and cultures provides an interesting precedent and starting point for designing architecture that is site specific and caters specifically to its local users.

If the overall form and its aesthetics saturate the user’s experience and re-direct their use of the space, this will assist in engaging society in sustainability and guide the user in understanding his part in achieving a sustainable society. This can come through architecture that integrates nature in its form and blurs the boundary between inside and outside,

giving the user the choice of a sunny outdoor experience while indoors and the opportunity to witness the building's sustainable operations. Through its architectural language, this building will tell the public that there is such a thing called sustainability, it will be whimsical yet intriguing and it will lure the public inside where it will demonstrate some sustainability practices.

From the successful case studies, we've uncovered the common thread or principles that good architecture embodies and these are the principles that this thesis will adopt:

- The choice of site was informed mainly by the social issues of the time such as the rejuvenation of a stagnant community.
- A history of the site and the current physical landscape were thoroughly studied and they informed the overall form and the design decisions that were made. These were evident in examples such as the city grid which informed the shape of MAXXI museum or Piano's use of iconic familiarity as an aesthetic language which recalls the pattern and form of typical rural village development in the beehive-like pavilions that look like the traditional Kanak hut.
- The space came about as a result of practical decisions such as the

continual growth of the book collection in the Seattle Library or the spatial ordering in the Nelson Mandela Museum which was uncovered from studying several yards in Alexander that revealed meaning and social order.

A building whose very purpose stands for progress and learning is a library. Its form, program, aesthetics and technology will follow the concept of engagement: the engagement of society with sustainability and the user with nature. From the moment of the user's first sight of the building to his using the library facilities, he will engage with the aesthetics metaphorically and gradually engage with the sustainability practices that the building embodies. The resultant building will not only have a significant environmental impact by its reduced energy consumption but it will have an impact on a broader scale by its ability to initiate change. It will be a landmark of our cultural values and represent a shift in focus towards environmental sustainability in architectural design.

# section B

---

Design development



# chapter 7

## **the library**

*“...there is no denying the social function of the library to a sense of identity, community and nationhood.” (Edwards and Fisher 2002: ix).*

## Program

Libraries have been the storehouse of information for centuries and the places where the exchange of information occurs. Now the internet has made information virtually available everywhere and is no longer constrained by buildings. Brian Edwards and Biddy Fisher claim that the library’s prime function is now making that knowledge available everywhere and encouraging exchange and reflection upon it (2002: ix). From the evolution of the printing age to the internet, architecture has had to adapt to cultural changes in the information age and re-direct new ways of inhabiting the library space.

“The growth in ‘national’ libraries is an expression of the cultural func-

tion of the library in a world increasingly dominated by global values,” Edwards and Fisher (2002: ix). The library space changed from private adjuncts of monasteries to public spaces where children, adults, scholars and the whole community gather to gain information. Libraries not only grew spatially but also aesthetically and have expressed the values and attitudes of their creators as well as the culture in which they were built. From the great flowering of the library as a recognizable building type in the eighteenth century to the dome and cube form and eventually to the more fluid space of the modern library, the library evolved accordingly to the values and culture of the time. Today, a library which expresses the pertinent issue of creating a sustainable environment which does not hinder future generations from meeting their needs through its fabric and operations is ideal for extending sustainability values to future generations of occupants and visitors. Winston Churchill’s words, “we shape our buildings and thereafter they shape us” helps us understand the importance of architecture in expressing sustainability through its form and fabric. The library’s role as a community’s center and its mission to serve as an educational resource make the library an ideal platform for distributing the sustainability message.

A library’s symbolism as an information store-house for society’s devel-

opment works hand-in-hand with sustainability’s mission to not compromise the ability of future generations to meet their needs. “One of the central themes of the library’s mission is to preserve knowledge so that it can be passed on to future generations,” (Green Libraries 2010). Both the library and sustainability have mankind’s empowerment and the preservation of resources for future generations as their main priorities. “All libraries have a mission statement, and spoken or unspoken, libraries are here to improve the condition of mankind,” (Green library 2010). How can an institution which is aimed at improving the human condition contribute to the destruction of its future? If a library is symbolic of an investment into the future then it cannot contribute to its destruction. It is such a building, by its very purpose, that is concerned with society’s future and embodies the goal of sustainability that serves as the perfect program on which to demonstrate sustainability in order to enlighten society on the issue.

### ***The library as a tool for sustainability***

Numeracy and literacy levels in South African primary and high school students are reported to be very low. This has been directly linked to the lack of libraries in most schools. The department of education is aware

of this problem and government has set aside funds to correct this issue. This lack of sufficient libraries in South African schools is another reason for the choice of a library as a tool for a sustainability-awareness intervention. The Star Newspaper (29 March 2010, p 1) reported that to build a library for each school in the country, it will cost the government a staggering R2,2 billion. A potential solution that was suggested by the department of education is for schools that have libraries to share with nearby schools that do not have libraries. This may cause a problem of over-crowding and may be inconvenient for students from schools who do not have libraries. The other option is to set up mini-libraries in each classroom with books that relate to a specific subject. This is still a far cry from achieving satisfactory literacy and numeracy levels.

Another concern is one of tertiary students who come from other parts of the country and are unable to find residence on university campuses. These students are forced to share flats, live in communes near to their campuses and so forth which makes access to libraries in the evenings inconvenient and dangerous.

One other solution that the Department of Education has suggested is a stand-alone library that can serve a cluster of schools. This library can be a pillar of computer and library aid for schools in the chosen commu-

nity as well as an after-school study and resource centre for the primary, high school and university students who reside in those communities.

The objectives in this study are to build a sustainable or 'green' library, to fully equip the library with books, create a system of loaning books to nearby schools, provide study facilities, provide computers for use in the library and a computer centre which will be part of the library. Students from nearby universities, technikons and colleges can use this as a study venue and have easy access to prescribed text books and to the second-hand bookstore that will be located in the vicinity.

Judith Heerwagen, PhD, conducted research into the connection between green building strategies and occupant well-being and found that "many of the prominent features of green buildings are likely to have their greatest impact on cognitive and psychosocial well-being. For instance, contact with nature and sunlight penetration has been found to enhance emotional functioning. Positive emotions, in turn, are associated with creativity and cognitive "flow," a state of high task engagement" (Sands 2002: 4). A sustainable library will contribute towards a sustainable society in numerous ways. Boyden and Weiner (200:3) suggest that the widely varied client base of a typical public library makes an ideal

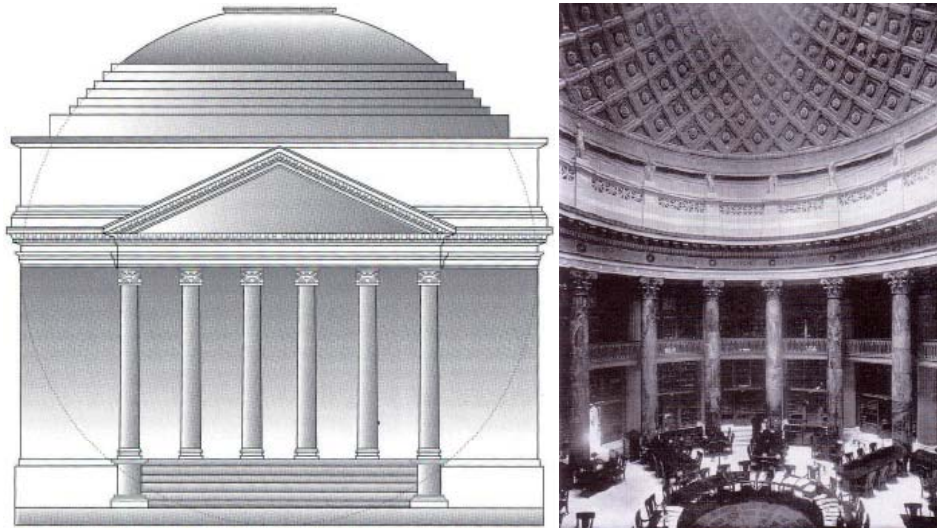
project to teach the concepts and realities of sustainable processes to the community. Its highly visible character and accessible spaces for all allow it to be a welcoming space for the community to engage in the world of information and education.

### ***Types of libraries***

Edwards and Fisher (2002) identified four main types of libraries: the public library, academic or university library, national library and specialist library. Each operate differently and prioritise different functions of the library. The national library places emphasis on the safe housing and conservation of scarce material as well as material of national importance among a comprehensive collection of books (Edwards and Fisher 2002:21). Public libraries placed a considerable amount of emphasis on local social advancement. Such a library provides books for loan along with study facilities and material or facilities for use by community groups. The academic or university library primarily supports learning and research. It houses books, journals, periodicals and electronic information systems. The specialist library does not normally offer books for loan and is mainly research-based. It is houses a special collection to serve a professional body and a wide variety of material such as photo-

graphs, letters and plans. Only the public library is of relevance in this thesis. To understand the functioning of the library program lets briefly look at how it has evolved. The modern library typically has a functional plan with a logical structure for the book collection, clear access to the study material and study facilities with adequate lighting for the users. The early eighteenth century library had an elliptical reading room set symmetrically within a 'golden section' plan. The plan later evolved through the dome and cube form. The dome was at the centre of the square and covered a circular central reading room and was surrounded by high level windows. The cube housed the bookshelves around the reading room. Books were stored in large semi-basement room to allow for easy delivery of the reading material at street level. The public was elevated to a first floor approach where the entrance was grandly marked architecturally (Edwards and Fisher 2002:3). Until modern times, the dominance of the reading room shaped the form of the building. It was the modern library that introduced fluid spaces which in turn translated into unfamiliar forms. Technology and the internet made information more freely accessible which influenced new arrangements of programs and forms. Typically the public library would have a lending library, a reference library, children's library, a dedicated area for news-

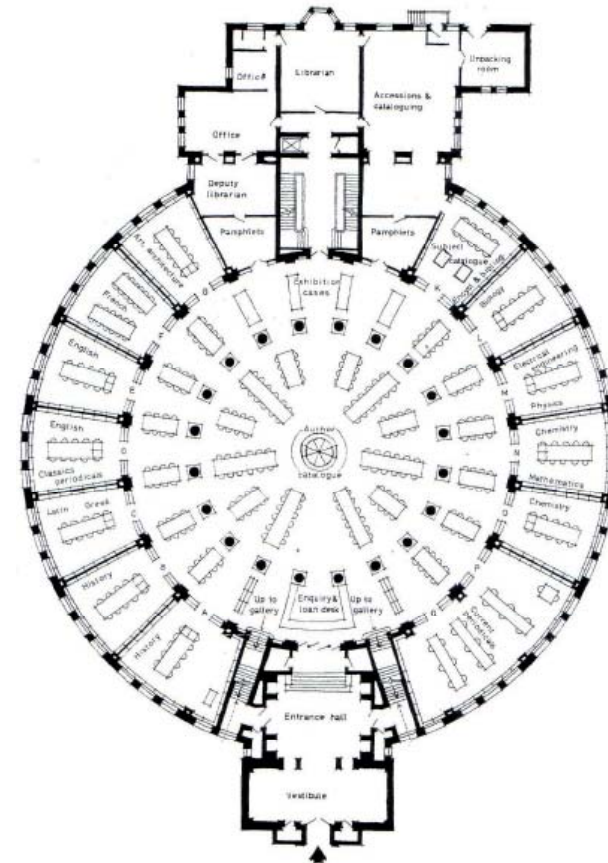
papers and periodicals and sometimes a music room, exhibition space and local history collection.



**Figure 7a:** Jefferson, T. Library at university of Virginia. Virginia, 1819 (Edwards and Fisher 2002:4). **Figure 7b:** McKim, Mead and White. Reading room, New York University. New York, 1895 (Edwards and Fisher 2002:5). Images showing the dome and cubed form of the 19th century library and the dominance of the reading room in the centre.

The reading room however remains an important feature of the library. it allows close access to books by the readers whose table are normally situated alongside the bookshelves. This is the character of the open access reading room with its casual ambience where readers are primarily browsing for books as opposed to spending most of their time sitting and reading the sourced material. The closed reading room is more

formal and has more tables and chairs for study purposes. The readers would use the books primarily for reference and spend most of their time reading.



**Figure 7c:** Lanchester and Lodge. Brotherton Library, University of Leeds, 1930. (Edwards and Fisher 2002:10). The plan of the Brotherton library further illustrates the dominance of the reading room even in the 20th century when the dome and cube form began to evolve.

**Library of Mount Angel Benedictine College, USA by Alvar Aalto**



Figure 7d: Aalto,A. Library of Mount Angel Benedictine College,USA. 1970 (<http://www.galinsky.com/buildings/mountangel>. Cited 2010-10-20)

Designed in 1965-1966 and built in 1967-1970, this library sits at the centre of the campus of Mount Angel Benedictine College. The plan consists of a fan shape on the southern side of a rectangular shape. This fan shape which houses the book well and reading galleries on its inner edges, consists of three levels and extends or widens as it rotates from east to west. The building is located on a steep slope and entry into the library is on the highest floor on the northern side of the building. By locating the bottom two floor along the edge of the slope, the original character of the site is not disturbed. The humble entrance leads you

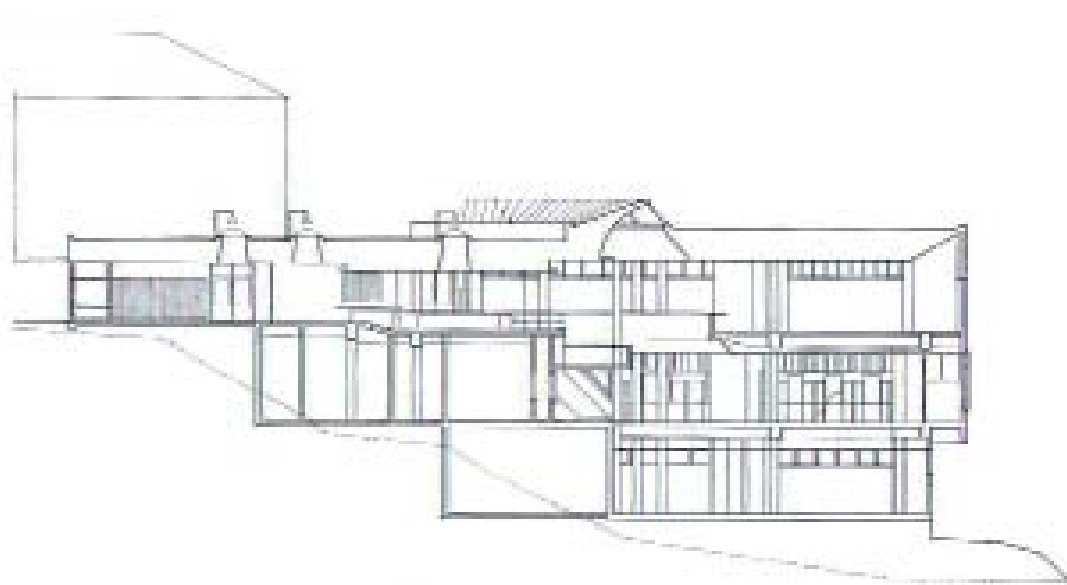
into a foyer where one finds utility rooms, administration rooms and a lecture hall in a tract on the left eastern side of the foyer. The plan is based on the geometry of the circle with very few parallel lines, except in the administration area.



Figure 7e: Aalto,A. Library of Mount Angel Benedictine College,USA. 1970 ([www.flickr.com/photos/cheeseboy/2424029755/sizes/z/in/photostream/](http://www.flickr.com/photos/cheeseboy/2424029755/sizes/z/in/photostream/). Cited 2010-10-20)

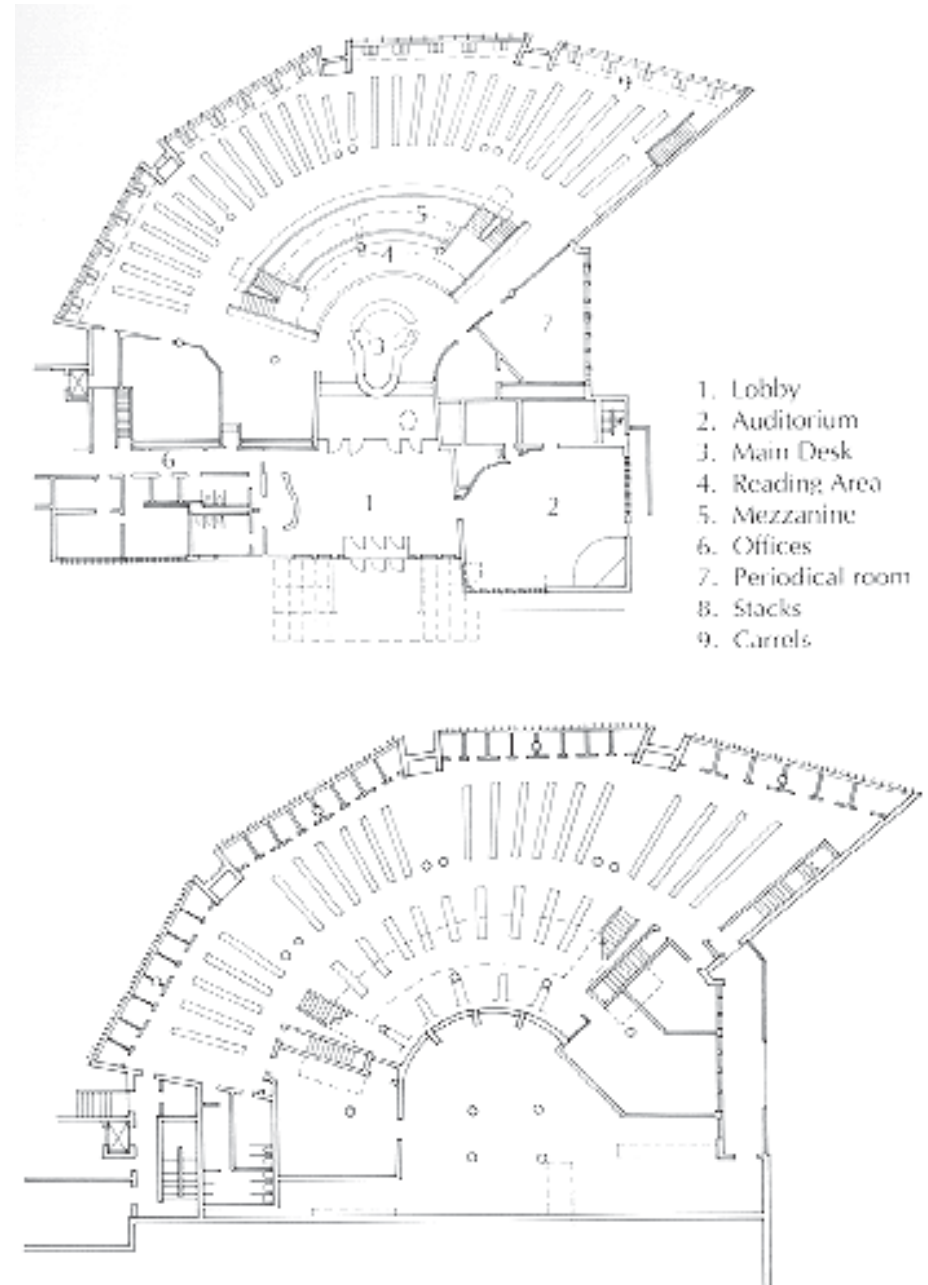
The interior construction follows the contours of the site and immediately ahead as you leave the foyer is the three-levelled book stack area with reading galleries each overlooking the level below in a large triple

volume space. Large clerestory windows which follow the fan shape allow cool north light into the deep book well and reading galleries. Study cubicles are found on the outer edges of the fan shape on the middle level.



Above. Figure 7f: Aalto,A. Library of Mount Angel Benedictine College,USA. 1970. (Aalto 1963:127)  
 Opposite. Figure 7g: Aalto,A. Library of Mount Angel Benedictine College,USA. 1970. (Aalto 1963:127)

The plan of this library echoes some of the historical form of the library. The fan shape which houses the book well and reading galleries is the core of the building and is reminiscent of the dome and cube form with its central reading room. As with the historic library, the cube, in this



case the rectangular shape, houses the administrative programs.

### ***The Berea Community***

The government has recently decided to spend more money on education and a portion of it will be allocated to providing schools with libraries. As a research driven, community and membership-based organisation, the Equal Education society group that has members who are qualified librarians, teachers, principals and students who are actively involved to promote the right to equality and education in order for the poor and marginalised to receive an equal opportunity in life. These are strengths that will allow the library to function fully as a source of information for the schools and students who reside in the above-mentioned communities. The Department of Education can own this library and the Equal Education group will be responsible for the day-to-day running of the library as well as the management of the building. Surrounding schools will have rights to the use of the libraries as part of their teaching curriculum and venue. Students from surrounding primary and high schools will have the opportunity to act as librarians and computer assistants in the computer centre. The miscellaneous programs attached to the library will contribute to the running costs of the centre by paying

rent.

### ***The triple bottom line***

To consider the library's impact on economic, social and environmental sustainability we need to take into the account the community's needs as well as the everyday financial and technical operations of the library. As I've mentioned before, the primary tool for social sustainability in this study is education. The community library will contain instructional areas, reading rooms, a children's library, offices, multi-media rooms and an electronic library. There will be adult literacy facilities and sustainability awareness talks for the general public and for the primary and high school learners who will be using the library as part of their curriculum. Sustainability practices will form part of the everyday functions within the building and part of the building fabric which will thus be the main tools for making the community aware of environmental concerns. Computer facilities will form part of the educational program and be used by the students, the general public and be rented for computer literacy training and any related training. Another important function for this computer centre will be its dedicated job-sourcing area where the public will apply for jobs with recruiters online under the assistance of

the computer centre staff. This will be a well-known job searching centre where recruiters or any business-people can advertise jobs to interested individuals.

Among the environmental performance criteria will be the adoption of green technology to generate energy for use in the building as well as mechanisms to reduce waste. Some studies have shown that reading or studying outside has increased concentration and efficiency. The design of the building will be such that it opens up to the natural environment thereby giving the users a choice to read 'outside' or 'inside'. Along with passive climatic design strategies such as the correct orientation of a building, the choice to read 'inside' or 'outside' will go towards reducing the reliance on electrical air-conditioning systems.

### ***Competition***

University libraries and schools are still a good place to study and are very convenient places to do homework.

The advantage of the Berea Community Library is that it is close to students who stay off-campus in the surrounding neighbourhoods and allows them to study in the evenings away from their noisy shared flats. Another potential pitfall is that some primary and high schools already

have libraries. This library will be promoted by school teachers and principals because it will have larger selection of books and will be a compulsory component, enforced by the education department, within the syllabus to expose students to the different media that the library will offer. It will also be a forum for exchange between pupils, teachers and principals from the different schools that will be using it.

### ***Industry analysis***

Existing libraries hire permanent staff. At the Berea Community Library, the students will be the librarians and will be supported by a small framework of permanent staff.

Similar programs as those of the Berea Community Library are located nearer to the city centre and away from residential areas and schools. All the programs on the site have the advantage of their clients and customers living and studying near these programs.

### ***Team summary***

1. Eskom: supports and offers energy efficient strategies to new buildings.
2. Green building Council South Africa: will rate the building for free because they support community-based green building.

3. Department of Public Works: will offer funding toward civil engineering work required.
4. City of Johannesburg: will wave all fees related to the approval of the building drawings and municipal connections.
5. South African Council for Educators: are offering support in terms of finding qualified librarians to run the library, assist and guide the students.

# chapter 8

## mapping

*"The future of South Africa and its valuable water sources rely on the education of the public – both those with access to technology and those without it. As with many African nations, South Africa is a country divided by financial extremes, with striking poverty levels closely tied in to access to education."*

The My Hero Project, 2010. Earthkeeper hero: Wetland and water conservation in South Africa. (Cited 2010-08-02.[http://www.myhero.com/go/hero.asp?hero=South\\_Africa\\_Wetlands](http://www.myhero.com/go/hero.asp?hero=South_Africa_Wetlands))

## Context

### *The perfect platform*

For this message of sustainability to reach the widest possible audience it needs the best platform on which it can be conveyed. The area of focus is a community where students at tertiary level reside and areas that are within walking distance to primary schools and high schools. A site in a busy area would be ideal because the building will have a bigger audience and be accessible to a large number of people. The ideal location would be a dilapidated or previously used site so as to minimise disruption of organisms, plants and the natural cycle of the site. An existing building may have undesirable form or aesthetic implications or the need for demolition which may in turn require more energy and

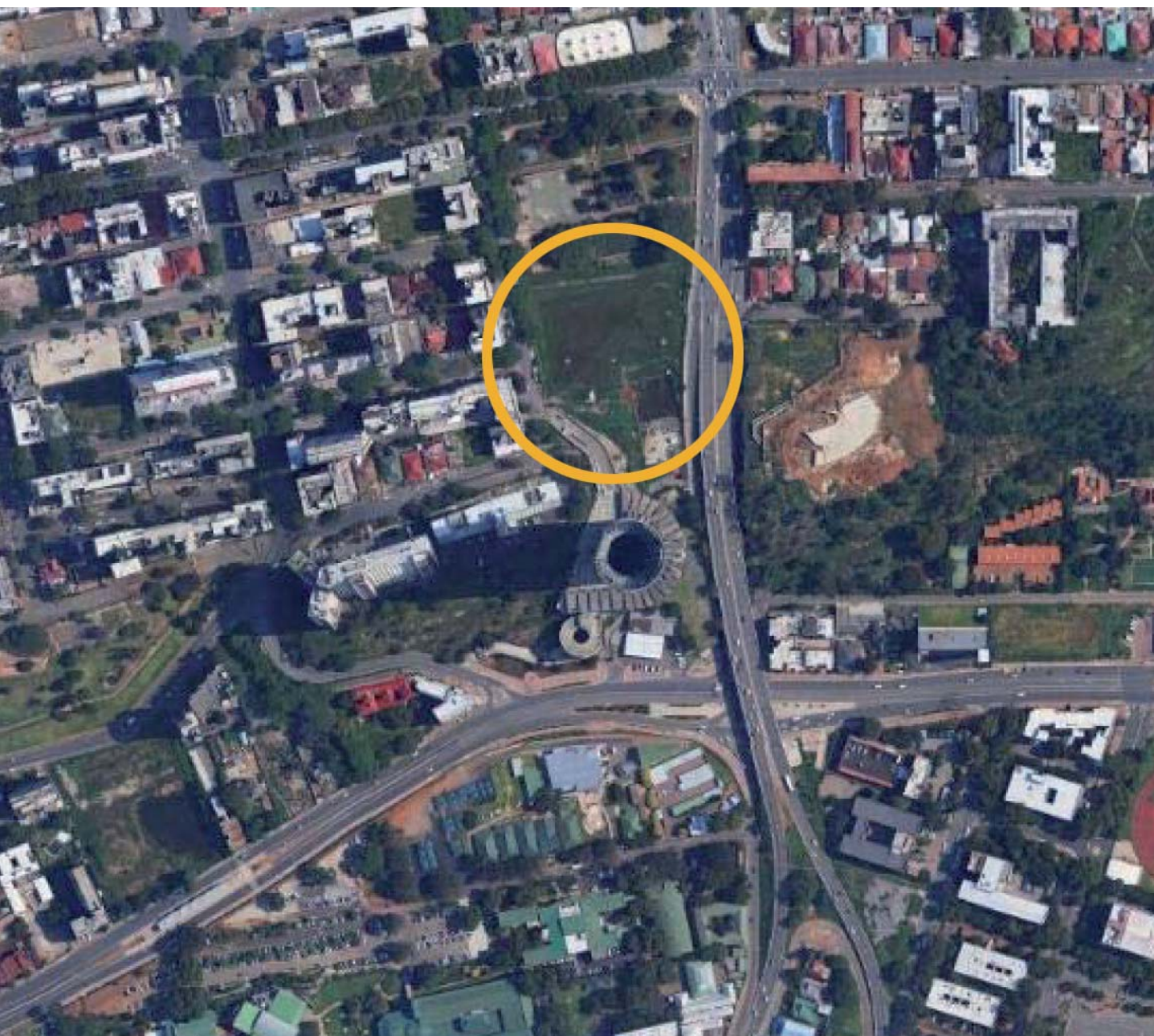
resources.

Edwards and Fisher (2002) outline the following as criteria for the choice of a good location for a library:

- the library needs to be well-connected to civic life in order to fulfil its duty in the widest sense. This requires good access to public, private transport, convenient access for pedestrians as most will arrive on foot, convenient access for the disabled and bicycle facilities for cyclists. A poor location is one where the library will be disconnected to civic life physically and psychologically.
- a successful library is one which is conveniently accessed via attractive and safe urban spaces and where there are areas to pause and reflect upon the material read.
- a good location is one which gives priority to the user above the those of the staff and deliveries. It needs to promote people movement through the space and secondary to that would be vehicular movement through the site. The interior and exterior volumes would in turn express movement through the space and promote linkages with space.
- the site should promote a high degree of visibility and the

library likewise. Its form must be distinctive to promote the hierarchy of function implicit in a library.

- a library should not open directly onto a busy street as this may add to levels of disorientation for the reader who has just come out a the quiet refuge of a library. “Far better to place the library in a square or have a recessed place at the centre where readers can meet friends and gather their thoughts before confronting the bustle of modern urban life”, Edwards and Fisher (2002:27).
- the library requires a distinctive site to avoid losing its effect due to being placed in ordinary streets.
- the library requires contrast from a domestic or mundane physical context to lift the area aesthetically and enhance its status culturally.
- “It is important that the library takes its place amongst the community of public buildings and has a character which is recognizably that of a library (so that meaning can mature through association), yet is able to grow and respond to programmatic changes.



Stand number 104/92-IR between Joe Slovo Drive and Lily Avenue in Berea meets the above criteria but is unfortunately away from public buildings. Its location away from other public buildings places the library amongst its target users: the schools in Hillbrow, Berea and Yeoville that require libraries; the students that reside in the neighbourhoods and study at the nearby University of Johannesburg and the community that has many unemployed adults who frequently use the existing libraries' facilities to search for employment.

# legend

residential



parks & open spaces



government



institutional



educational



business



vehicular traffic



pedestrian traffic



USERS: SCHOOLS & RESIDENTS





## legend

**residential**



**parks & open  
spaces**



**government**



**institutional**



**educational**



**business**



**vehicular  
traffic**



**padestrian  
traffic**



**ZONING**

# legend

residential



parks & open  
spaces



government



institutional



educational



business



vehicular  
traffic



padestrian  
traffic



MAJOR TRAFFIC



### ***A brief history of Berea***

Berea was established in the 1890s with its neighbour Hillbrow, lying very close and east of Johannesburg's Central Business District. This proximity to transport links and proximity to job opportunities meant that Berea and Hillbrow were historically very attractive places to live. "At the same time a sense of impermanence has also been a historic characteristic of the area: Hillbrow was seen as a place to make the transition from the city to the country, a transit camp to suburbia" (Silverman & Zack 2008:15). During the 1920s, developers took advantage of Hillbrow's location and began demolishing the existing free-standing houses to develop multi-storey residential apartments. These apartments grew higher and higher in the post world war two industrial boom and more services and entertainment areas were built to cater to the skilled white workers who resided there. Berea, in contrast, experienced much of its development in the 1960s and 1970s. It retained a more residential character with fewer shops and entertainment venues, but with more parks, religious buildings and schools (Silverman and Zack 2008:16). Strict town-planning regulations were soon put in place, slowing down development in the early 1970s. The lack of further development in Hillbrow and Berea remained relatively stable and they

functioned as high-density, primarily residential neighbourhoods characterised by large amounts of rental stock accommodating a white largely middle-class population. In the late 1970s, white residents began to flee Berea and Hillbrow as Indians and coloured defied the Group Areas Act and began to move in due to the housing shortage in black, coloured and Indian areas. In fear of not having enough tenants, landlords were happy to fill their vacant apartments with black, coloured and Indian residents. According to Silverman and Zack (2008), the following were symptoms of this relocation:

- Capital flight as property owners sought safer investments in the emerging decentralised nodes;
- Massive hikes in rents because unscrupulous landlords could exploit the vulnerable status of illegal black tenants;
- This made rents unaffordable, which in turn led to subletting – and sometimes overcrowding;
- This, in turn, led to excessive strain on the building services.

Black communities soon seized the opportunity to move closer to the advantages of city life such as job opportunities, services and social amenities. This defiance of the law by landlords who allowed non-white residents to illegally rent apartments and the lack of adequate control

by the government led to informality and other illegal practices. “Hillbrow and Berea were soon associated – in the minds of both residents and the authorities – with drug trafficking, prostitution, murder, theft and general lawlessness” (Silverman and Zack). This is the idea that still remains about Berea and Hillbrow among the general public. The areas were infested with crime and most people socialised within their homes with people whom they have long known as a safety precaution. This undoubtedly demoralised the spirit of Hillbrow as a vibrant entertainment area. Large retail developments soon moved out and made way for smaller businesses.

During the 1990s, Berea and Hillbrow became popular places for immigrants from other African countries (Silverman and Zack). It seems that they may have unwittingly inherited or otherwise earned the stigma that had been, and is still, associated with Berea and Hillbrow as crime-infested neighbourhoods.

According to Silverman and Zack, the Hillbrow/Berea area is probably the densest area in the city of Johannesburg and is one of the highest density urban areas internationally, with 135 000 people living in just under 2 km<sup>2</sup> (67 500 people per square kilometre). This is the result of high building densities, high occupancy densities and the relative lack of

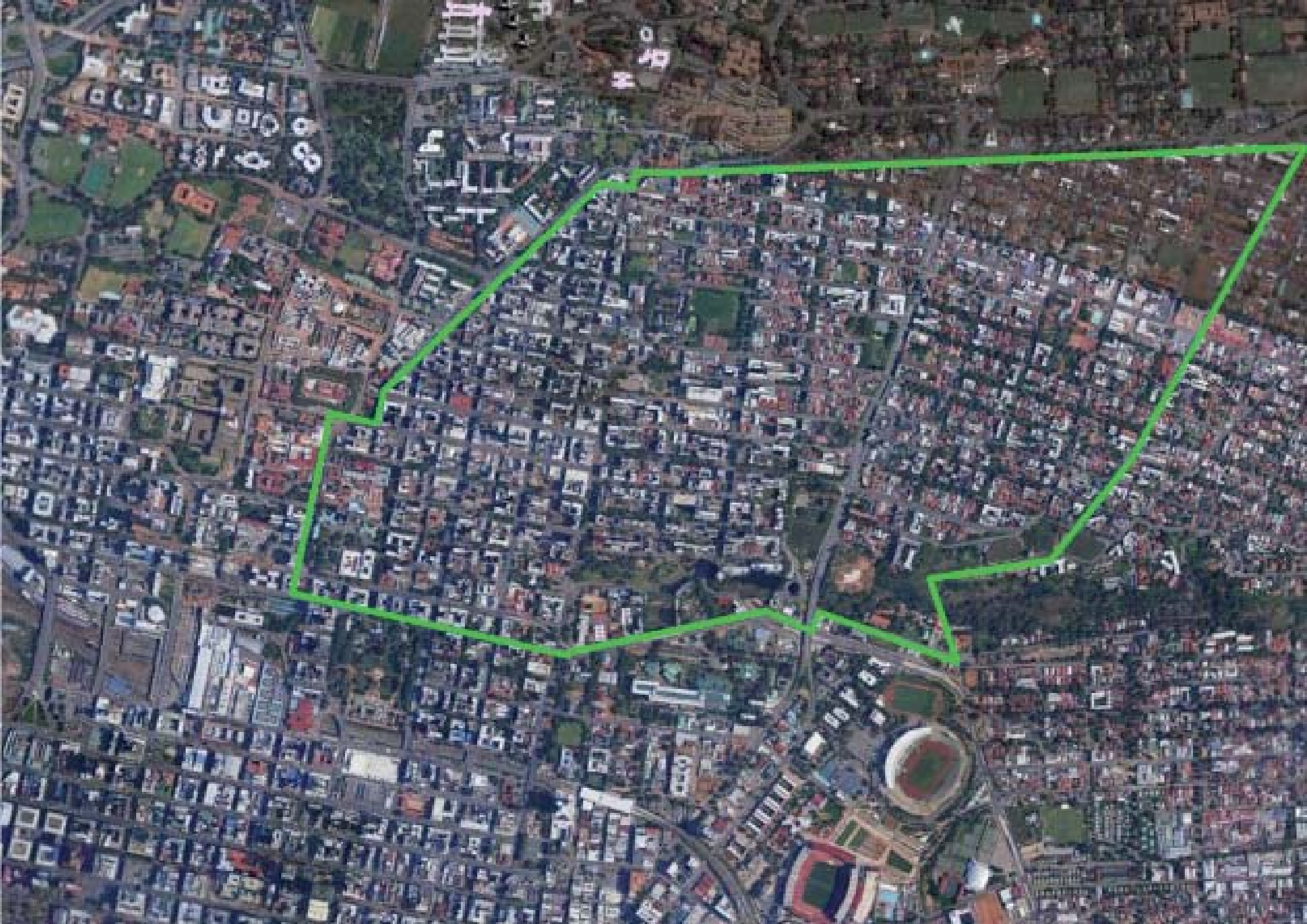
open space.

Silverman and Zack (2008) believe that high density areas have the potential to offer both their residents and the municipality a number of significant advantages such as residential thresholds that are high enough to support an active retail sector, well-located social amenities, a viable public transport system and the efficient provision of urban infrastructure.



The library will serve primarily the Berea, Yeoville and Hillbrow areas but the surrounding Doornfontein and Joubert Park areas are close enough to also benefit from the library.

**Map showing the location of Hillbrow and Berea in the Johannesburg context.**





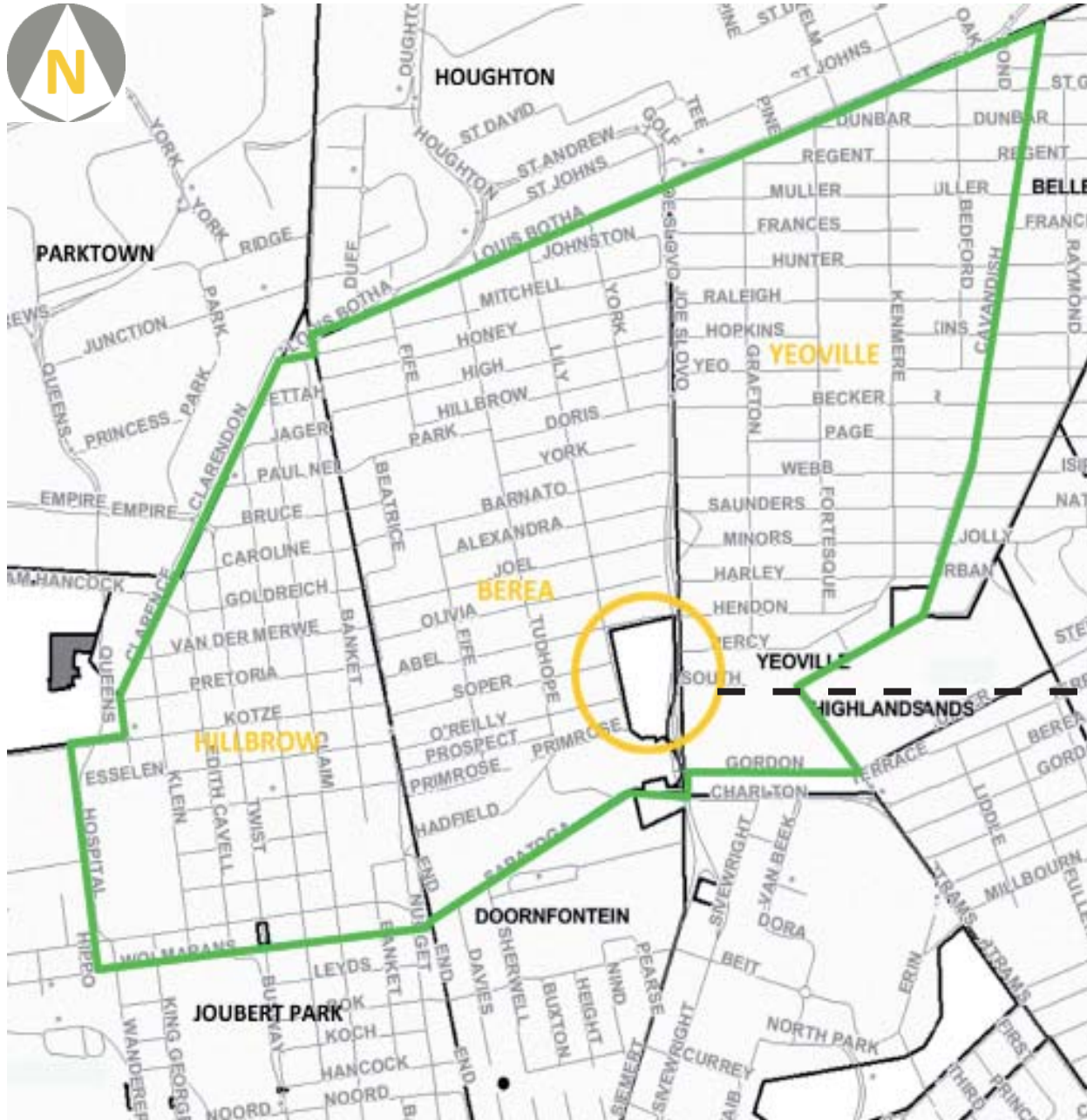
Hillbrow residential densities (Gapp & Shisaka 2006 quoted in Silvermann & Zack 2008:25)

|                                | 1983  | 2001  | 2006  |
|--------------------------------|-------|-------|-------|
| Nett residential density (ppa) | 700   | 1000  | 1812  |
| Floor space rate (m2/ person)  | 56.7  | 36.9  | 21.9  |
| Building density (FAR)         | 4.0   | 4.0   | 4.0   |
| Total population               | 34500 | 49600 | 89500 |

Green star's criteria for a sustainable location include the following:

- Ecological/Social Value of the Site
- Re-use of land
- Reclaimed contaminated land
- Change of ecological value
- Topsoil & Fill Removal from the Site





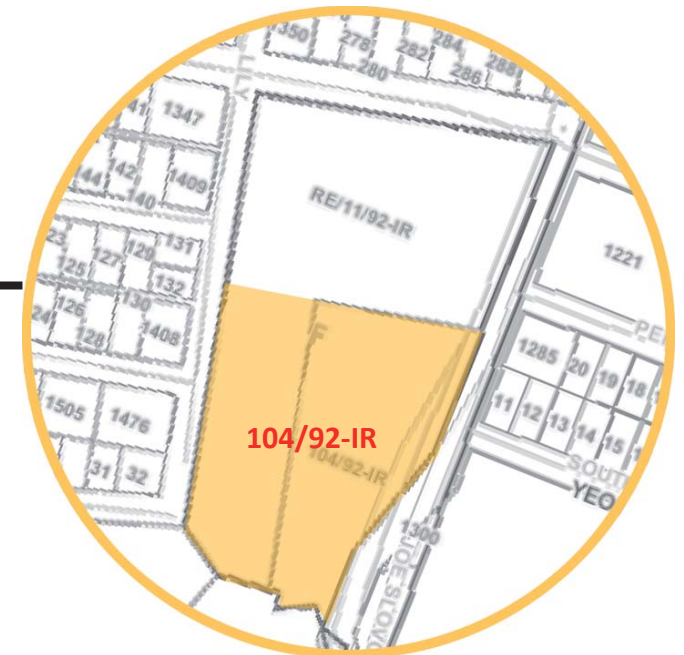
### SITE INFORMATION

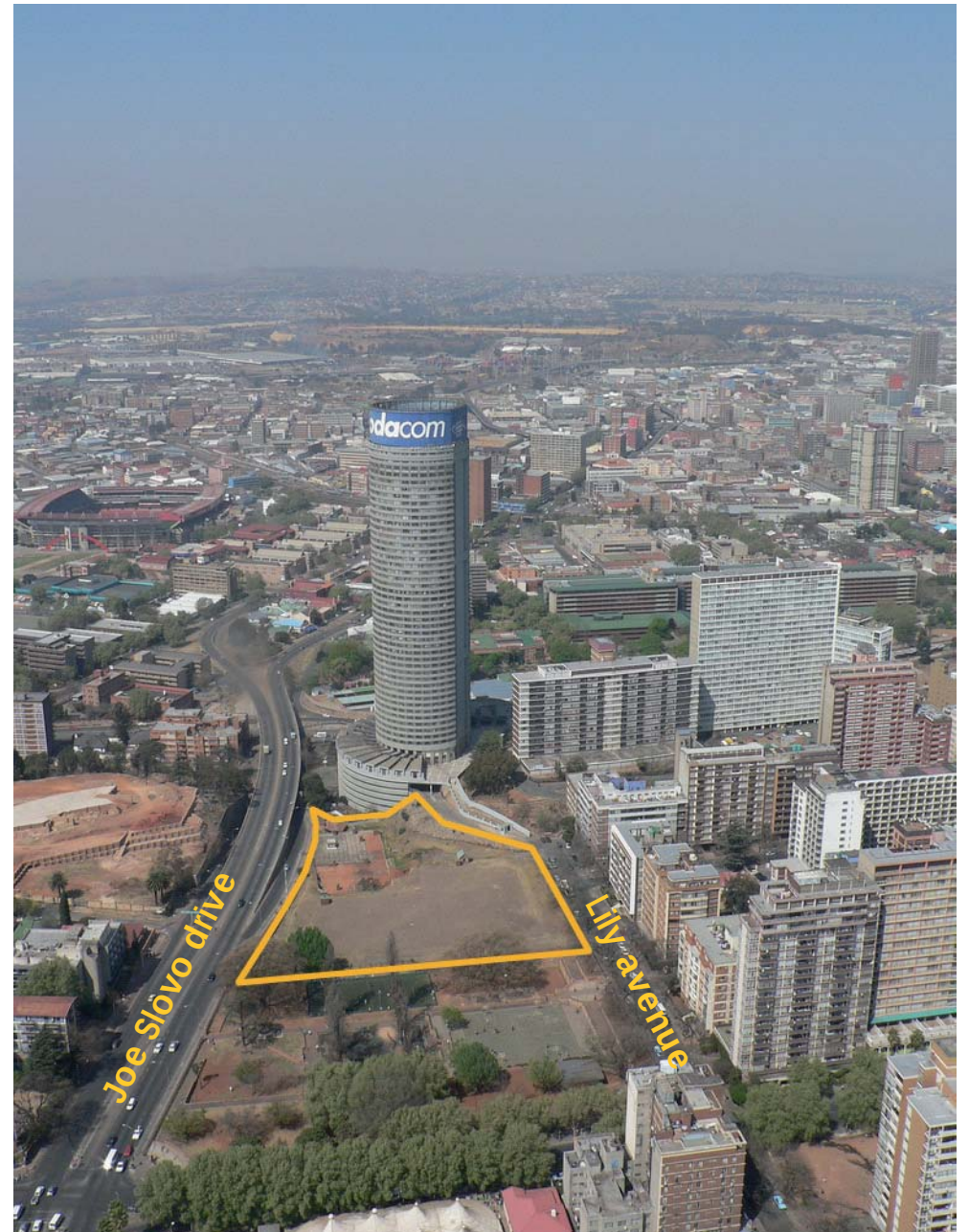
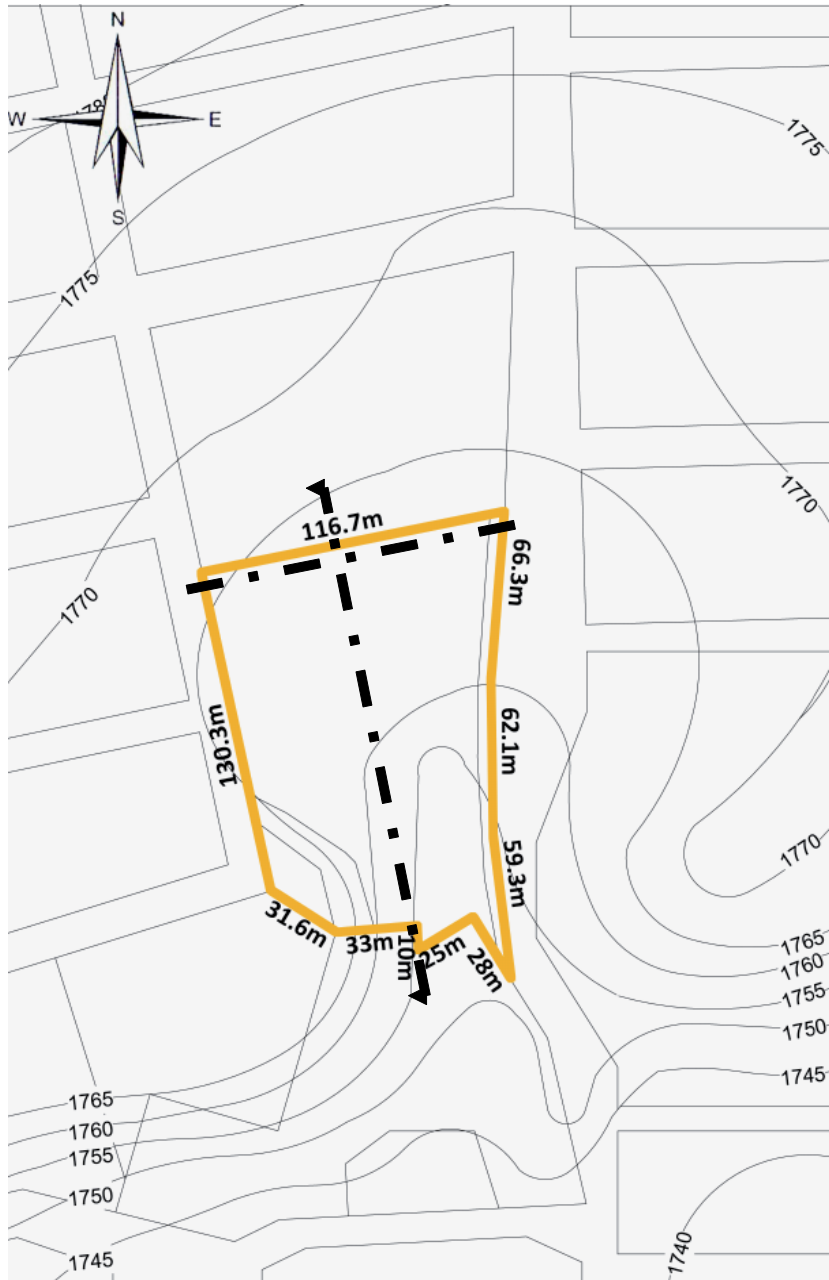
Farm name: Doornfontein 92 - IR

Farm Portion: 104/ 92 - IR

Area: 10 426,485 sqm

An additional 7000sqm of Farm portion RE/ 11/ 92 - IR will form part of the total site area. The total site area will be 17 426,485 sqm.







East elevation of site. (View from Joe Slovo Drive)



North elevation of site. (View from Donald McKay Park)

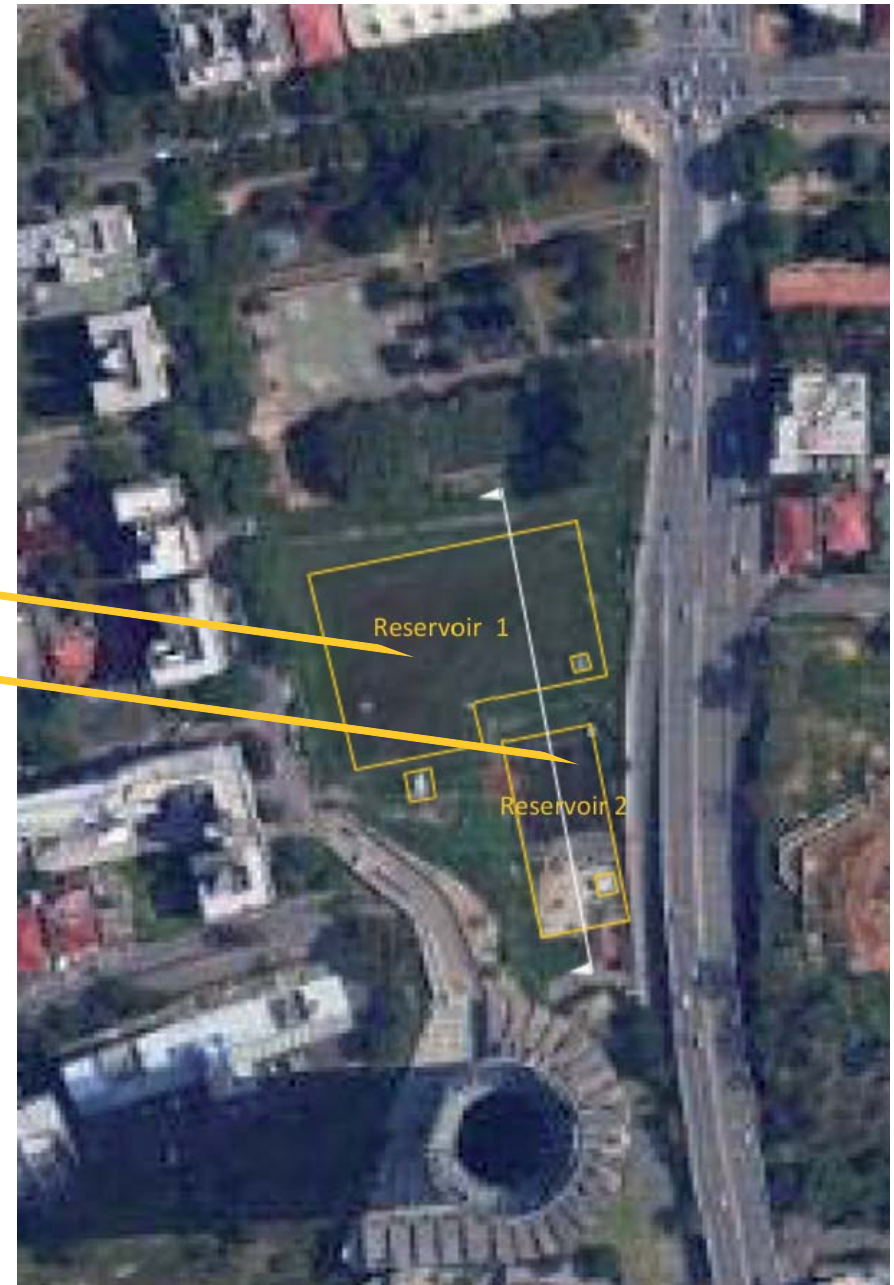
The site is home to two reservoirs which are named Berea Reservoir One and Berea Reservoir Two. The reservoirs service Alexandria and are supplied from RW's Forest Hill Reservoir in the south. The following images illustrate the exact positions of the two reservoirs.



Perspective showing location of reservoirs on the site.



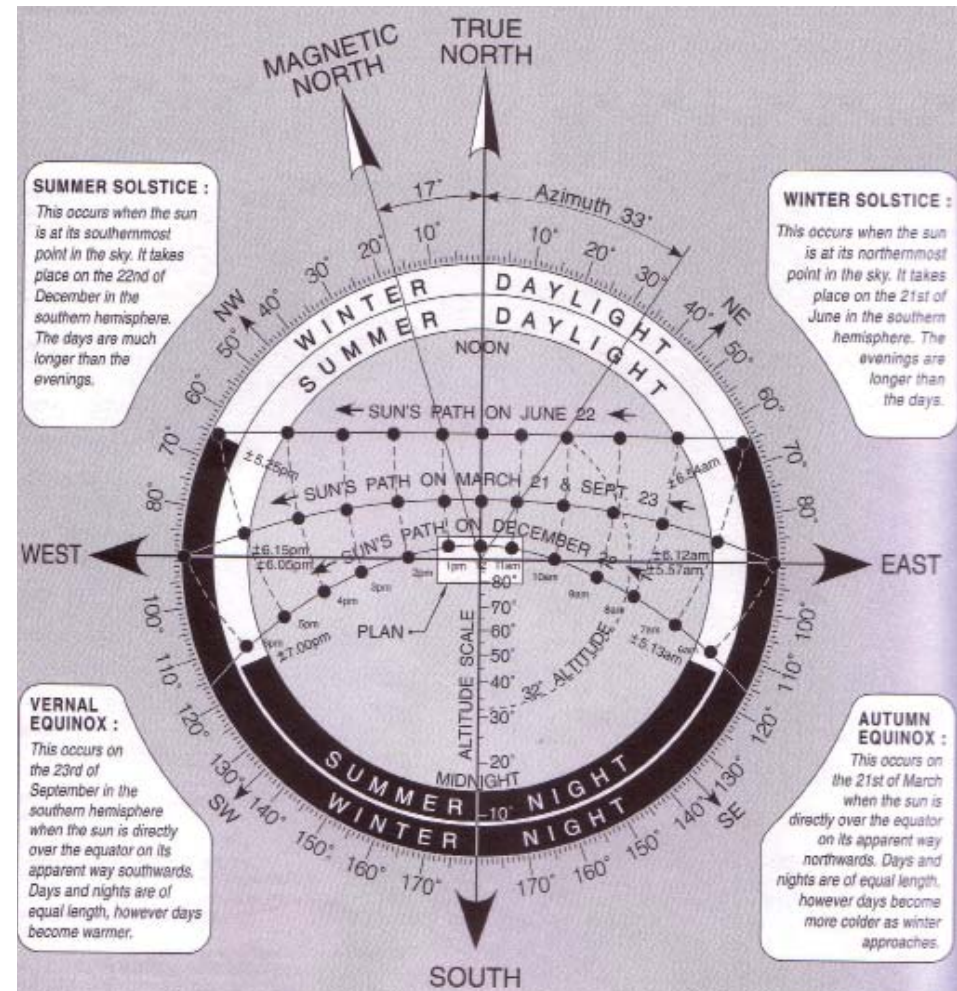
Section through the site showing the depth of the reservoirs in relation to the natural ground level.



The table below, prepared by Goba Consulting who prepared an analysis on the Johannesburg water network, shows the exact capacity and figures related to Reservoir One.

|                                | Berea Reservoir |
|--------------------------------|-----------------|
| RW Meter No. & Name            | 3908-Stafford   |
| RW Meter Size (mm Ø)           | 800             |
| Reservoir Capacity (MI)        | 22.73           |
| Top Water Level (masl)         | 1760.50         |
| Maximum Operating Level (masl) | 1760.10         |
| Minimum Operating Level (masl) | 1757.50         |
| Reservoir Depth (m)            | 6               |

From the northern boundary to the southern boundary the site slopes at 11m. A south facing slope imposes cold conditions as well as minimum sunlight in the building as most of the building will be shielded from the northern sun. The following sun chart illustrates the movement of the sun.



Sun chart diagram. (Grobbelaar 1993:40)

The Ponte City apartment building which is 173m high imposes no shadow over the site as it lies on the south side of the site. The surrounding buildings immediately across Joe Slovo drive are one to two storeys in height and cast no shadow over the site. The apartments on

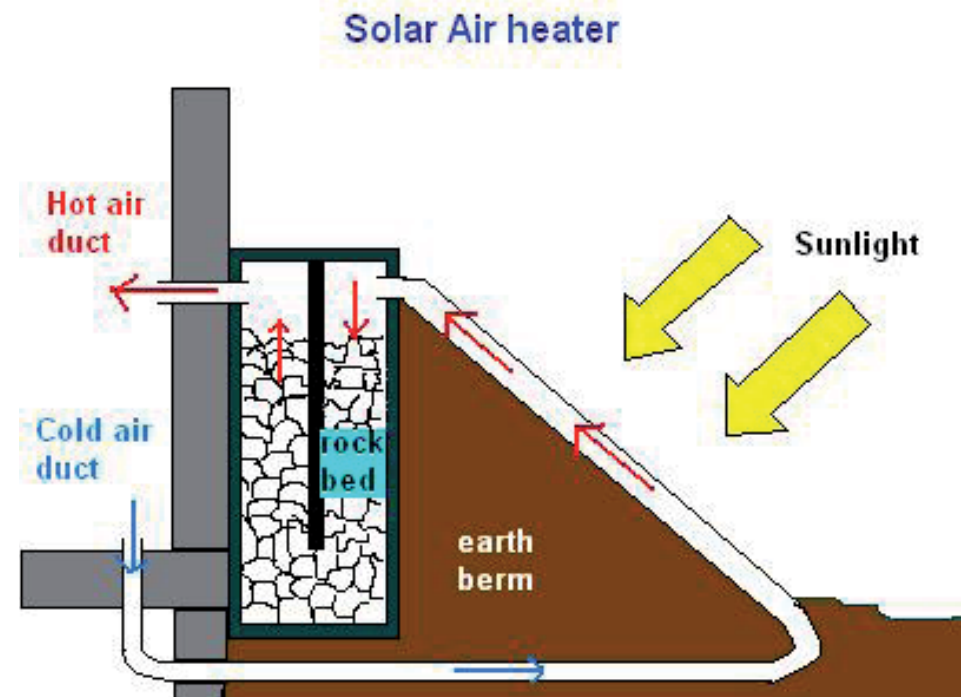
the western side of the site, however, are seven to ten storeys in height and shield the site from the harsh western sun in the late afternoon. The northern side of the site has no buildings and is the location of Donald McKay park. Therefore, the surrounding fabric imposes no damaging consequences for the future building.



Images showing in order the short buildings across Joe Slovo drive, the tall buildings on the western side of the site and Donald McKay park on the northern side of the site and Ponte City Apartments on the southern side.

The library aims to engage society with sustainability by expressing sustainability. The buildings aims to become part of its landscape by blurring the boundary where nature ends and where the building begins. Turf roofs, green walls and clerestory windows that flood the interior with light are some of the ways that nature and man-made form a mutualistic relationship. One identified passive system is the thermosiphon system which is a method of passive heat exchange based on natural

convection which circulates air without the necessity of a mechanical pump. It is normally passively driven by temperature differentials and is thus most effective in extreme temperatures and requires some active assistance in milder conditions. This system takes advantage of the tendency of warm air to rise and cold air to drop.



Renewable energy for the poor man. 2010. Thermosiphon Solar Air Heater. (Cited 2010-03-02. <http://poormanguides.blogspot.com/2009/06/thermosiphon-solar-air-heater-with-heat.html>)

The diagram illustrates how heated air is gathered in a collector and when it leaves the collector and directed into a room, the cold air from

the room is drawn into the collector to replace the warm air thus creating a convective loop which functions as long as heat is available. Sometimes heat can be lost through large expanses of windows and openings, making this system only 40% to 50% efficient. This number can be increased by a well-designed envelope for the building. The type of materials dictate how much heat can be transmitted through the building's envelope. Double glazed windows and materials with adequate thermal mass for floors, walls and roof help prevent heat loss. The rate of heat transmission is a function of two factors: the difference between the outdoor and indoor air temperatures and the resistance of building materials to heat flow. Therefore, the design of the building envelope can significantly affect the amount of energy a building consumes. Building form can thus be used to minimise heat gain or loss as well as to optimise daylight, natural ventilation and self-shading as needed.

### **Materials**

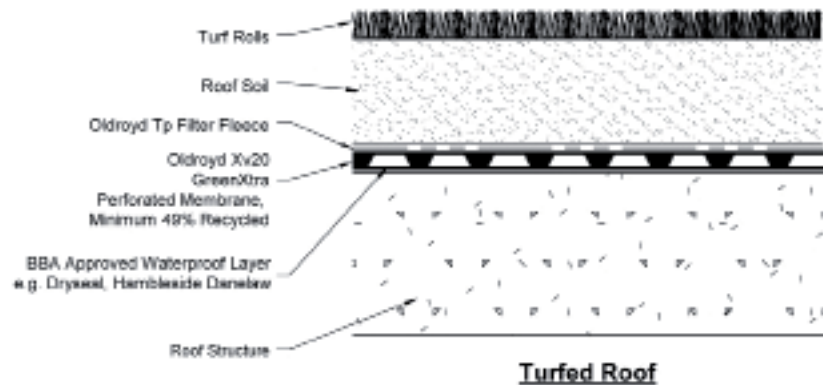
A building with an envelope that has a high thermal mass is likely to provide the most comfortable climatic conditions. Thermal mass refers to an object or material's ability to absorb and radiate heat. Heat always moves to colder surfaces. In the case of a building, materials with a large

thermal mass radiate heat which was absorbed during the day back into the cold interior of the building at night when temperatures have dropped. The thermal mass of an object is determined by three factors: the specific heat of the material, its density and thermal conductivity. Specific heat refers to the material's reluctance to change temperature. Materials with high specific heat will absorb heat and release it slowly. The material's density is its weight or mass in relation to volume and thermal conductivity refers to its ability to conduct heat. Water, stone and brick have high thermal masses.

From the top of the building, a thermally appropriate roof will be a turf roof. Turf roofs, also known as green roofs, are known for their ability to provide an extremely constant temperature throughout the year. How they operate is that they insulate the building and help keep heat in during winter and keep the building relatively cool in summer. A turf roof is a roof that is partially or completely covered in vegetation and planted over a waterproofing membrane. Aside from being good insulators, turf roofs can be used to absorb rainwater, reduce the heat island effect in urban contexts and to create a habitat for insects and wildlife. Turf roofs work well in expressing sustainability because they clearly demonstrate how the building's temperature is regulated.



CPG Consultants. School of Art, Design and Media Nanyang Technical University. Singapore, (Cited 2010-10-24. <http://earthfirst.com/10-photos-of-stunning-green-roofs-from-around-the-world/>)



Turfed roof. (Cited 2010-10-24. [http://www.safeguardeurope.com/info\\_support/cad\\_green\\_roof.php](http://www.safeguardeurope.com/info_support/cad_green_roof.php))



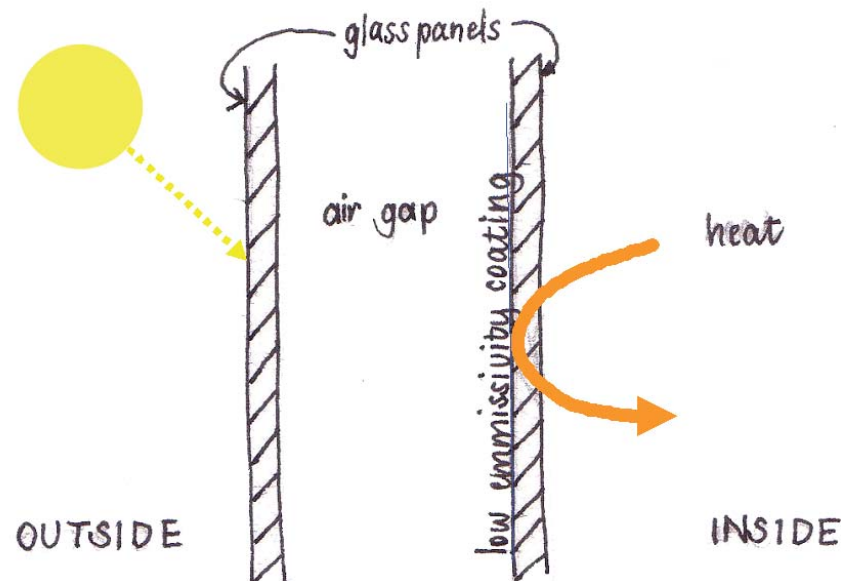
Mass Studies. Ann Demeulemeester Shop. Seoul, Korea. (Cited 2010-10-24 <http://www.dezeen.com/2007/12/26/ann-demeulemeester-shop-in-seoul-by-mass-studies/>)

Green walls are also good insulators. These are walls partially or completely covered in vegetation. These can be a means of water reuse because plants slightly purify polluted or grey water by absorbing the

dissolved nutrients.

Where sunlight is required, glazing is inevitable. Glass is not a good insulator therefore double glazing is introduced to minimise heat loss.

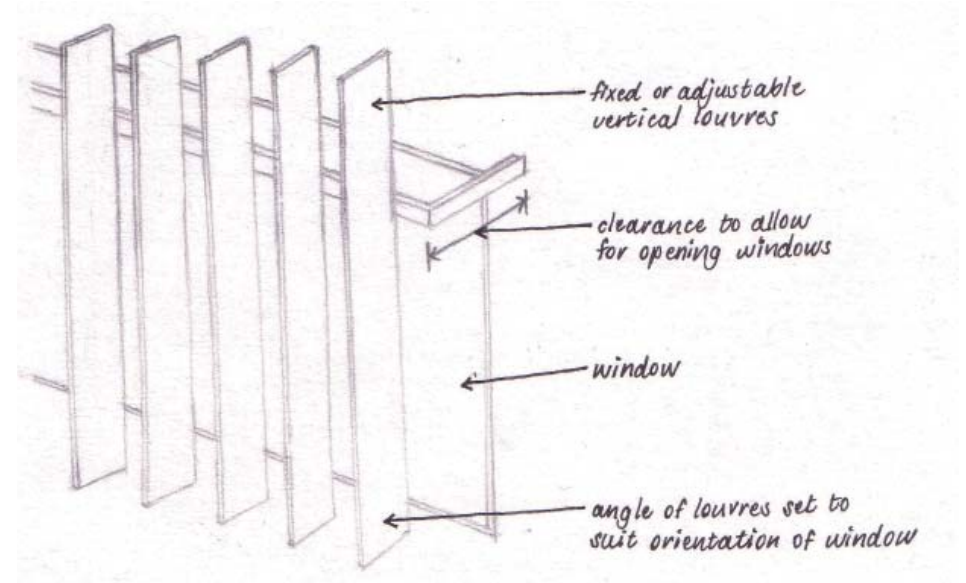
**Double glazing to prevent heat loss.**



This is a system where windows are constructed using two panes of glass, instead of a single pane, which are several millimetres apart forming a layer of insulation by trapping air in between the panes. For this system to be efficient, it must be airtight and moisture-tight which is why a drying agent is added to ensure that no moisture is present inside

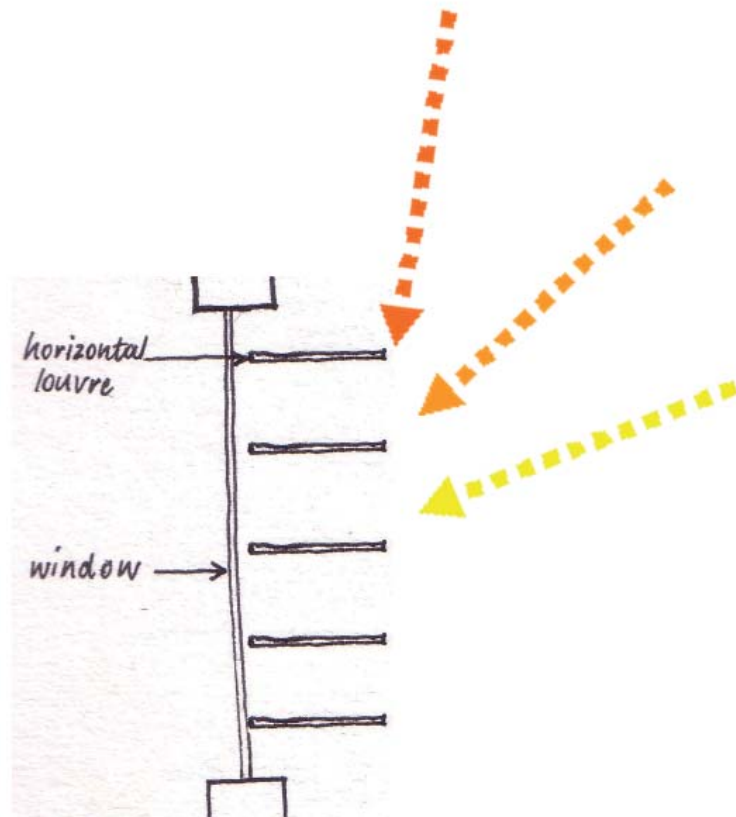
the finished glass unit. Double glazing also helps with noise insulation which is absolutely necessary in a library.

**Vertical louvres to filter out west and east light.**



Sun penetration is controlled through louvres, blinds, overhangs and various types of glass. Vertical louvres are effective on the eastern and western facades to filter the low morning and afternoon sun. The depth, spacing and orientation of the louvre blade are critical to the design of the louvre system in order to eliminate undesirable sun penetration.

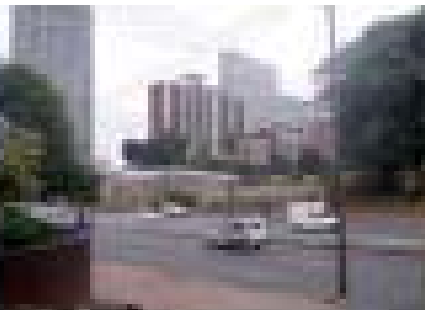
Horizontal louvres, sometimes known as blinds, are most effective on the northern facade to filter out the high midday sun. As with the vertical louvres, the depth and spacing of the louvre blades is important in blocking out the harsh summer sun and admitting the warm winter sun. **Diagram showing vertical louvres blocking out the harsh summer sun and allowing the winter sun in which is at a lower angle.**



Images showing the site and its surroundings



Joe Slovo Drive looking south



View of site from across Joe Slovo Drive



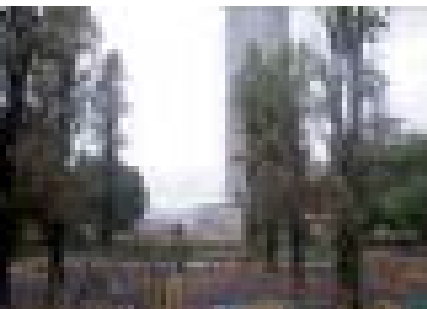
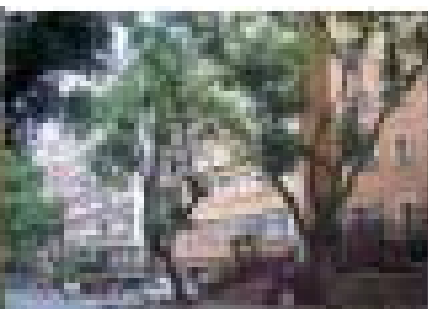
View of site from its North east corner



Joe Slovo Drive looking North



Joe Slovo Drive looking North



**North elevation of site**

**Nearby apartment on western side**

**Lily Avenue looking north**

**Donald Mackay Park looking south**

**Donald Mackay Park looking south-east onto site**

**Eastern side across Joe Slovo Drive**

# chapter 9

## design development

## Steps to the final design

In the case studies that I've investigated, I've uncovered that buildings that are regarded as good architecture typically have three guiding principles in common: a clear intent, the site informs the design decisions and they have some cultural content. These three components will guide the design process. The site will inform the technical aspects and the cultural component will comprise of green issues. In the Seattle Public library, the intention was to accommodate the ever-increasing collection of books. My intention is to visually engage the user in green issues and provoke the passing audience's interest in sustainability. The first image in my mind of engaging was that of the hands holding on to each other and that was my starting point in designing.

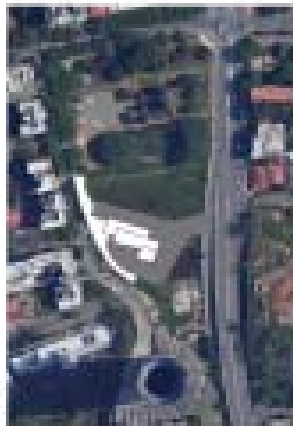


## stage 1

### ENGAGING SOCIETY

A conceptual form of the concept of engagement.

## concept



## site

### LOCATION

The 'form or shape' of engagement is illustrated in how the building will draw different users in from different directions.

## stage 2

### INITIAL FORM

The building begins to take shape as separate compartments which will service different users.



### PONTE & PARK

Integrating the public and private which are represented by the square park and the round Ponte building. These shapes imply inclusion and exclusion respectively.



## stage 3

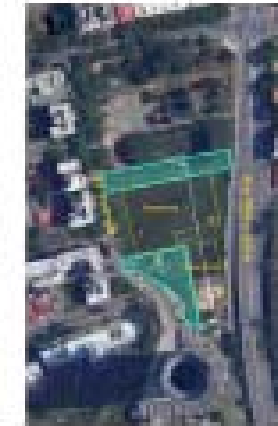
### CONSTRAINTS

The building shifts south, next to the reservoirs and not on top of them.



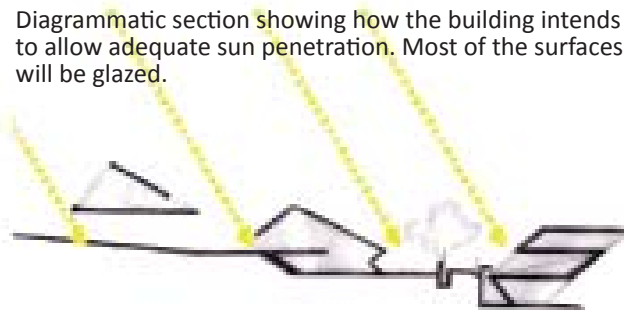
### RESERVOIRS

It was discovered that the reservoirs cannot be built upon as they cannot carry the load of the building. The highlighted areas are spaces on which the building can be constructed.



## LIGHT

Diagrammatic section showing how the building intends to allow adequate sun penetration. Most of the surfaces will be glazed.



## green

## stage 4

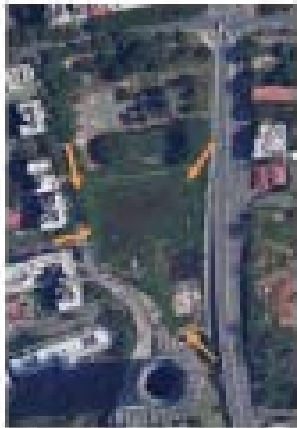
### MUTUALISM

The building and the site begin to express their intentions to work together with the land warming the building by wrapping over it and the building allows the land to continue to grow above it.



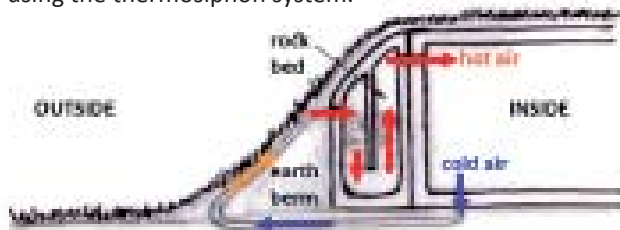
### ACCESS

Possible accesses identified because of the different users who will be coming from the apartment on the east, west and south sides, the children on from the park and pedestrians along Joe Slovo drive.



### HEATING & FOOTPRINT

To reduce the footprint of the building, the land acts as a blanket as it wraps up and over the building to warm it using the thermosiphon system.



## stage 5

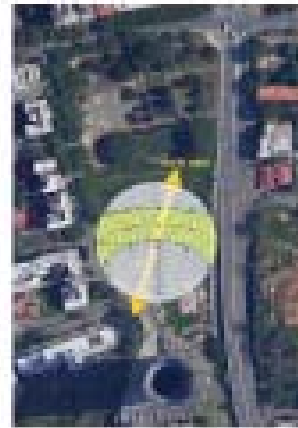
### LIGHT

The building's orientation shifts and the park begins to extend into the building.



### ORIENTATION

The best orientation is north-east to allow maximum light into the building.



## stage 6

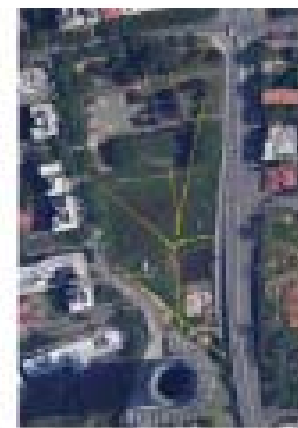
### LIBRARY GARDENS

The extended part of the park takes on a new shape as it playfully creates spaces for leisure, reading and other events.



### URBAN DESIGN

The site is designed to attract many users. The will also be the library gardens with a small amphitheatre.



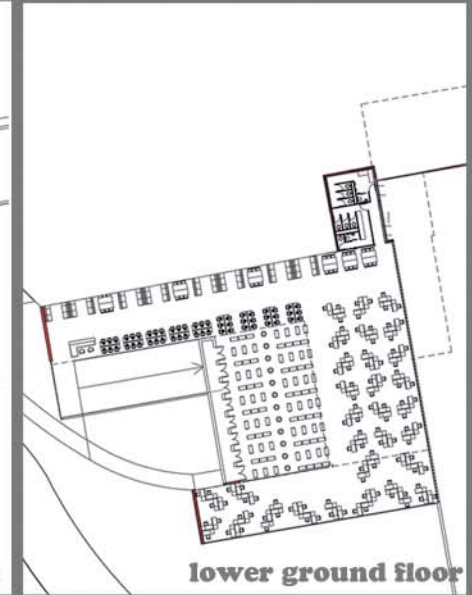
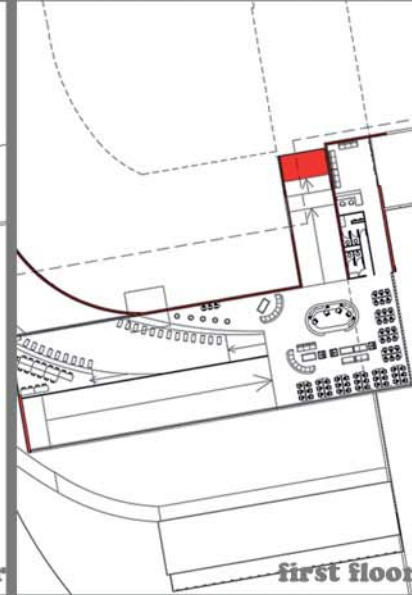
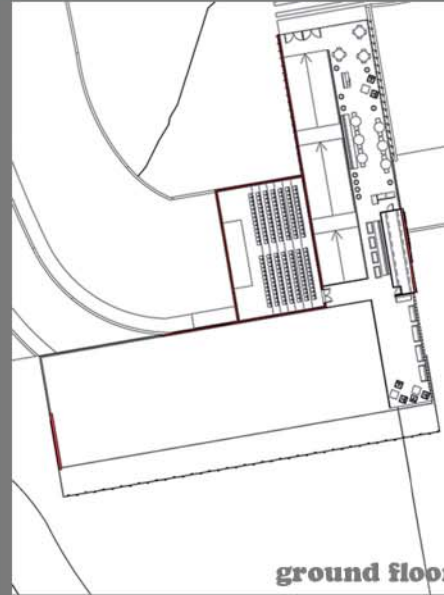
### LANDSCAPING

The landscape is designed to catch storm water.



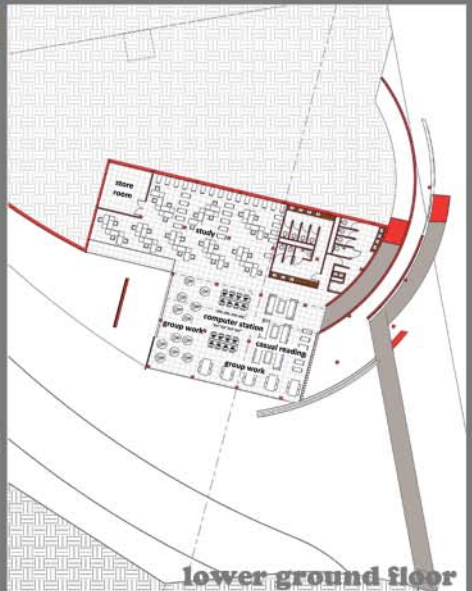
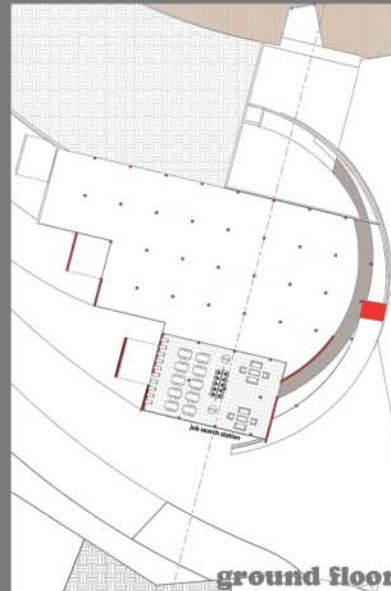
## design 1 space planning

Floors were allocated according to user type. The adults' career advancement facilities were located on the first floor where the entrance to the library was located. The level immediately below the first floor is the ground floor where school children were located. The instructional areas for the school children are also on this floor. The lower ground floor was the quieter study area for high school and university students.



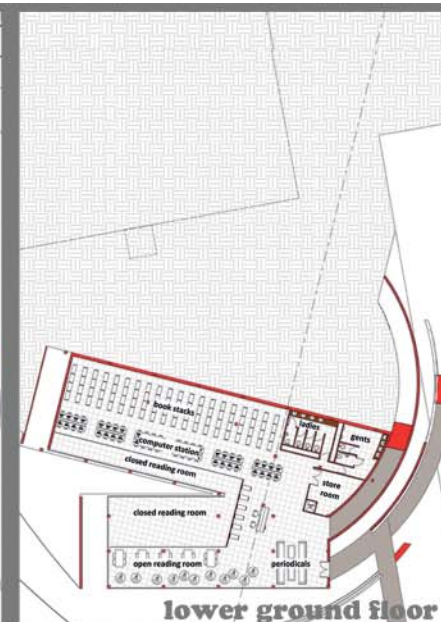
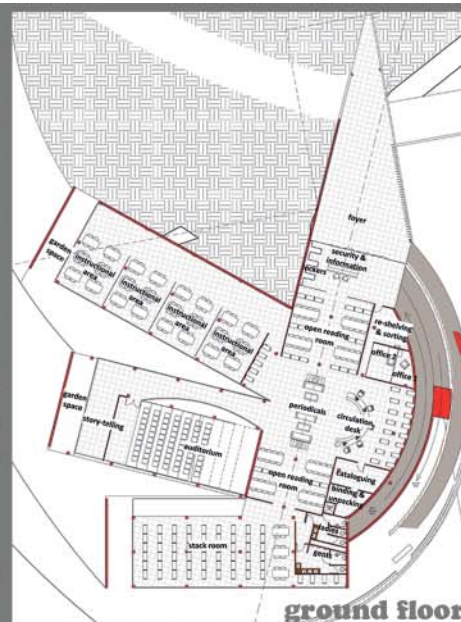
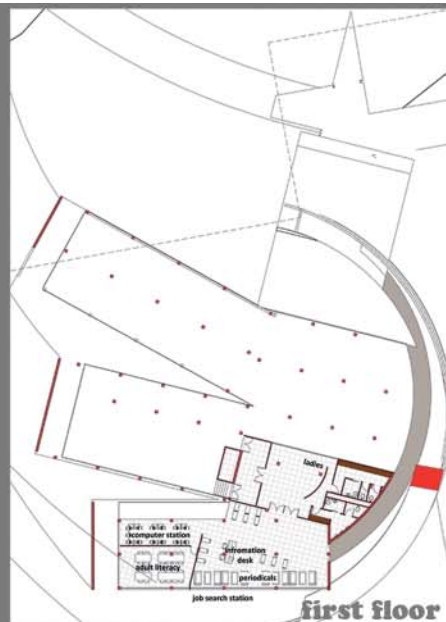
## design 2 space planning

The orientation of the building changed along with the ratio of space allocated to each user type. The ground floor became the level where the entrance is located. This floor remained the children's floor but more space was allocated to their instructional areas and more book stacks were accommodated on this floor. The level above was given to the adults' career advancement facilities as they required the least space. The lower ground level remained that of the students. The main circulation ramps were moved to the far east side of the building.



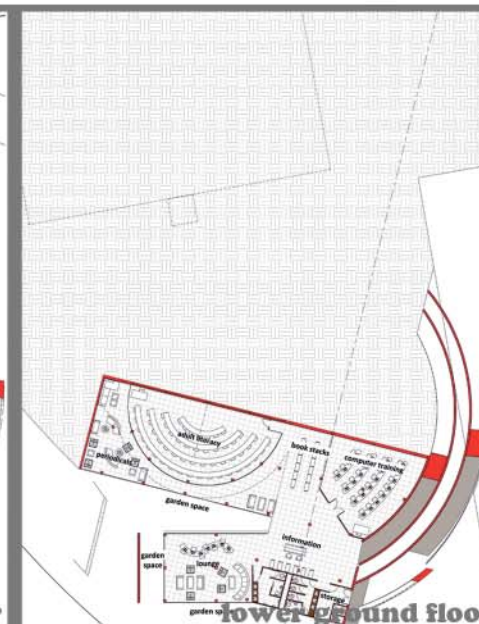
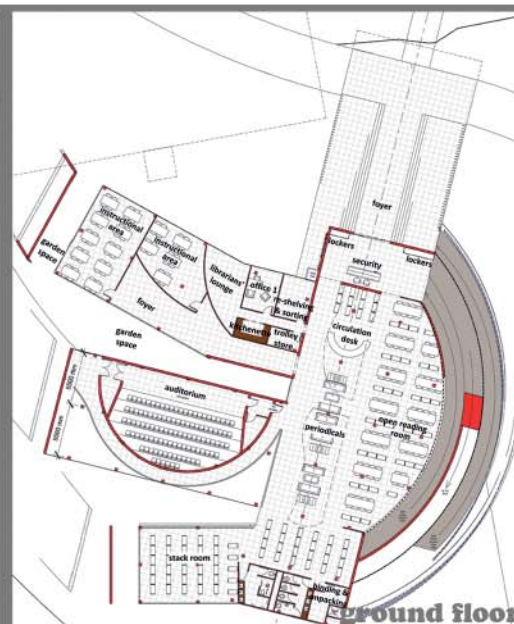
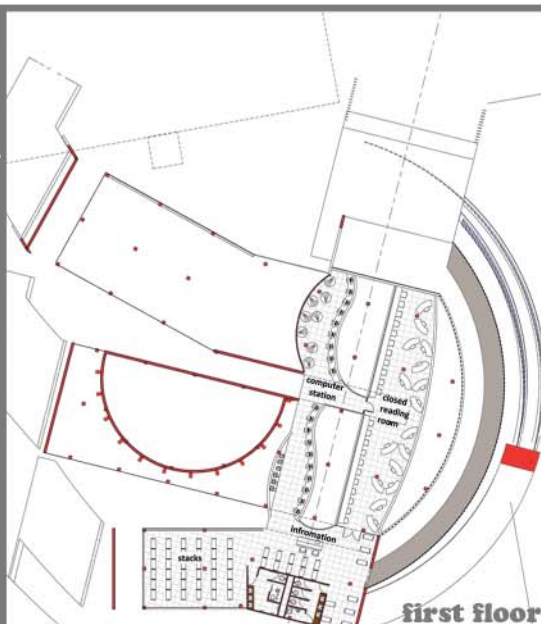
### design 3 space planning

The students' and the adults' spaces swapped floors but the children's area remained on the ground floor. The historic theme of the reading room as central to the library was pursued. The reading room was located in the central spine of the building on the ground floor and all other programs radiated from there. The circulation and information desk was located at the centre of the arc.



### design 4 space planning

Spaces began to playfully reshuffle to echo the new programs of the modern library. The reading room remained central and was given more space. The information and circulation desk were moved to the north end of the central spine. Programs are boldly expressed in unfamiliar forms but the historic stack rooms remained formally organised for ease of finding books. Administration areas were moved away from the central core to the north wing near the scholars' instructional areas.



# chapter 10

## how it works

## Berea Community Library

Green architecture need not be a specialisation on its own or a division of the techno-science disciplines but remains a creative discipline in the design of inspiring and habitable spaces for human beings. Green architecture need boldly re-affirms issues that had been lost in the architecture discipline and whose neglect are in turn damaging the earth. This thesis aimed to prove that green architecture needs to remain expressive of modern cultural issues and inspire new ways of thinking about space.

This was done through boldly expressing how the Berea Community Library respected the earth and had a mutualistic relationship with nature in order to provide comfortable and inspiring spaces. Firstly this was done through tucking the building into the earth by allowing the earth to act as a thermal blanket to warm up the south-facing building and letting it tilt up toward the northern light. The earth benefits be-

cause the greenery is allowed to continue instead of just being robbed by the building. When one sees greenery growing over the building they immediately associate it with sustainability or, at the very least, are intrigued. Bulkheads and floor finishes also go towards expressing the mechanics of how the building is kept at a comfortable temperature. The water which was previously directed into the sewage system is now being used to flush the toilets in the building. The location of the tanks at the base of a steep roof and near the toilets provide clues as to how the toilets are being flushed. The building harvests renewable energy for its own use through the large 170 square meter area for the solar panels which are raised high above the roof in a round shape different to that of the rest of the roof and clearly visible for all to be aware. It requires less energy to operate because its skin allows it to retain heat for colder times of the day.

The library accommodates children, students and adults and follows the historic arrangement of the central reading room with all other programs radiating from there. The modern library, which the Berea Community Library aims to be, has no strict or rigid spaces. Spaces are flexible and far more casual. The PC lounge on the first floor has beanbag chairs and playfully laid out furniture. The adults section below is

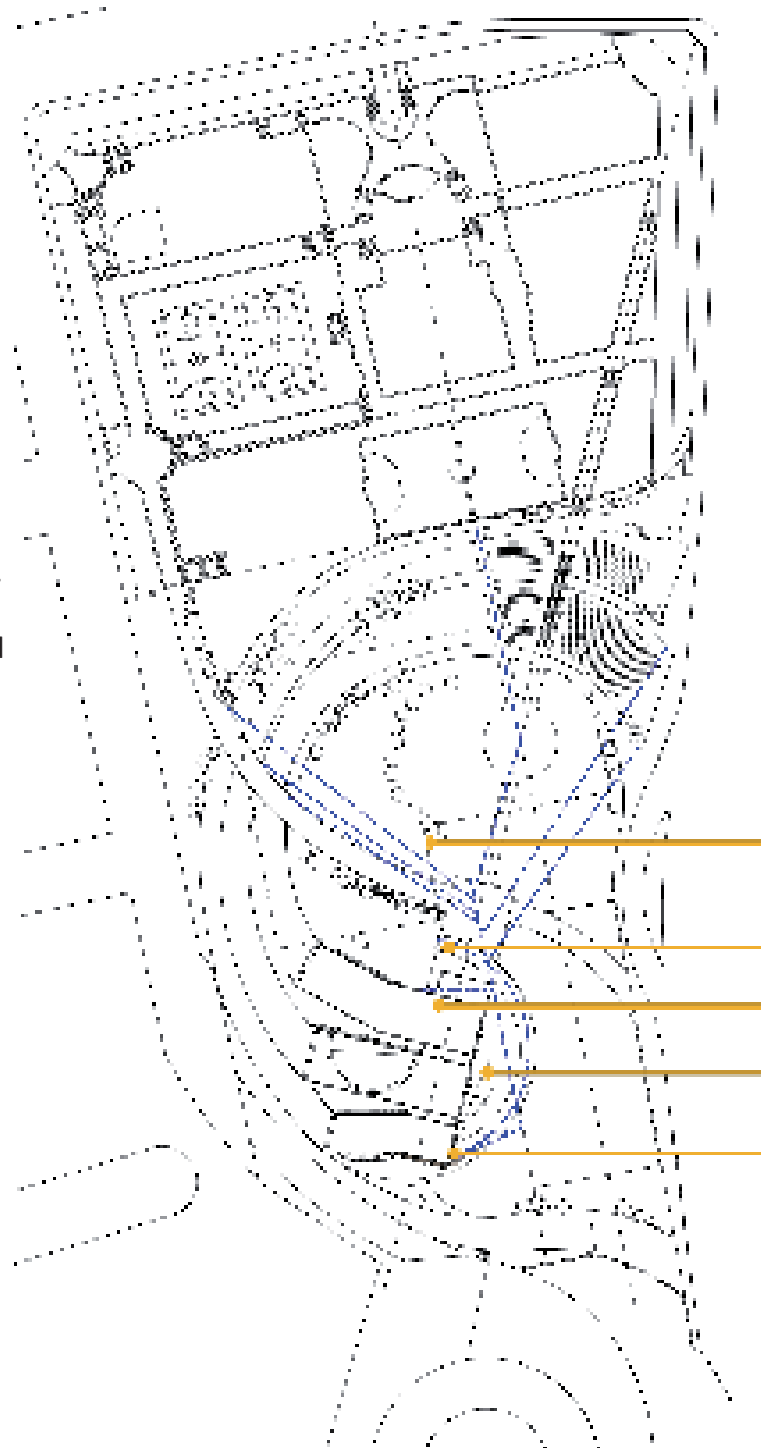
more interactive with couches and computers within the lounge area, except for the computers in the training centre. The only formal spaces in this library are the traditional stack rooms with rows of books which are logically arranged for ease of retrieval.

The library garden allow for spontaneous activities. There is the amphitheatre for small gatherings, hills and undulating landscapes with trees for reading a book which may have been borrowed from the library, study groups to gather if they prefer spaces other than the garden spaces between the library spaces. Different paths welcome the different users from around Berea and make the Joe Slovo edge far more pleasant to walk on, unlike the present conditions. The children who gather at the Donald MacKay Park daily are likely to be attracted to the library because of its facilities and the inviting gardens.

Parking for those who will be using private transport will be arranged by management with Ponte management to lease parking space from the seven floors of unused Ponte parking. The seven floors of parking have never been half-way full since the construction of Ponte thirty years ago and an elevator from the parking will take motorists to and from the library. There is a bicycle rack provided near the entrance for cyclists and a drop-off point for buses on Joe Slovo Drive.

## water

Stormwater is currently being discharged into drains. The site is landscaped to allow for the capture of stormwater for use in the building. This stormwater along with the stormwater from the roof is collected in tanks near the toilets for flushing the toilets and irrigating the turf roof and the vegetation on site.



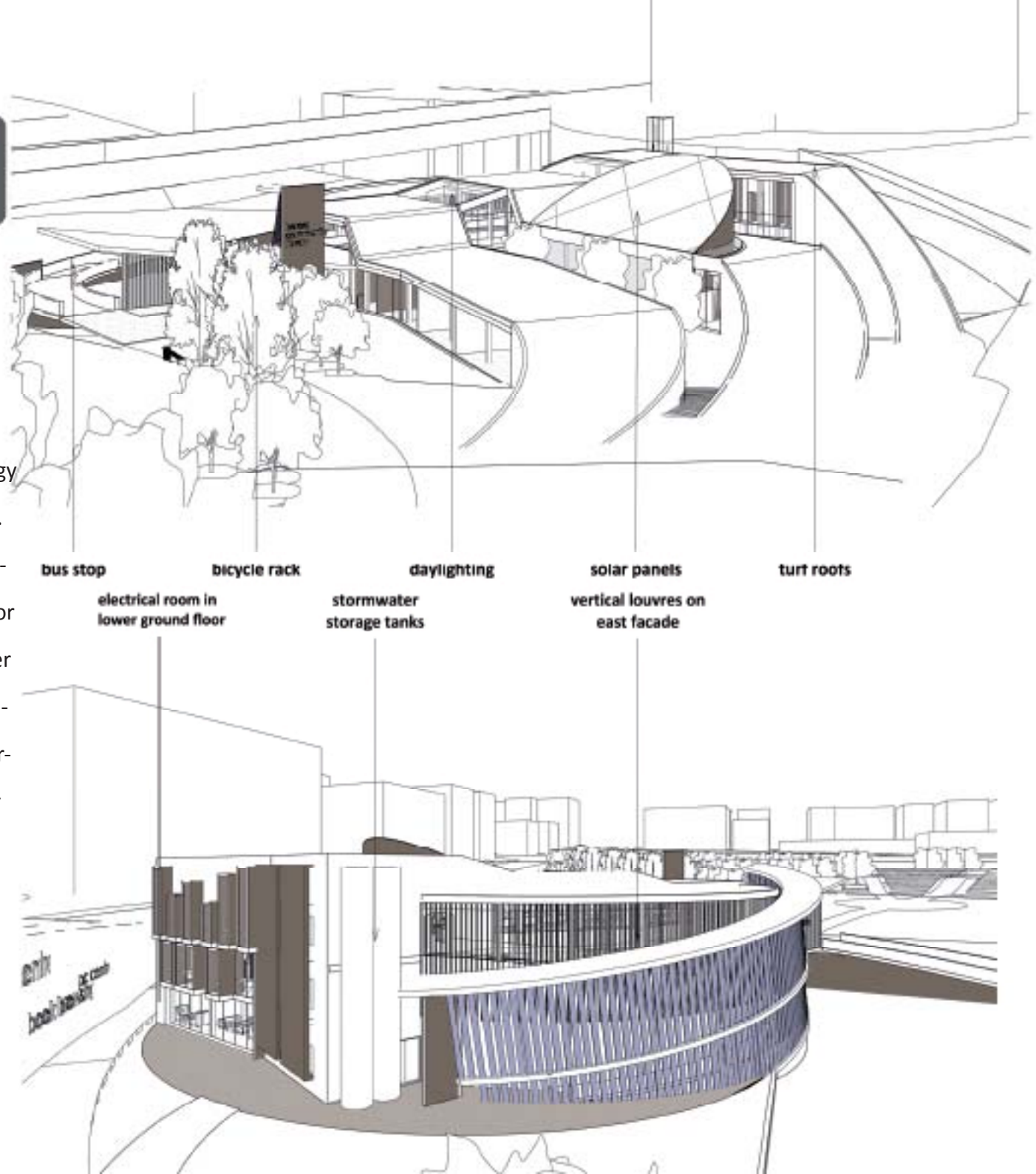
## thermosiphon system



The thermosiphon system regulates the indoor temperature to remain between 20 and 24 degrees Celsius. Cold indoor air is extracted and travels in pipes through an earth berm. As the air travel through the earth berm is temperature begins to rise to that of the earth berm. A section of the pipe or duct has a glass surface which is exposed to direct sunlight thus heating the air inside. As this warm air rises, it is forced into a rock bed for storage and is then released into the interior of the building because heat moves to colder areas. The hot air is discharged throughout the building at different points. This air is then extracted above as shown on the plans. A return wheel assists in ensuring that the amount of air that is discharged is equal to the amount of air extracted.

## green interventions

The building incorporates photovoltaic cells on the roof of the auditorium which is at 30 degrees in order to achieve maximum daylight throughout much of the day. The area of these solar panels is 170 square meters and the energy harvested from is the primary source of energy. An electricity provider such as Eskom is an additional back-up source. On the lower ground floor there is an electrical room where the two power sources are controlled. The turf roof aids in controlling the indoor temperature through its thermal mass. Bicycle racks, a bus stop, stormwater storage tanks and naturally lighting the interior spaces help increase the building's ecological, economic and social sustainability.



## materials

The skin of the building is important for regulating the indoor temperature. Materials with a high thermal mass were chosen for their ability to absorb heat and keep it for longer periods. The turf roof was chosen to act as a blanket over the building. This turf roof begins at the western facade and extends to the east of the building. Masonry walls were used on the perimeter but where glazing is required, double glazing was used because, as mentioned before in chapter 8, heat is lost where only single glazing is used.



water tanks

recycled timber  
louvres

recycled timber  
panels

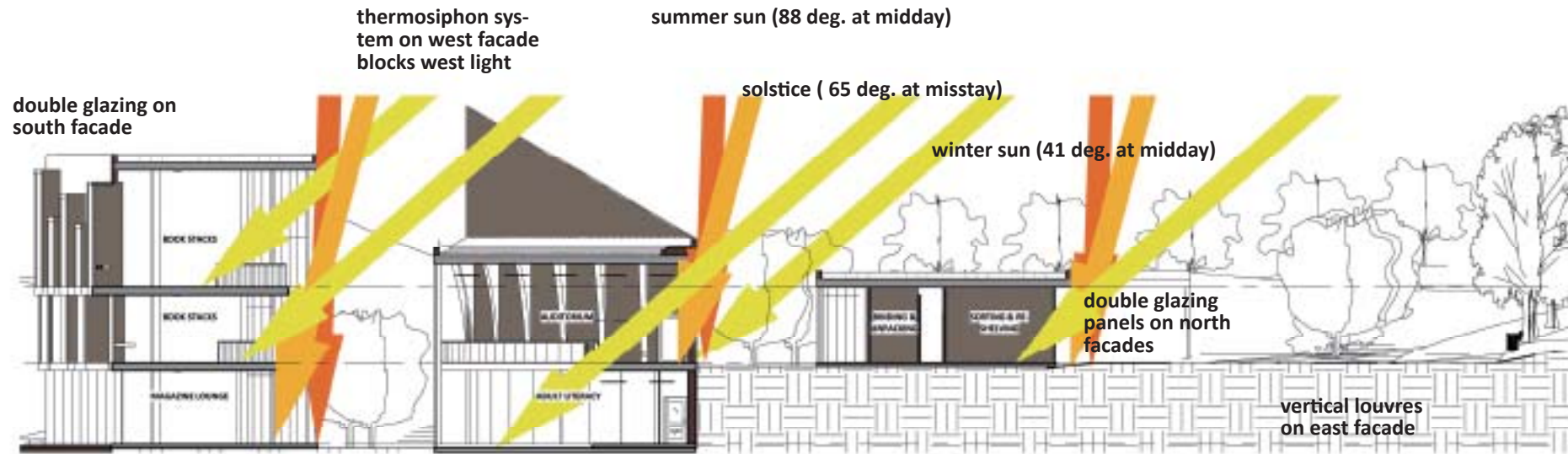


turf roof

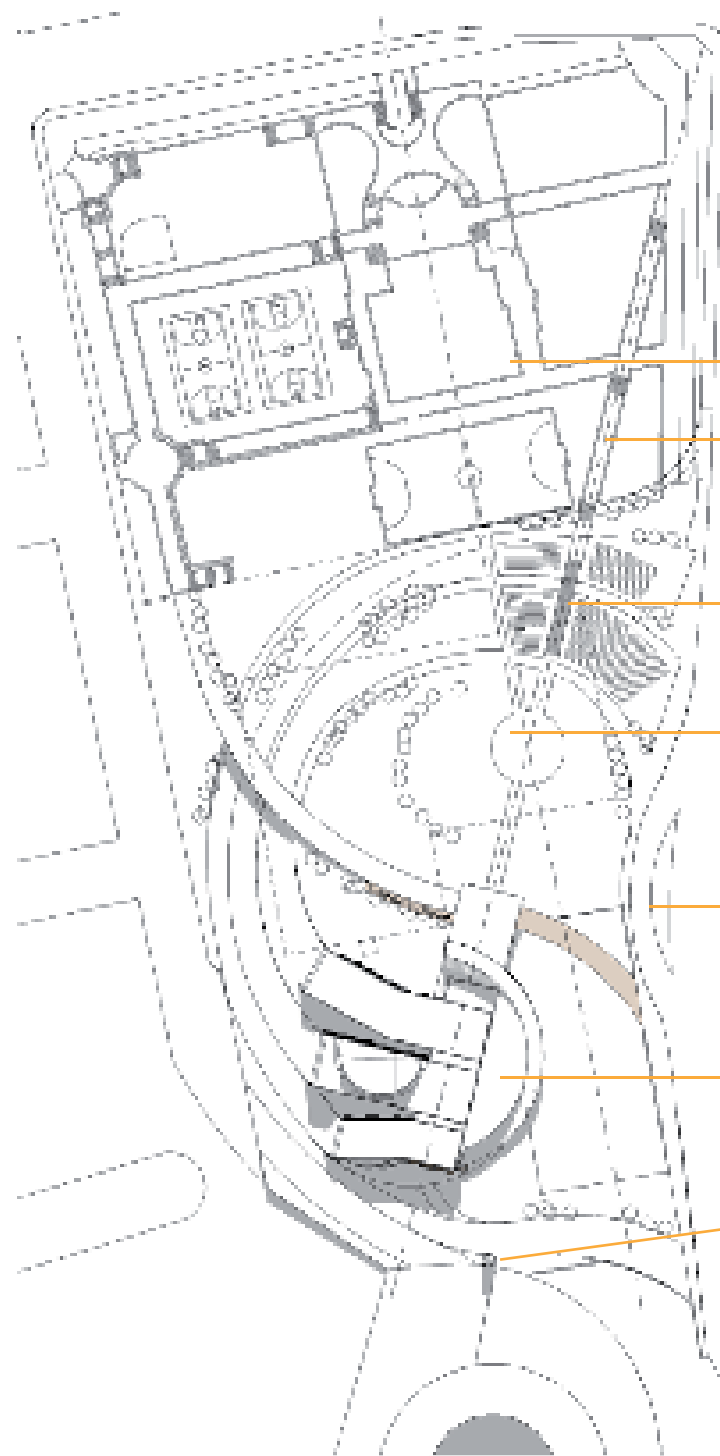
turf wall

double glazing

## daylighting



The footprint of the building is positioned to receive maximum daylight into the spaces. There is a light shelf on the ground floor (between the auditorium and the stack room) to allow sunlight to reach the periodicals area on the lower ground floor. The northern facades have horizontal louvres to filter out the harsh summer sun yet allowing the winter sun to enter. The surface of the northern windows is not vertical but at slightly varying angles to control the amount of sun exposure in different parts of the building. The southern facade is double glazed throughout to allow indirect sunlight which is suitable for book storage. The vertical louvres on the eastern facade filter out the low morning sun but the western sun is completely blocked out by the thermosiphon system on the western side of the building.



Donald MacKay Park

Walkway from north-east park gate

Amphitheatre

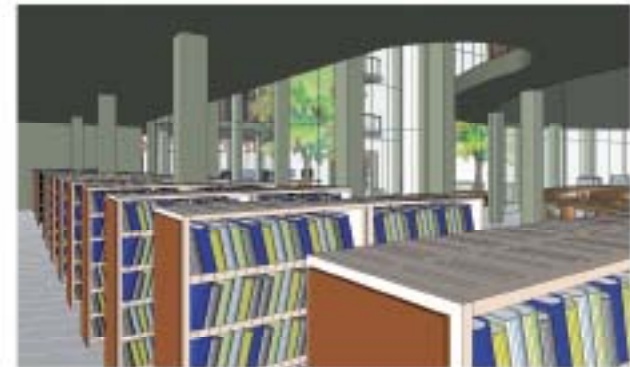
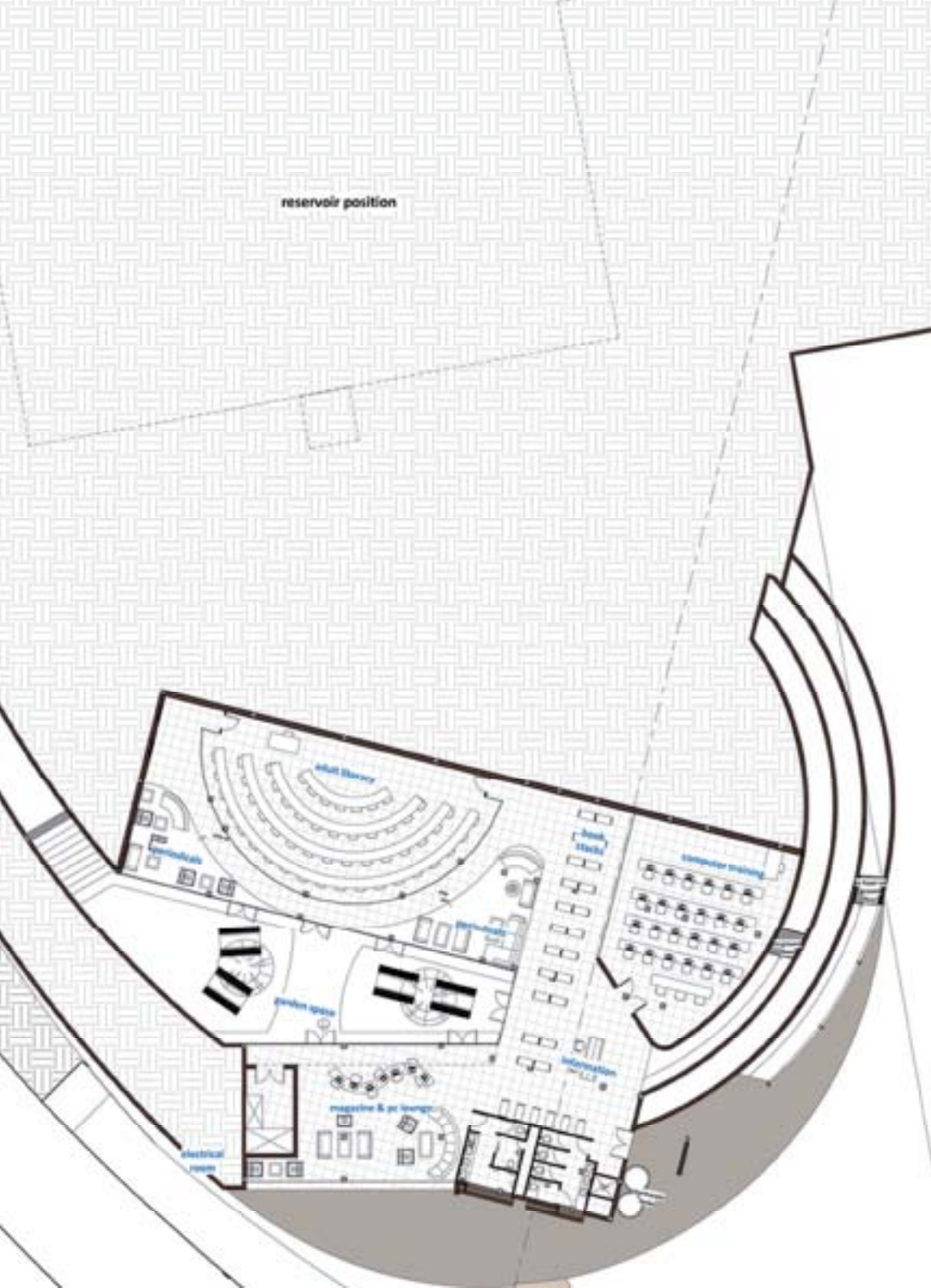
Library gardens

Drop-off

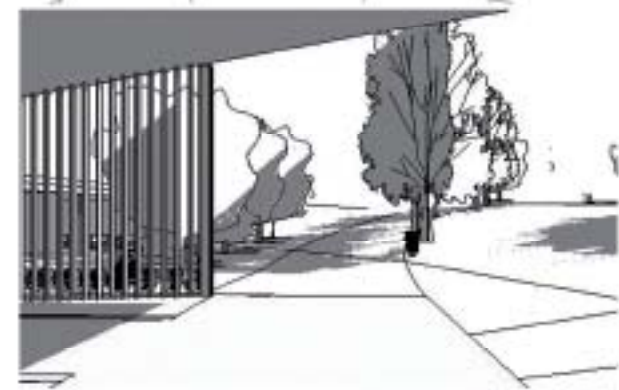
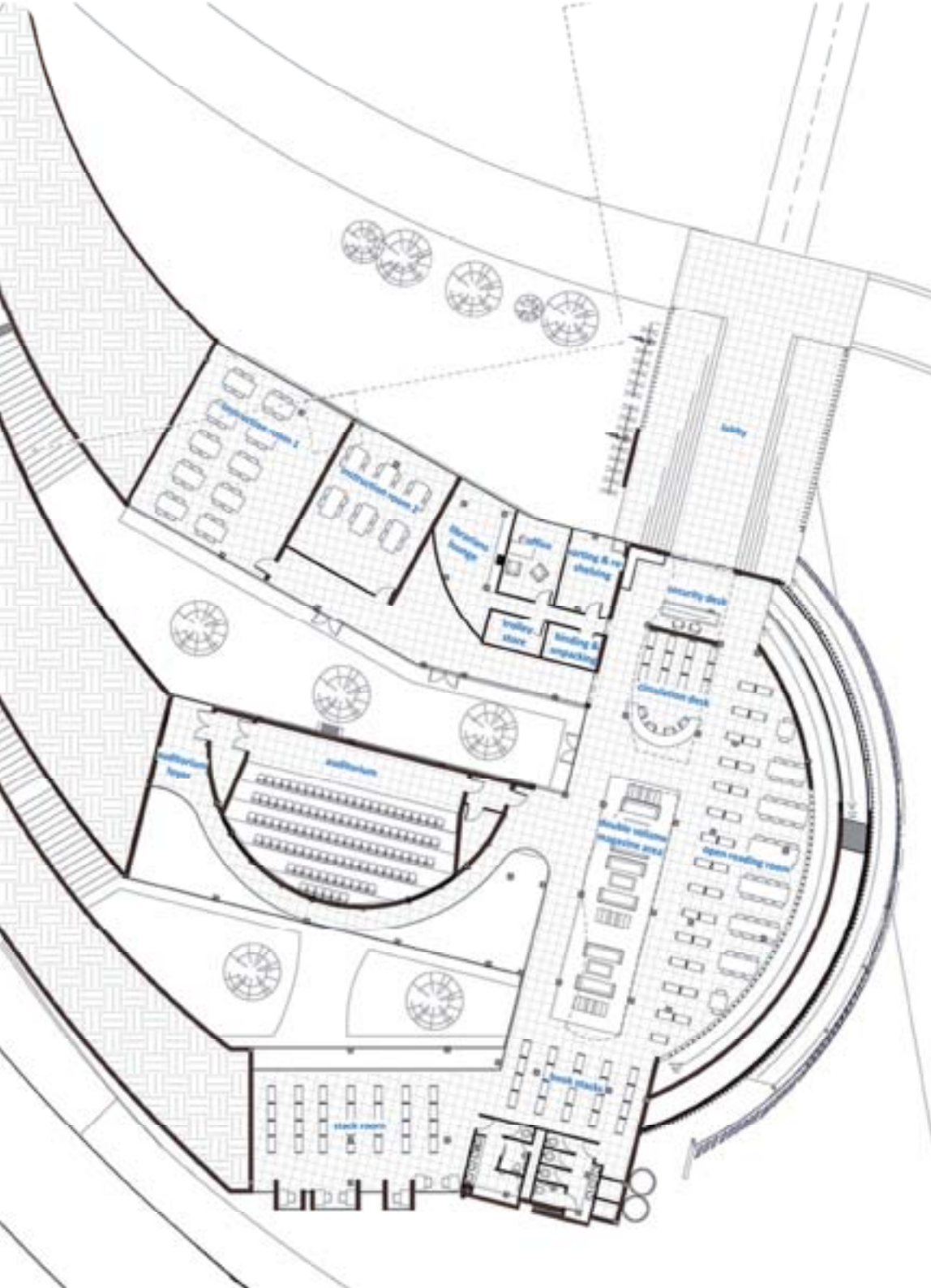
Berea Community library

Elevator from Ponte parking

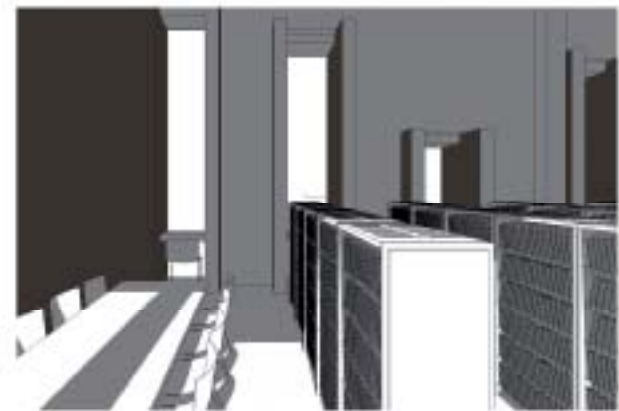
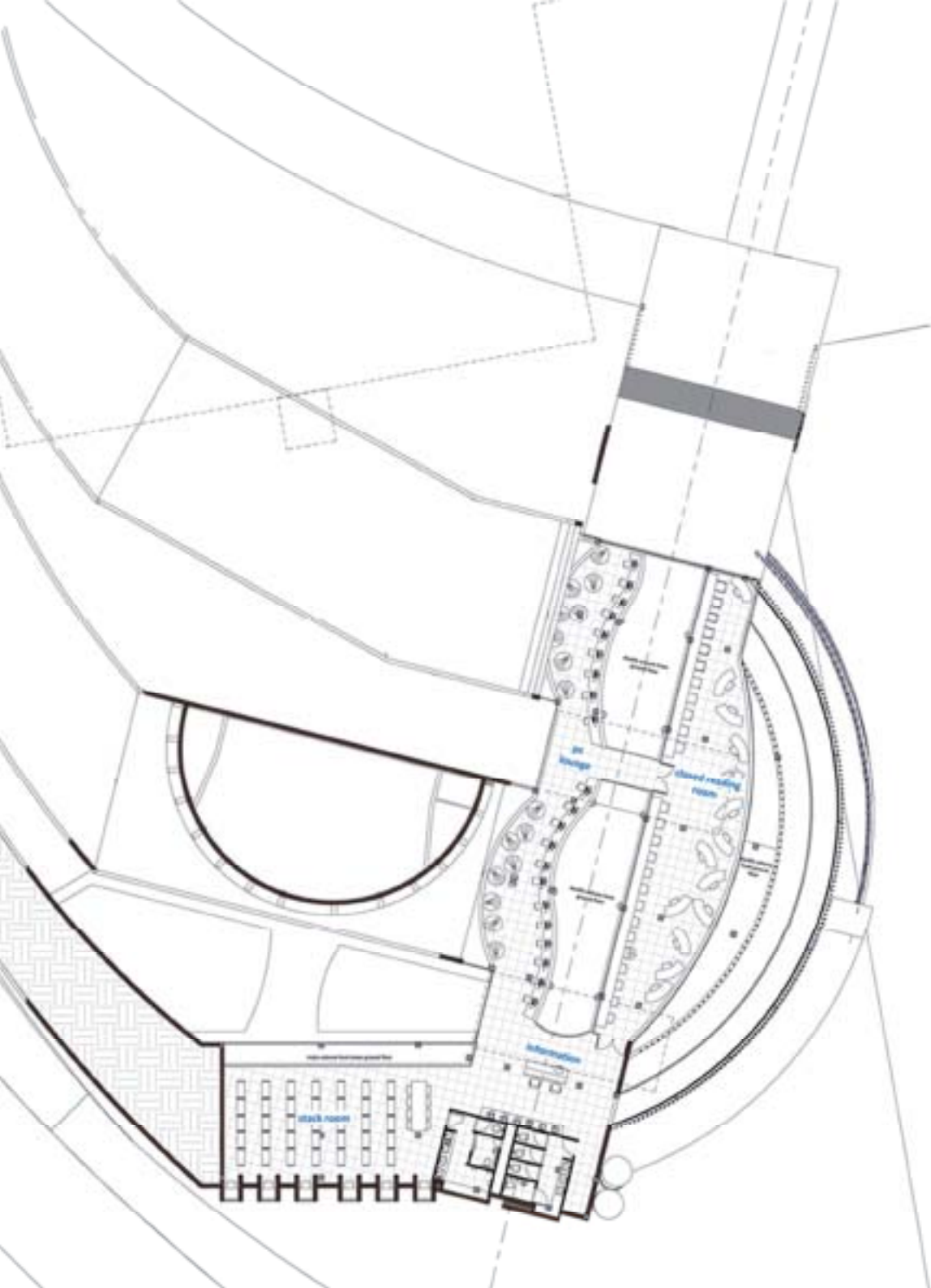
site plan  
11.01.20.2020



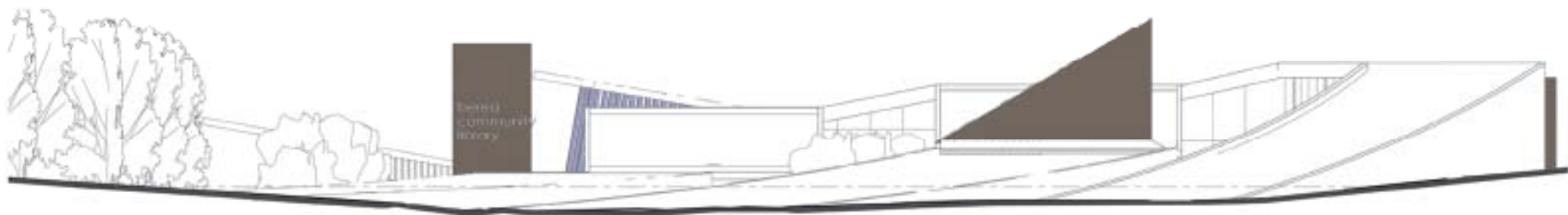
**lower ground floor**



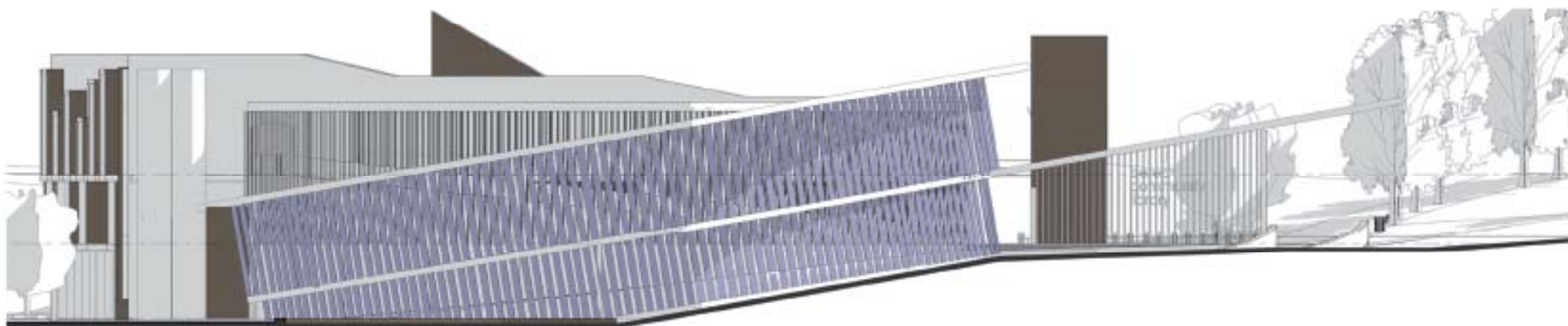
**ground floor**



**first floor**

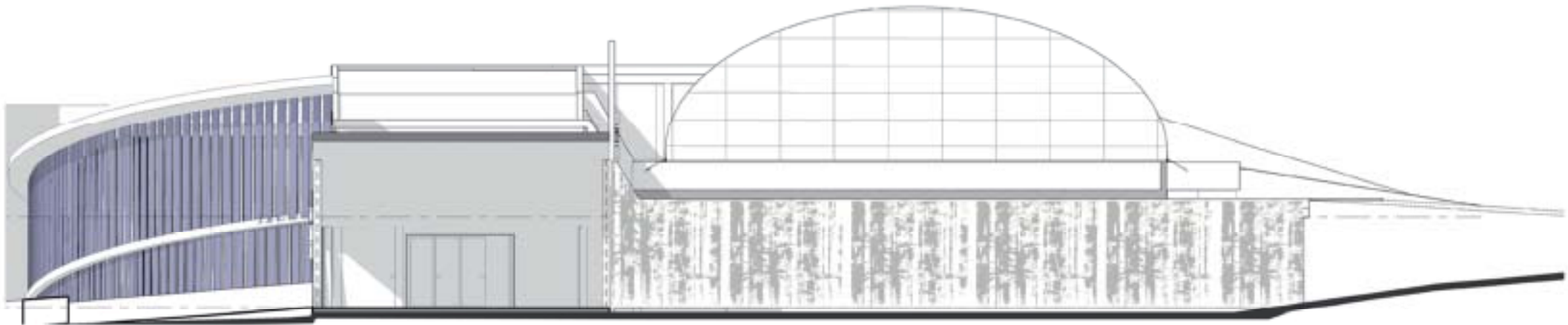


**west elevation**

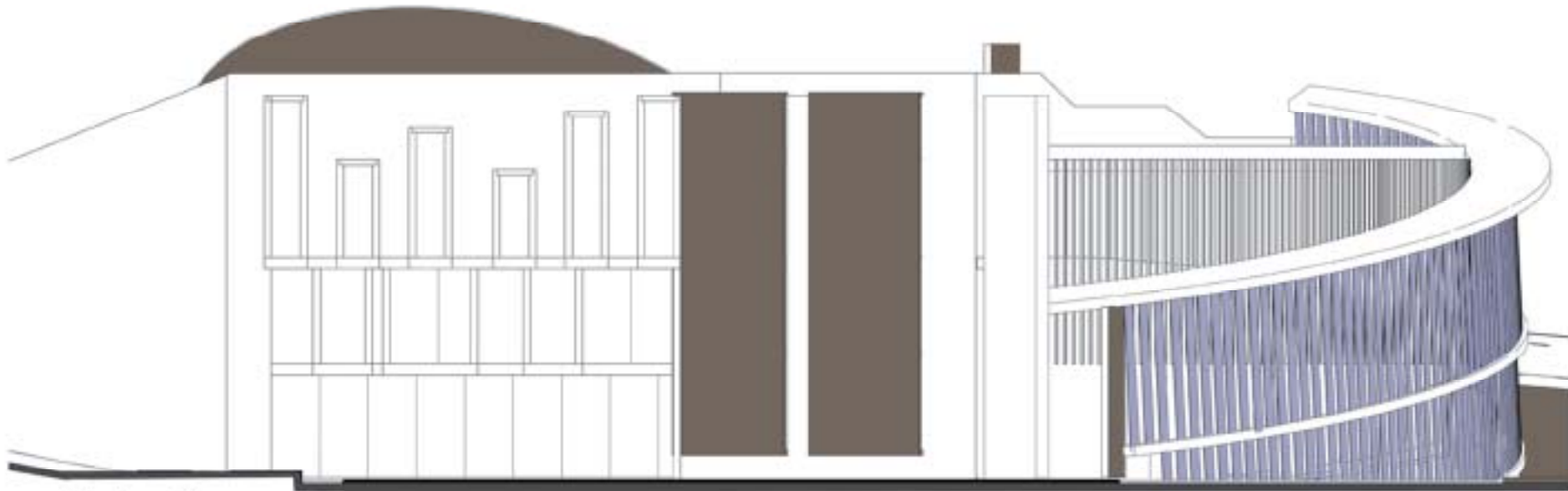


**east elevation**

**elevations**

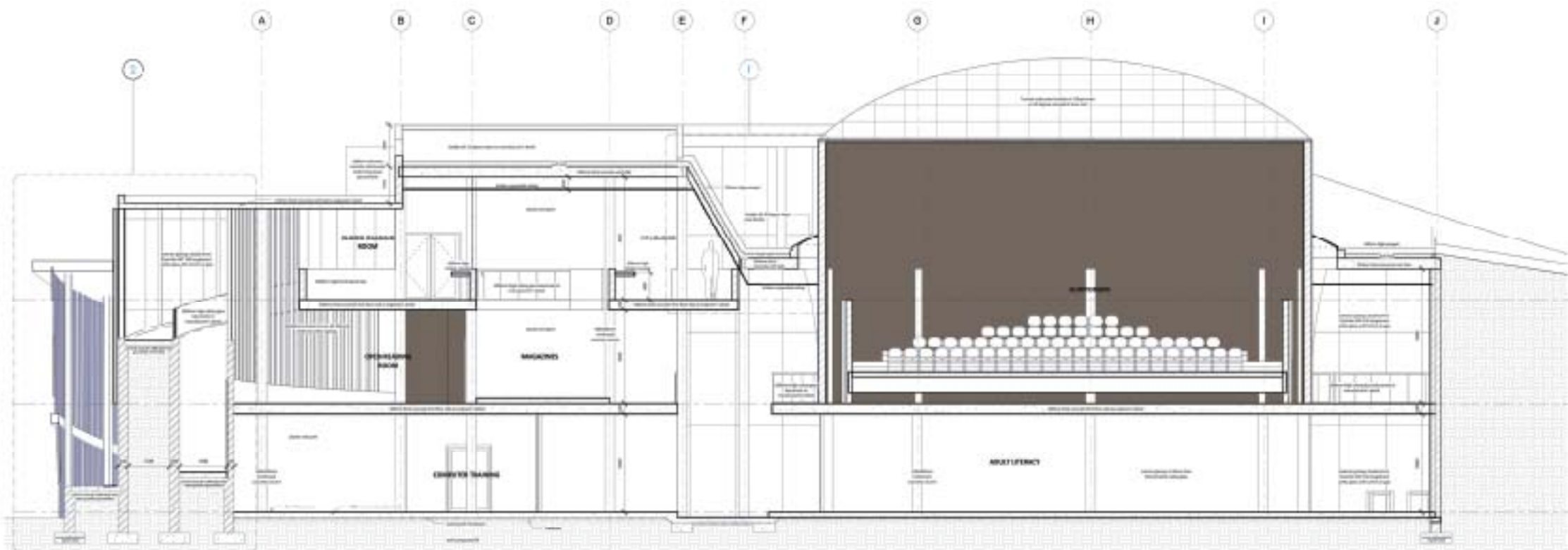


**north elevation**



**south elevation**

**elevations**



**section through auditorium**



**first floor pc centre**



**atrium from first floor**



**ground looking onto south garden and auditorium**



ENGAGING **ARCHITECTURE** WITH NATURE | SOCIETY WITH **SUSTAINABILITY**



TRUE COLOURS OF **GREEN**  
Lomile Mokoka

## BIBLIOGRAPHY

- ART INFO. (2010). Can Zaha Hadid's MAXXI Museum show art. Art Info, 7 June. Cited 2010-07-01. <http://www.architectureweek.com>.
- BACHMAN, L. R. (2003). Systematic Centre Pompidou. Architecture Week, 3 December. Cited 2010-04-05. <http://www.architectureweek.com>.
- BALLANTYNE, A. (2002). What is architecture?. London; New York: Routledge.
- BANHAM, R. (1969). The architecture of the well-tempered environment. [S.l.]: Architectural
- BLUNDELL JONES, P & CANNIFFE, E. (2007). Modern architecture through case studies. 1945-1990. Amsterdam; Boston; London: Elsevier/Architectural Press.
- BROWN, G & GIFFORD, R. (2001). Architects predict lay evaluations of large contemporary buildings: whose conceptual properties?. Journal of Environmental Psychology. 21, pp 93 – 99.
- BRUTE FORCE COLLABORATIVE. (2010). Elevating the Discourse: Umweltbundesamt Dessau. [INTERNET]. [bruteforcecollaborative.files.wordpress.com/](http://bruteforcecollaborative.files.wordpress.com/). Cited 2010-05-30
- CITY OF JOHANNESBURG. (2009). City of Johannesburg: Towards a greener Joburg. Johannesburg. Cited 2010-03-28. [www.joburg.org.za/content/view/4575/201](http://www.joburg.org.za/content/view/4575/201).
- CITY OF MELBOURNE. (2009). City of Melbourne. Cited 2009-09-09. [www.melbourne.vic.gov.au/Environment/CH2/DesignDelivery/Documents/Study1Outline\\_updated.DOC](http://www.melbourne.vic.gov.au/Environment/CH2/DesignDelivery/Documents/Study1Outline_updated.DOC).
- CONWAY, H. (1994). Understanding architecture: an introduction to architecture and architectural history. London: Routledge.
- DEAN, P. (2009). Delivery Without Discipline. SITE. pp 24,26
- EDWARDS, B & FISHER, B. (2002). Libraries and learning resource centres. Oxford ; Boston : Architectural Press
- FRAMPTON, K. (1992). Modern architecture: a critical history. London: Thames and Hudson
- GIANNOTI, A. (2009). MAXXI Museum/ Zaha Hadid Architects. Arch Daily, 16 December. Cited 2009-04-05. <http://www.archdaily.com/43822/maxxi-museum-zaha-hadid-architects/>
- GIFFORD, R, HINE, D, MULLER-CLEMM, W, REYNOLDS, D & SHAW, K. (2000). Decoding Modern Architecture: A Lens Model Approach for Understanding the Aesthetic Differences of Architects

and Laypersons. *Environment and Behaviour*. 32, pp 163.

- GOODLAND, R. (2002). Sustainability: Human, Social, Economic and Environmental. *Encyclopaedia of Global Environmental Change*. John Wiley & Sons Ltd.
- GOODLAND, R and DALY, H. (1996). Environmental sustainability: Universal and non-negotiable. *Ecological Applications*, Vol. 6, No. 4 (Nov): 1002-1017
- GREAT BUILDINGS COLLECTION. (2010). Centre Pompidou. [Internet]. [http://www.greatbuildings.com/buildings/Centre\\_Pompidou.html](http://www.greatbuildings.com/buildings/Centre_Pompidou.html) Cited 2010-05-10
- GREEN BUILDING COUNCIL AUSTRALIA. (2009). [INTERNET]. <http://www.gbca.org.au/green-star/green-star-overview/> Cited 2010-07-08
- GREEN LIBRARIES. (2010). Wikipedia. Cited 2010-04-11. [http://en.wikipedia.org/wiki/Green\\_library#What\\_makes\\_a\\_library\\_green.3F](http://en.wikipedia.org/wiki/Green_library#What_makes_a_library_green.3F)
- GUY, S and FARMER, G. (2001). Reinterpreting Sustainable Architecture: The Place of Technology. *Journal of Architectural Education*. 54/3, pp 140-148
- HESSELGREN, S. (1969). *The language of architecture*. London: Applied science publisher
- HOLGATE, A. (1992). *Aesthetics of built form*. New York: oxford University Press.
- JENCKS, C. (1991). *The language of post-modern architecture*. London: Academy Editions
- JODIDIO, P. (2010). Five works by Zaha Hadid. *Architecture Week*, 6 January. Cited 2010-04-06. <http://www.architectureweek.com>.
- KONRADIN RELATIONS. (2006). *Format*. Cited 2010-07-06. [epaper.konradin-relations.de/xella/2006002/en/pdf/format\\_e.pdf](http://epaper.konradin-relations.de/xella/2006002/en/pdf/format_e.pdf)
- KUBO, M and PRAT, R. (2005). *Seattle Public Library*. Barcelona: BActar
- LANG, J.T. (1987). *Creating Architectural Theory: The Role Of The Behavioral Sciences In Environmental Design*. New York: Van Nostrand Reinhold
- LE CORBUSIER. (1986). *Towards a new architecture*. Dover Publications
- MEISS, P. (1990). *Elements of architecture: from form to place*. London: Nostrand Reinhold (International).
- MINAI, A. T. (1984). *Architecture as environmental communication*. Berlin: Mouton.

- MITCHELL, L. M. (2009). Green star and NABERS: Learning from the Australian experience with green building rating tools. In R. K. Bose (Ed), *Energy efficient cities: Assessment tools and benchmarking practices* (pp 93 – 130)
- OUROUSSOFF, N. (2009). Architecture review: Modern lines for the modern city. *The New York Times*, 11 November. [http://www.nytimes.com/2009/11/12/arts/design/12zaha.html?\\_r=1](http://www.nytimes.com/2009/11/12/arts/design/12zaha.html?_r=1). Cited 2009-04-05.
- OWEN, C and DOVEY, K. (2008). Fields of sustainable architecture. *The Journal of Architecture*. 13/1, pp 9-21
- RADOVIC, D. and CRIST, G. (2006). Nature and Aesthetics in the Sustainable City. In *AusIndustry Technical Research Papers*
- RAPOPORT, A. (1974). Symbolism and Environmental Design. *Journal of Architectural Education*. 4/1974, pp 58 – 63.
- RASKIN, E. (1974). *Architecture and People*. New Jersey: Prentice-Hall Inc.
- SANDS, J. (2002). Sustainable library design. *Libris Design Project*, 2-17. Cited 2010-07-12. <http://www.librisdesign.org/docs/SustainableLibDesign.doc>
- SAUERBRUCH, M & HUTTON, L. (2006). *Sauerbruch Hutton: archive*. Baden: Lars Muller.
- SCHWARZER, M. (1993). Ontology and Representation in Karl Botticher's Theory of Tectonics. *The Journal of the Society of Architectural Historians*. Society of Architectural Historians.
- SCRUTON, R. (1979). *The aesthetics of architecture*. London: Methuen
- SEIBOLD-BULTMAN, U. 2007. What does sustainability look like: Green architecture as an aesthetic proposition. *Interdisciplinary science reviews*. 32/2007, pp 3 – 6.
- SHARP, R. (2008). Earthship enterprise: the ultimate eco-house. *The independent*. 17 July. Cited 2010-05-30. <http://www.independent.co.uk/environment/green-living/>
- SILVERMAN, M & ZACK, T. (2008). *Land use management and democratic governance in the city of Johannesburg Case study: Hillbrow and Berea*.
- SNODGRASS, A. (2006). *Interpretation in architecture: Design as a way of thinking*. London; New York: Routledge.
- SUSTAINABILITY. (2010). Wikipedia. Cited 2010/03/02 <http://en.wikipedia.org/wiki/Sustainability>.
- WINES, J. (2000). *Green architecture*. Koln; New York: Taschen.

- YATZER. (2007). MAXXI National Museum of XXI Arts. Cited 2010-04-05. [http://www.yatzer.com/2021\\_maxxi\\_national\\_museum\\_of\\_xxi\\_century\\_arts\\_by\\_zaha\\_hadid](http://www.yatzer.com/2021_maxxi_national_museum_of_xxi_century_arts_by_zaha_hadid).