

chapter 03

theoretical discourse

“The hard facts of ‘sustainable’ development are that humans are totally dependent upon the green world – on living plants – for survival. Plants are the primary producers upon which all higher organisms are dependent.... On the other hand, plants do not need higher organisms such as humans to survive. They can survive – thrive, actually – without us.”

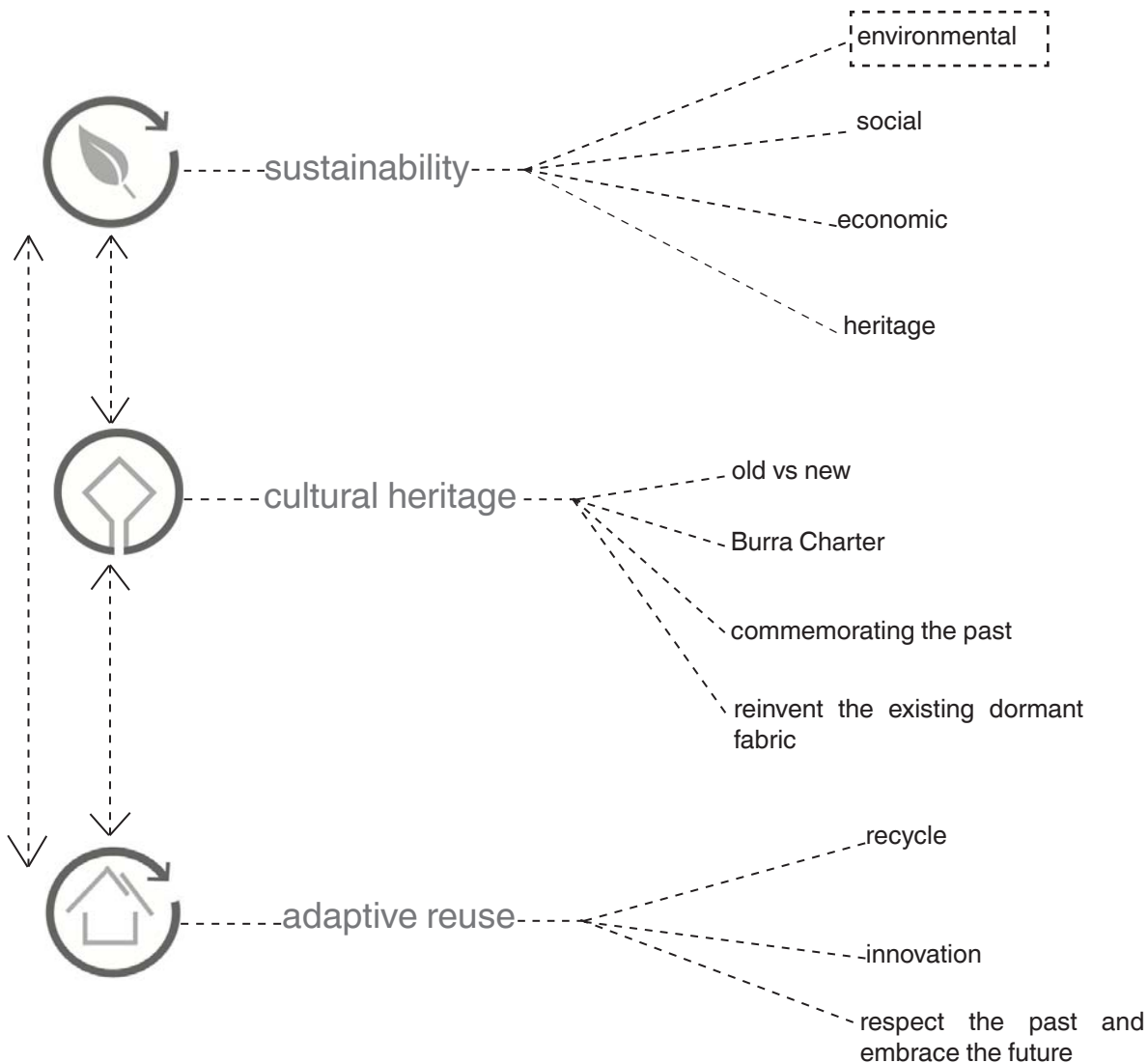
(Wells, 2003:271)

03_theoretical discourse

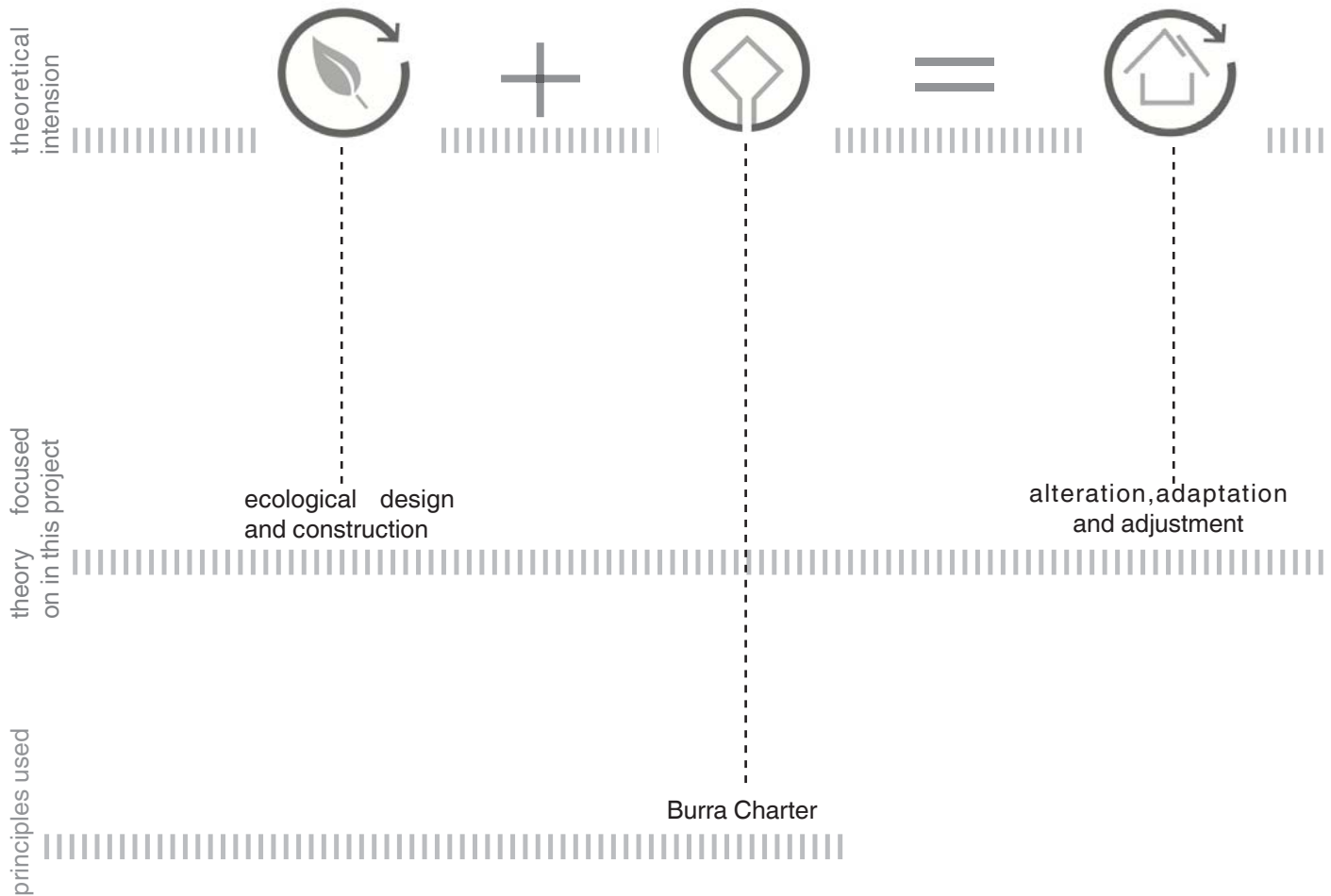
3.1_INTRODUCTION

What follows is the theoretical approach of this project. It will discuss the meaning, intension and application of 'sustainability', 'heritage' and 'adaptation'. As part of this theoretical investigation, the author poses questions which intend to be rhetorical. However an answer is given based on this theoretical investigation and the author's normative position.

Question: What is the role of architecture in era of environmental change? Can architecture really influence the world in its current environmental state?



theoretical intension for the Adaptive Reuse of the Agrivaal Building



3.2 SUSTAINABILITY

Warnings have been given on the consequences of modern society's ignorance of its actions (Wells, 2003:268). Reports from the United Nations, environmental summits and scientific research prove that we are facing detrimental environmental issues. As early as Rachel Carson's *Silent Spring* (1962) and Paul Ehrlich's *The Population Bomb* (1968), we have been exposed to climate change warnings and the "unsentimental reports on issues and trends that most wish to ignore or pretend will somehow be miraculously solved by technological innovation" (Wells, 2003:268).

Despite our knowledge of environmental troubles, new buildings are proliferating even as the world's resources are at a premium. "Suburban sprawl continues to remove productive forests and agricultural lands and create a landscape that numbs the soul" (Wells, 2003:271).

"The life cycle components of the typical building – its materials, the land on which it sits, how it is designed to work with local temperature, rainfall, sun, wind, the humanity of the interior environment, the ability to adapt and change, and the preservation or re-use and recycling of the whole or the parts at the end of its functional life – are in fact controllable by the designers, builders, developers, and owners of buildings" (Wells, 2003:268).



3.2.1 ECOLOGICAL DESIGN AND CONSTRUCTION

The concept of ecological design and construction is based on the systems of nature. In emulation of biomimicry, the study of nature enables the reproduction of nature's 'blueprint' and applies it to architecture. "Ecosystems are the source of important lessons and models for transitioning human activities onto a sustainable path" (Kilbert, Sendzimir and Bradley Guy, 2003:6). The design process looks at a number of scales involving the holistic intension. This informs and enables a study of different linking systems that, when put together as a whole, establish closer linking and cyclical processes which enable sustainable design. "Examining nature and ecological systems for patterns of energy and materials metabolism for their potential adoption into human systems can provide a substantial improvement on current methods of attempting to green the built environment" (Kilbert et al, 2003:26). These thoughts are synonymous with Fritjof Capra's theories. He mentions that the main characteristics of 'systems thinking' emerged simultaneously in several disciplines during the first half of the 20th century. It was initially thought of by biologists who insisted that living organisms are best understood as integrated wholes (Capra, 1997:21). It was further deepened by Gestalt psychology and the new science of ecology. It affected quantum physics which showed that at the subatomic level there are no parts at all, that what we call a part is merely a pattern in an inseparable web of relationships (Capra, 1997:21).

Capra believes that the key to the theory of living systems depends on two approaches: the study of pattern (or form, order, quality) and the study of structure (or substance, matter, quantity). The structure approach tries to understand the properties that make up the object of study. The pattern approach attempts to understand the relationships between its constituent parts (Capra, 1997). The combination of these two approaches in accordance with the living systems theory brings about a new way of thought and comprehension of reality. Pattern, structure and process are inseparable perspectives of life. Thus to understand any living system one must ask these three questions: what is its structure? What is its pattern of organization? And what is the process of life? (Capra, 1997:21) These questions are relevant in design and construction; they are very important in creating a building that works as a whole.

Design should be aware and responsive to context, climate and the surroundings. "Ecological design is a design of place, the place of the users, the climate, the topography,

and the local culture. As in Nature, where species from similar genetic strains will evolve into subspecies when faced with different bioregional forces, so will the generic 'modern' architecture building either fail in its location (environmentally) or adapt" (Guy, 2003:228). As time passes, needs and conditions change. Architecture cannot afford to ignore these changes, as deterioration and disruption occur in cycles thus affecting systems of the building, the block within the city, and the city itself.

This thesis takes a stance in investigating sustainability in the built environment at different scales. It will focus on the mitigation of climate change through learning from and reacting to nature. This theoretical viewpoint provides a spine which will guide the design in a manner that works with nature so as not to destroy it. The Eastgate Centre is a precedent that uses nature's systems in a termite mound and uses the concept in the design of a large scale shopping and office block.

3.2.2 GREEN STAR RATING TOOL

The Green Building Council of South Africa (GBCSA) developed Green Star SA, based on the Green Building Council of Australia's Green Star rating system, to provide the commercial property industry with an objective measuring tool for green buildings and to recognize and reward environmental leadership in the property industry (GBCSA, 2008:v). Each Green Star SA rating tool reflects a different market sector or phase in the building life cycle (GBCSA, 2008:v).

The objective of the rating tool is to establish a common language and standard of measurement for green buildings and to promote integrated, whole-building design. The handbook discusses sustainable approaches that aim to reduce environmental impacts of development.

Green Star SA covers a number of categories that assess the environmental impact that relates to the sequence of a project's site selection, design and construction (GBCSA, 2008:v). This thesis will adapt the criteria according to which the rating tool measures sustainability in an office building. It will systematically provide information and strategic elements to inform the proposed design of the Agrivaal Building. Certain categories will be used to assist in focusing on environmental design i.e. ventilation, heating and cooling and natural light in a building.



Fig.219:Eastgate Shopping Centre, designed influenced by the work-ings of a termite hill. [Source: www.treehugger.com/files/2006/08/biomimetic_buil_1.php, accessed 2 October 2011]

Fig.221:Eastgate Centre elevation, with chimney vents allowing air to escape the building. [Source: www.nubianarchitects.wordpress.com/2010/08/16/termite-and-temperature-control-from-zimbabwe/, accessed 2 October 2011]

Eastgate Centre

Harare, Zimbabwe
Architect: Mick Pearce

precedent study on ecological design

The Eastgate Centre was designed to be naturally ventilated and cooled. The designed systems we based on termite mounds which included flues which allow for ventilation through the sides and on top of the mound. The termite mound is shaped in a manner that catches the breeze allowing it into the mound. The termites control the air flow by opening or blocking the tunnels which helps the hot air from the main chambers below the ground exit the structure (Doan, 2007).

Similarly, the Eastgate Centre draws in air which is either warmed or cooled by the building mass, depending on whether the concrete or the air is hotter (Doan, 2007). The air is vented onto concrete beams on the floors of the building's offices before leaving through chimneys at the top.

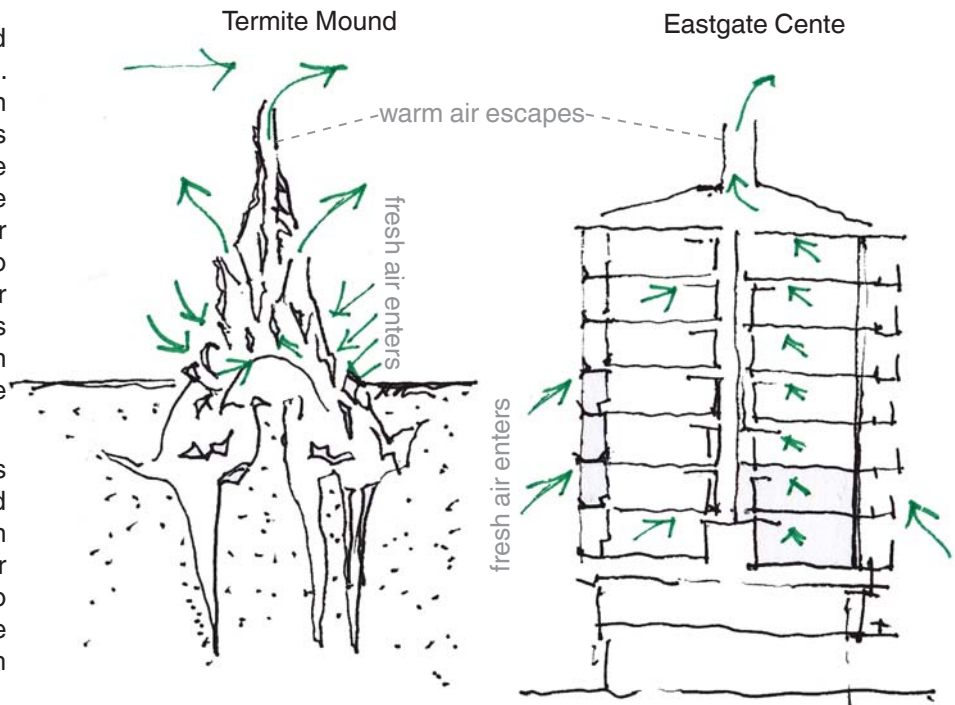


Fig.220: Ventilation [Source: www.treehugger.com/files/2006/08/biomimetic_buil_1.php, accessed 2 October 2011, edited by author 2011]

3.3 Heritage

Introduction

As mentioned in chapter one, the definition of cultural significance is that of “aesthetic, historic, scientific or social value for past, present or future generations” (The Australis ICOMOS Burra Charter, 1999:1). The Agrivaal Building is considered to be part of a cultural significant layer in the City of Tshwane. This layer speaks of the architectural advancement and international influence that has left its mark in the city. This mark is part of the city’s heritage and must be respected and maintained.

Different buildings have different importance and cultural significance. The Union Building is the seat of the administrative government of South Africa. Designed by Sir Herbert Baker in 1908, the building represents layers of heritage and political, social and economic advancement in South Africa. In contrast, the Agrivaal Building may not have such high value and cultural significance on a national scale like the Union Buildings. However, it holds significance to Tshwane, showing signs of architectural transformation in the city in its era. It is a building that forms part of the approach to the Union Buildings and must be awakened from its dormant, abandoned state and contribute to its surroundings.

Heritage strategy:

A building analysis on the Agrivaal Building (Chapter 4) will highlight elements of cultural significance that will be of importance in the intervention. This process is subjective to the author, and will be moderated by using the Burra Charter, as an international guideline on principle of conservation and cultural significance.

Burra Charter

The aim of the Burra Charter is to conserve places of cultural significance. According to the Burra Charter the reasons for conservation are as follows :

- people’s lives are enriched
- the preservation of historical records is ensured
- connect the community and landscape, to the past and to lived experiences
- reflect the diversity of a community
- preservation for the present and future generations

The Burra Charter presents a set of guideline that assists in the comprehension of the cultural significance of a place. The following five chapters of the conservation process are pertinent to this design process:

The Burra Charter Process

Sequence of investigations, decisions and actions

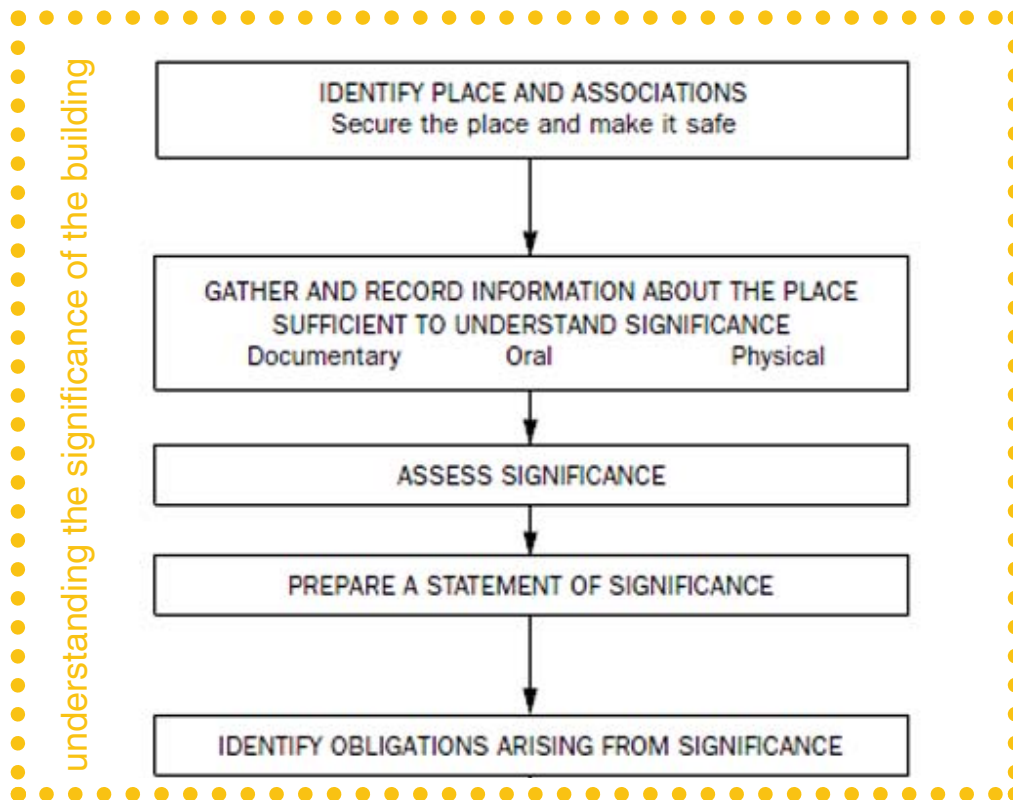


Fig.222:Process from the Burra Charter that assists in understanding the significance of the building. This process has been done for the Agrivaal Building under chapter 4, building analysis

3.4 ADAPTIVE REUSE

Adaptive re-use encompasses a large pool of thought. This chapter will elucidate adaptive re-use in terms of the Agrivaal Building and how it will be treated. One of the main focuses of this thesis is to be responsible about decisions made in terms of the environment and thus a sustainable approach will be taken. “All buildings, once handed over by the builders to the client, have three possible fates, namely to remain unchanged, to be altered or to be demolished” (Scott 2008:1) There are different thoughts on how buildings should be treated when it comes to a point where ‘something needs to happen’ with the building as whole. A responsible decision would be to work with the building and to neither demolish it nor to allow its condition to worsen. Thus the route taken will be of intervention and adaptation. The responsibility is towards the environment, where wastefulness and the loss of large amounts of material and embodied energy are unnecessary.

The energy used in the lifecycle of a building encompasses all the non-renewable energy consumed. This includes:

- Initial energy - to acquire, process, manufacture, transport building materials and construction
- Recurring energy – to maintain and repair the building
- Operating energy - to heat, cool, ventilate, and light the building
- Energy to demolish and dispose of the building.

A 1996 study by the Heritage Canada Foundation examined the total life-cycle energy use in a 4,620m² three-storey, generic office building. On average, the total embodied energy of such a building increases by 56.5% by the time it is 25 years old, 144% by the time it is 50, and by 325% by the time it is 100 (see graph). If the building is demolished, this embodied energy will have gone to waste (Heritage Canada Foundation, 1996:1).

The rehabilitation of heritage buildings conserves embodied energy. A study of the Angus Technopole Building, a Montreal factory built in the early 20th century, compared the energy costs associated with the rehabilitation and adaptive re-use of the building as a residential complex to the energy costs of demolition and the construction of a new building on the same site. It illustrated that rehabilitation required 5,169 Gigajoules (Gj) of energy, while demolition and new construction required 13,734 Gj of energy. Restoration, in other words, would require 8,565 Gj less energy than demolition and building anew (Heritage Canada Foundation, 1996:1).

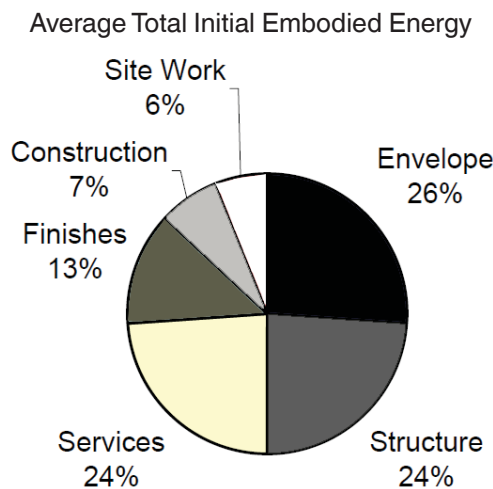


Fig.223:Pie chart showing the percentage of average total embodied energy [Source: www.heritagefoundation.ca/docs/Energy_Waste_EN.pdf. accessed: March 2011]

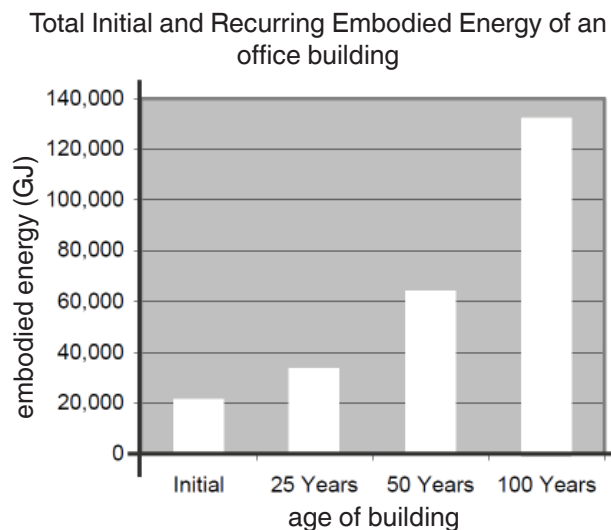


Fig.224:Bar chart showing the recurring embodied energy of an office building [Source: www.heritagefoundation.ca/docs/Energy_Waste_EN.pdf. accessed: March 2011]

3.4.1 'ALTERING ARCHITECTURE' -

ALTERATION, ADAPTATION, ADJUSTMENT

Alteration offers an alternative to preservation or demolition, and is a more general strategy to keep buildings that are to be inhabited/occupied extant beyond their time (Scott, 2008:11). Some buildings with heritage value are artefacts that must be preserved rather than worked with. The Agrivaal Building and its associated heritage will inform the new design, from concept to materiality. In the book *On Altering Architecture*, Fred Scott mentions that "the idea of a work of art is one that attempts to exclude alteration" (2008:7). This implies that a building is not necessarily a work of art which must be preserved and untouched, but rather that, with informed decisions on working with a heritage building, an informed judgment may encourage demolition in certain areas, or the option of creating a new complimentary addition in other areas.

"Context is inescapable for the interventionist; work is clearly inseparable from its context" (Scott, 2008:143). Intervention is almost always more complex than context and pure architecture. It is the cause of the intimacy that the designer must cultivate with the given building, and this is equally not limited to scale (Scott, 2008:143).

If a building is to be altered, chances are it will be altered again. The designer therefore carries responsibility for a building's past, its present and indirectly its future. The interventionist makes a contribution to a continuum, which is the life of the host building (Scott, 2008:143). The understanding that the city is always changing and that the needs of users are constantly modified, gives that greater and definite comprehension of how buildings will also alter towards new needs. It is thus imperative that any design will have the ability or at least the consideration of thinking for the future, but highly considering the present requirements and respect of the layered past.

"When a building is complete it wants to say, look how I'm made. But nobody is listening because the building is fulfilling function. When it becomes a ruin, the building becomes clear, the spirit returns. For Louis Khan, therefore, the spirit or essence of a building is something separated from form and perhaps in some cases antagonistic to function" (Scott, 2008:62).

The spirit of a building should not only reappear once the building is not in use or has been destroyed. This spirit must be experienced and explored by the users. It is as much part of the experience of the building as comfort and usability.

3.4.2 PROCEDURES IN ALTERING A BUILDING

Fred Scott provides a system for confronting an adaptive re-use project. He describes four planning procedures, 'stripping back', 'making good', 'enabling works' and 'new works.' These procedures will be used in addressing the new intervention for the Agrivaal Building and will thus guide the design in terms of heritage and sustainability.

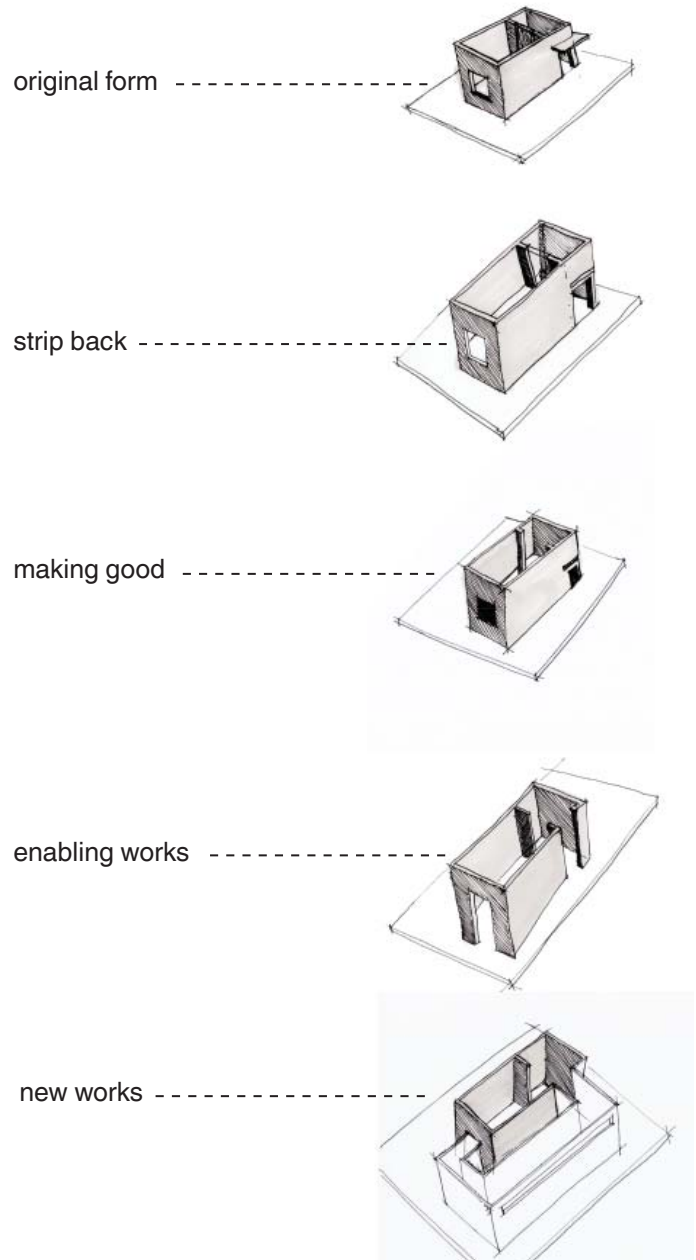


Fig.225: Interpretation of Fred Scott's theory on altering architecture [Source: author 2011]

3.5 CURRENT STANCE AND APPLICATION

Groák mentions that “everything we create has at least two narratives through which we comprehend it, two reasons for existence – ‘reason’ as purpose or ‘reason’ as cause” (1993:38). Reason as purpose refers to how we understand purpose, the aesthetic, functional, economic etc. Reason as cause refers to the social and economic circumstances which materialised the building (Groák, 1993). ‘Purpose’ and ‘cause’ are guiding principles in the new intervention on the Agrivaal Building. Consideration for and comprehension of what the previous intentions of the building were will guide current decisions. However, environmental concerns will have to be included in the responses, as they are part of issues that the world is currently experiencing. A significant problem concerning the globe cannot be ignored.

The inhabitants of the planet demand a constantly rising amount of non-renewable resources, with very little control over or consciousness of the impacts relating to current and future generations. An age where disposable non-recyclable products are the norm, and ‘brand new things’ are wanted and not needed, contributes to the environmental crisis.

The thoughts of the average world citizen need to be concerned with recycling, re-using, conserving and harvesting – with a more sustainable way of living. The media, non-governmental organizations, and many governments are slowly encouraging this phenomenon, while many contradictions occur at the same time.

Architecture and the built environment must be part of this sensitization of ignorance towards the environment. A large percentage of material resources taken from nature are building related.

The building sector contributes a large percentage to national waste levels, as well as to the amount of energy consumed.

This thesis aims to specifically investigate an existing building that does not necessarily function well in terms of sustainability, due to the era in which it was built. It is a building that has been deteriorating for a number of years and thus any alteration done to it must be appropriate and should respond to the current needs of the environment. The intervention should respect the building in terms of its architecture, construction and aspects of cultural heritage. It will utilize systems of self sufficiency and interior environmental comfort (bio-climatic comfort). A system that is built with nature, responding to nature and respecting nature, will be created.

The built environment’s moral stance must evolve in terms of understanding the short and long-term repercussions of design decisions. It is therefore imperative that sustainability be an essential informant in design. This thesis intends to be an example of consciousness of the environment, working with existing buildings and thinking contextually.

The Agrivaal Building acts as a ‘shell’ in which sustainable design decisions will enable the success of the building in terms of user comfort, respect for context and cultural heritage. There are a number of tools that ‘measure’ the sustainability of a building. These tools are divided into categories and thus determine how successful the building is. These categories will specifically be investigated and where applicable be incorporated in the design for the Agrivaal Building.

3.5.1 QUESTIONS ANSWERED?

The questions discussed refer to the introduction of the theory chapter, where climate change and architecture preceded theory on ‘sustainability’ and ‘alteration’.

What is the role of architecture in an era of climate change? Can architecture really influence the world in its current environmental state?

In terms of the theory discussed, these questions have been posed and postulated. Hypothetical answers may perchance be provided within a decade or century, depending on the proactive efforts of the current generation.

The author’s hypothesis: The role of architecture is to respond to need and context. Context includes the actual site and its conditions concerning solar angles, wind direction, vegetation etc. It includes the influences of the city block in which the site is located, the precinct, the city, the country, the continent, and finally the earth as a whole. These different scales will all be affected in numerous ways and in different timelines. These affected scales will require different reactions and create different concerns. In this century, at the largest scale and amongst other societal issues, the earth is concerned with global warming and its repercussions affecting all scales of life.

Comprehension of the different scales of context, their interdependency and associated connections will bring answers concerning the mitigation of climate change through the built environment.

Context has changed. Architecture must respond to context.



Fig.226:A image portraying the architect as a major cause in changes in the environment. [Source: WELLS, p 272]