ADAPTIVE REUSE IN CONTEXT: TOWARDS SUSTAINABLE MIXED - USE HOUSING IN DURBAN.

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ABSTRACT

In this dissertation the process of adaptive reuse – the recycling or rehabilitation of buildings – is analysed in terms of the tenets of sustainability and place theories as construed in the field of architecture, as well as within the context of architectural and urban theory and history. The dissertation demonstrates how different approaches to adaptive reuse result in a sustainable architecture that is responsive to its context.

Adaptive reuse is the historically normal practice of recycling buildings. Initially, the research focused on the relationship between old and new buildings; how is the new synthesised with the old, and what are the values of this relationship? It soon became evident that by today's definition of sustainability in architecture, the practice of recycling buildings, and indeed the partial modification of buildings, came very close to fulfilling the 'ideologies' of sustainability. This research paper reconciles the history and practice of adaptive reuse, with the currently popular theories of sustainability and Place Theory.

The pursuit of sustainability (Chapter One), in terms of architecture and building, results in part from the forces of rapid urbanisation, impending and/or perceived food, water and resource shortages, and the linear metabolism of the modernist built environment. A detailed review of related concepts and theories in Chapter Two, aim at giving the reader a better understanding of the context of adaptive reuse in this paper. The author has used the concepts and theories as tools for research (in Part I - Dissertation) and analysis (in Part II - Design).

Chapter Three looks at three approaches to adaptive reuse – conservation, preservation and demolition – and relates them to the tenets of sustainability, as well as the concepts and theories laid out in Chapter One and Two. Specifically, each approach to adaptive reuse is contextualised in terms of the economic, environmental and social agendas of sustainability, which include both quantitative and qualitative aspects such as eco-efficiency and Place theory respectively.

Chapter Four is a case study of the Bartel Arts Trust (BAT) Centre, Durban, South Africa. The study provides the historic, cultural and climatic settings, or contexts, of the conservation project, and relates these contexts to the architect's approach to adaptive reuse. A carefully designed questionnaire has been used to identify those qualitative aspects which are otherwise unattainable through interview, review or perceptual observation. The case study also integrates the concepts and theories which underpin the topic, thereby contextualising the study in terms of this paper.

DECLARATION

I declare that this dissertation is my own, unaided work and carried out exclusively by me under the co-supervision of Mr. Phillipe Yavo and Mr.Yashaen Luckan. It is being submitted for the degree of Master of Architecture in the University of KwaZulu-Natal. It has not been submitted before for any degree or examination in any other University.

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Dimitar Vladimirov Dobrev

20 March 2012

Date

DEDICATION

I dedicate this dissertation to the victims of Procrustean education.

ACKNOWLEDGEMENTS

Thank you mother Maria; father Vlad; Ru; Matt; Davey; Yashaen and Dr. Zami.

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CHAPTER 1

1.1 INTRODUCTION

1.1.1 Background

In this background, the relationship between man, his settlements, and the world as a sustainer is introduced. Cities, and therefore in part architecture and building, are shown to be directly related to the pursuit of sustainability. The pursuit of sustainability, simply put, is the search for an efficient and effective method of managing *land* and *energy,* towards a symbiosis between man and nature, and hence towards the future of man himself. However, genuine sustainability is regarded as encompassing and upholding certain social factors, in addition to the enviro-economic ones. The ideas discussed in this section serve to introduce the reader to the scale and complexity of the phenomenon of sustainability. The result is a point of departure towards answering the question: how can architecture and building contribute to a more sustainable context?

Human history, from one perspective, is an elaborate record of the survival of human beings. Simply stated, man has always sought a way to sustain his own life and that of his children through his own ingenuity. But this ingenuity is nothing without the bountiful resources provided by nature. Today more than ever, it appears that a parasitic relationship between man and nature's resources is reaching its limits. This parasitic relationship – as exemplified by the city's relation to the country – is a non-sustainable relationship in terms of energy flows, and has resulted in "the pursuit of sustainability" (Jenks *et al*, 2006:1):

> *"The pursuit of sustainability has been placed on the agenda of governments and non-governmental organizations after the 1972 UN Conference on the Human Environment, and more recently by the World Commission on Environment and Development (1987) and the 1992 Earth Summit in Rio"* (Jenks *et al*, 2006:1).

The pursuit of sustainability is based on the idea that contemporary global civilization is on a path towards self-destruction. One argument is that the endeavours and lifestyles of human beings have exceeded the "carrying capacity" of the planet:

> *"Carrying capacity is usually defined as the maximum population of a given species that can be supported indefinitely in a defined habitat without permanently impairing the productivity of that habitat"* (Rees, 1996: 224).

In essence, Rees' argument and 'ecological footprint' analysis illustrate that "the ecological locations of high-density human settlements no longer coincide with their geographic locations" (Rees, 1996: 236). Yet, people continue to survive (and 'prosper') in the most inhospitable

locations (Figures 1.01 & 1.02), owing to mass production and mass transportation afforded by industry, science and technology. Mumford suggests that New World cities are fundamentally unsustainable, in that they arose in "relatively unfavourable spots … and … required a maximum human effort" (Mumford, 1961: 92).

Figure 1.01: Dubai in 1990: the construction of an artificial city in an inhospitable location begins (URL0005).

Figure 1.02: Dubai, the same street in 2003: large buildings have appeared, fed by a highway (URL0005).

> *"the modern metropolis is … an outstanding example of a peculiar cultural lag within the realm of technics itself: namely, the continuation by highly advanced technical means of the obsolete forms and ends of a socially retarded civilization"* (Mumford, 1961: 544).

Another reason for the pursuit of sustainability is impending food and water shortages on a global scale. According to the World Water Council (URL0001):

> *"While the world's population tripled in the 20th century, the use of renewable water resources has grown six-fold. Within the next fifty years, the world population will increase by another 40 to 50 %. This population growth - coupled with industrialization and urbanization - will result in an increasing demand for water and will have serious consequences on the environment"* (URL0001).

It is widely accepted that the world is facing an impending water crisis. The United Nations claims that "the world's six billion people are appropriating 54 percent of all the accessible freshwater contained in rivers, lakes and underground aquifers" (URL0003). This statistic is a reflection of the carrying capacity of the world. Yet water is considered to be "the ultimate renewable resource" as it cannot be destroyed, only polluted (Pearce, 2006: 19). Historically, the architecture of the cistern, the aqueduct and the reservoir kept a city's inhabitants alive (Mumford, 1961). Today, large dams store and provide water for people, covering great areas and distances (Pearce, 2006).

The issue of sustainability is further compounded by the effects of climate change and rapid urbanisation – both of which have perceived negative effects on availability of resources, agricultural output and food security. According to the Population Reference Bureau (URL0002):

> *"(July 2007) For the first time, more than half the world's population will be living in cities and towns by next year, according to the State of World Population 2007 report from the United Nations. Less developed regions will hit the half-way point later, but likely before 2020. The urban percentage of the world's population is projected to reach 60 percent by 2030 (see figure). The urban share is likely to rise from 75 percent to 81 percent in more developed countries between 2007 and 2030, and from 44 percent to 56 percent in less developed countries"* (URL0002).

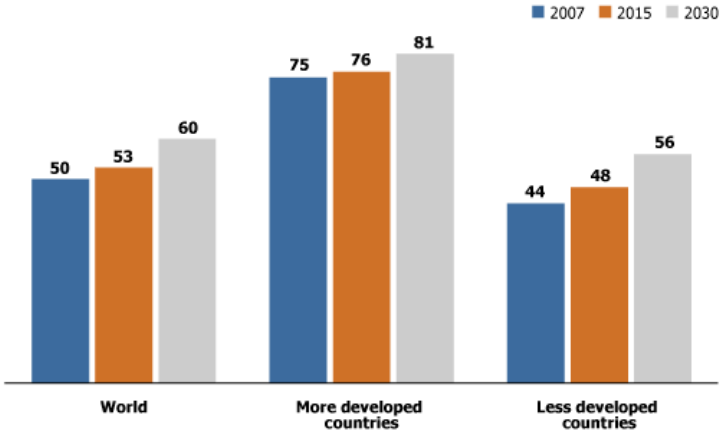


Figure 1.30: percent of urban populations, as per the Population Reference Bureau. Sources include: United Nations Population Fund, State of World Population 2007; and United Nations Population Division, World Urbanization Prospects: The 2005 Revision (2006) (URL0001).

As people move into the city and multiply, so the strain on the carrying capacity of the land is increased. Mumford claims that in history, "as a city's population grew, it was necessary either to extend the area of immediate food production or to extend the supply lines…" (Mumford, 1961: 53). Contemporary cities take the latter approach, continuously encroaching, or sprawling, outwards in response to a demand for energy and resources. However, the historically normal practice of what is now termed 'urban agriculture' is becoming vogue in the field of urban and architectural design, in response to food security issues.

Girardet argues that the relationship between cities, i.e. urban areas where more than half of the world's population now dwells, and their "host environment" is "largely parasitic" (Girardet, 1996: 13). He claims that:

> *"The history of early cities shows that they often depleted local hinterlands, draining their fertility without replenishing it. They exhausted the forests, watersheds, and farmland that had enabled their existence"* (Girardet, 1996: 11).

Yet history suggests that it is people, and not necessarily cities, that are parasitic. Rapa Nui, more commonly known as Easter Island, "has served as a cautionary tale about the cultural and

environmental dangers of overexploitation" (URL0004). The tiny island, roughly 164 square kilometres, is considered to be "one of the world's most isolated inhabited islands" yet it had supported a human society for hundreds of years (URL0004). Historians have shown that as the island became increasingly overpopulated, resources diminished. According to Barbara A. West, there had been "tremendous upheaval" in the social system and this was brought about by a "change in the islands ecology" (ibid). Whilst ecological calamity was not the sole cause of social collapse, the story of Easter Island is an historical example of how human beings abuse natural resources with disastrous effects.

Mumford claims that the early city was a container of containers, holding food and water in cisterns and granaries, and holding man and nature at bay with walls (Mumford, 1961). Rees has suggested that in the 20th century, "cities have become entropic black holes drawing in energy and matter from all over the ecosphere (and returning all of it in degraded form back to the ecosphere)" (sic) (Rees, 1996: 237). This notion has profound effects on architecture and the pursuit of sustainability, particularly regarding the Modern Movement in architecture and urban planning.

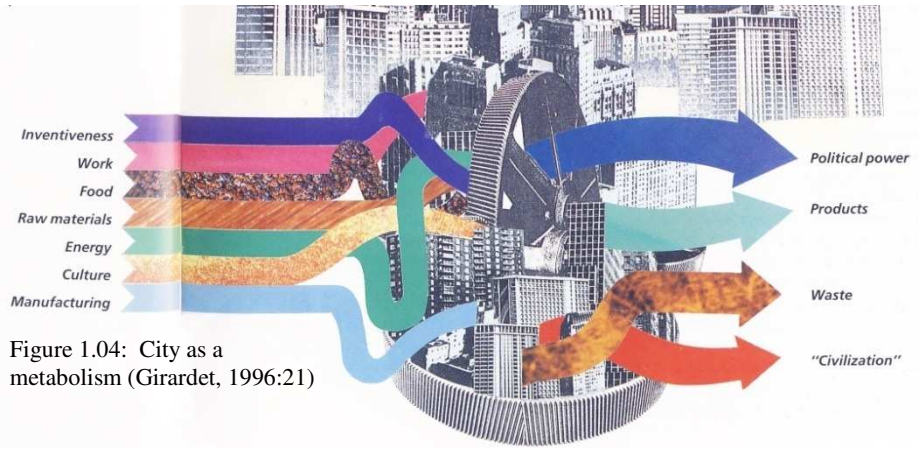


Figure 1.04: City as a metabolism (Girardet, 1996:21)

He notes that this relationship is an "inevitable expression of the Second Law of Thermodynamics… [which] states that the entropy of any isolated system increases [as] available energy spontaneously dissipates [and] gradients disappear in a inexorable slide toward thermodynamic equilibrium" (Rees, 1996: 237). His analysis shows that:

> *"as nodes of energy and material consumption, cities are causally linked to accelerating global ecological decline and are not by themselves sustainable. At the same time, cities and their inhabitants can play a major role in helping to achieve global sustainability"* (Rees, 1996: 223)

Similarly, Mumford conceptualises the modern metropolis as an "anti-city", one which "annihilates the city whenever it collides with it" (Mumford, 1961: 505). Yet, in the pursuit of sustainability, many consider higher urban density as being able to contribute "to a range of ecological, social and

economic benefits" (Slaev, 2004: 7). The outcomes of higher urban densities vary (Adebayo, 2002; Wood, 2008; Slaev, 2004), but many of the key factors are quantitative, that is, based on the premise that efficiency is the key to sustainability: a notion which is fundamentally flawed (McDonough, 1998; Wang, 2010). It is important at this point to differentiate between social and enviro-economic sustainability. The former concerns itself with the social, humanistic and psychological aspects of architecture, whereas the latter (while sharing overlapping spheres) concerns itself with efficiency and aesthetics. The "social agenda" is indeed forefronted by many authors, and is at times in conflict with the interest of the economy (Lewis, 2005: 39).

As designers of buildings, architects are directly involved in the energy/matter cycles of cities (figures 1.05, 1.06), and therefore the environmental and economic sustainability of cities. The recycling of buildings or the *adaptive reuse* of buildings is perceived as part of the circular metabolism.

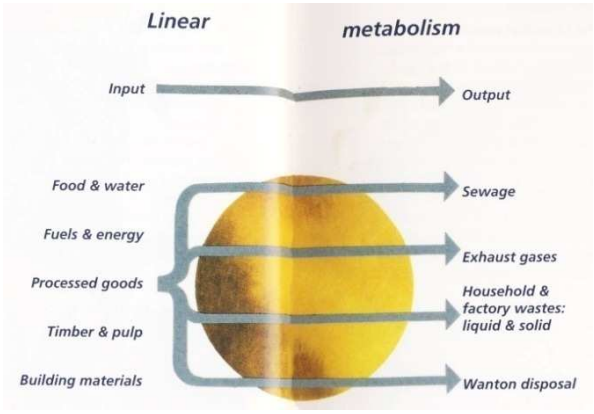


Figure 1.05: Concept of linear metabolism (Girardet, 1996: 22)

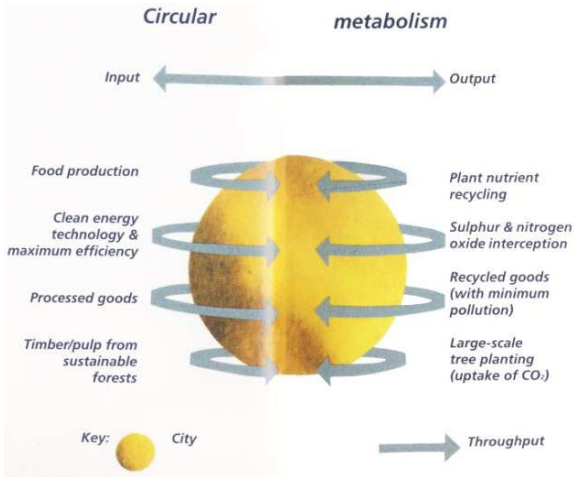


Figure 1.06: Concept of circular metabolism (Girardet, 1996: 22).

According to van Wyk, "construction is responsible for 50 per cent of all resources consumed in the world" and is considered "one of the least sustainable global industries" (van Wyk, 2010: 1). In *The Next Industrial Revolution* (1998), William McDonough argues that enviro-economic sustainability may be achieved through the processes of recycling and eco-effective design. These two processes – recycling and design – are central to the theory of sustainability, inasmuch as they describe the process of adaptive reuse. But the pursuit of sustainability is more than simply a matter of economy and ecology: it is also about people.

Social sustainability, as one of the three pillars of sustainability, is largely about autonomy; self-direction; a sense of security and freedom (Alexander, 1977; Frampton, 1985; Gehl, 1987; Mumford, 1961; Rand, 1984).

In history, social sustainability was as much an issue of safety and security, as it was about fulfilling the spiritual and cultural needs of citizens (Mumford, 1961: 83). The city in history was about protection, from man, the natural, *and* the supernatural (religion). It was, according to Mumford, a "container of disruptive internal forces, directed toward ceaseless destruction and extermination" (Mumford, 1961: 53). The city today is no longer simply a container. It is a "magnet", to use Ebenezer Howards term, in the sense that the city offers something more compelling and desirable than simple security (Mumford, 1961: 81). The city is essentially a living factory, a dynamic advertisement for a particular way of life – the urban life – one which is characterised by linearity, speed, self-fulfilment, and isolation.

Based on historical precedent, Mumford suggests that "the whole organization of the metropolitan community is designed to kill spontaneity and self-direction" (Mumford, 1961: 546). In other words, the modern metro as a man-made organisation or "installation", is in fact antithetical to genuine social sustainability, as by its very design it "guides subjects" into their respective "activity tracks" and is therefore dehumanizing (Lahlou, 2009: 27).

Lahlou suggests that, in the pursuit of sustainability, "sociability" ought to be regarded as a "source of value" (Lahlou, 2009: 29).

Golany, Mumford, Alexander and many others, demonstrate using historical precedent that social sustainability is strongly linked to environmental sustainability, and *vice versa*. The seemingly complex, but essentially simple concept of sustainability is discussed throughout this paper. It must be noted, that complexity arises, more than anything, from a misuse of words and an absence of generally accepted definitions.

A possible approach towards sustainability of the city, according to Rees, involves a reduction of the city's dependence on external flows; an investment in the rehabilitation of their "own natural capital stocks" and a promotion of the use of "local fisheries, forests, agricultural land, etc." (Rees, 1996: 241). Essentially, Rees argues for a decentralized approach to sustainability, in which cities must attempt to reach some level of autonomy with regard to resources. Architecture and building are perceived as fundamental to the idea of autonomy, in that they are linked to the economic, environmental and social aspects of our existence.

Others argue for a "compact city" approach in the pursuit of sustainability (Adebayo, 2002; Wood, 2008; Slaev, 2004). This approach, in concept, essentially perpetuates the non-sustainable aspects of the city – that is the anti-human aspects of the metropolis. Simply put, this approach is based on the idea that efficiency in growth is sustainable. However, the inherent inefficiency and ineffectiveness of the current urban system, and its 'parasitic' growth pattern, renders this approach somewhat detached from the greater notion of sustainability. Lahlou explains:

> *"We have collectively failed in creating a sustainable civilisation, and there is little time left to change it into a better system. I am not talking here specifically about CO2 emissions, which is probably a minor issue to which we may eventually adapt, but more generally about the way we regulate the system and always seek growth"* (Lahlou, 2009: 29).

Another viewpoint is that "political conflict and power struggles … are an enemy of sustainability" (Adebayo, 2002: 352). Indeed, sustainability as a practice depends upon overcoming the bureaucratic systems and regulation set in place by those who have assumed control over the land. To demonstrate, architect Michael Reynolds, conceiver of the zero-waste self-sustaining "Earthship" (Figure 1.07), has included the following map (Figure 1.08) on his company's website (URL0006). This 'freedom map' demonstrates a power struggle, showing "the places where [people] do not have the freedom to build a carbon zero home for [their] families without going through a tremendous amount of red tape, and effort, and time, and money" (URL0006).

Figure 1.07: Earthship – self-sufficient house. (URL100).

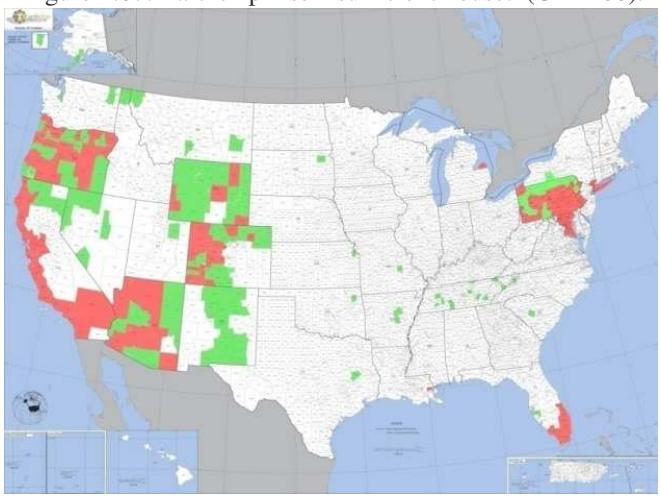


Figure 1.08: Freedom Map: Green = Free Counties, Red = Not Free Counties (URL0006).

These kinds of 'legal' restrictions, in combination with a modern "totalitarian approach to city planning", deny the organic growth of human settlements; a growth pattern which, for thousands of years, has been key to the economic, environmental and social sustainability of urban centres (Girardet, 1996: 56; Mumford 1961). Notably 'informal' settlements – those that grow despite legal

restrictions – serve as reminders that human beings are capable of survival and organisation without the 'aid' of planners or a central government.

In conclusion, the city has been identified as an historically significant entity or phenomenon, which has direct impact on the pursuit of sustainability. Architecture, as an urban phenomenon, is perceived as a mediator between people, the natural, and the urban environment. It is therefore connected to both global issues of sustainability, as well as local (urban) issues. Unless there is a shift in the conceptual understanding of 'progress' in terms of development and a revolution in Industry (McDonough, 1998), there is a limit to what architecture and building as *design products* can achieve towards genuine sustainability. As *social* products however, architecture and building has the capacity to address the psycho-social issues of sustainability. Therefore, it is perceived, that architecture and building as both *design* and *social products* will have significance in the pursuit of sustainability.

1.1.2 Motivation / Justification

Texts, such as that of Mumford (1961), Golany (1995), and Pearce (2006) among many, are abundant with historical precedent illustrating the ways 'sustainability' was achieved in the past; namely through a respect and understanding of the cyclic nature of life, and through the concepts of adaptation, recycling and reuse as part of a "circular metabolism" (Girardet, 1996: 22).

Based on the researcher's experience of architecture through the academic institution, publications, practical experience, and life experience in general, contemporary practice (at least the way it is represented in the media, and taught in schools) of architecture appears to be based on modernist ideology and market demand, and has all but 'forgotten' what was considered normal (what is now considered sustainable) for thousands of years prior.

The historic process/concept of adaptive reuse does not appear to be embraced as an approach to sustainability in the local context and in architectural education. In other words, the issue of sustainability is superficially forefronted in schools, yet the fundamentally sustainable process of adaptive reuse (conservation) is largely unexplored.

> *"It appears architectural conservation has again been relegated to the status of an arcane technical specialty and has almost entirely vanished from the design studio curriculum in most schools. It depends on the dedication of particular staff. However, it's different in practice"* (Peters, 2007: 25).

Salingaros argues that contemporary design is driven by "a simple set of beliefs, founded in the media-driven architectural authority" (Salingaros, 2008: 175). The proof of this is in architectural education itself, where the value and application of adaptive reuse appear to be largely absent from

academic discourse. This is attributed to the same forces of modernism and the market, the former championing new over old and the latter stimulating "development" in the name of "progress" – notions which, when manifest in reality, have little to do with their names. Salingaros, in *Anti-Architecture and Deconstruction* (2004) and *A Theory of Architecture* (2008), argues that this modern ideology has infiltrated institutions, as well as the minds of designers, forcing them to continue, unwittingly, to create inhumane and therefore unsustainable human habitats.

One way or another, the pursuit of sustainability has been embraced by the architectural profession. As noted, this 'embrace' is assumed superficial and contradictory. The researcher recognizes that sustainability, as a theory that is external to the field of architecture, has limited application in the field of architecture due to the regulatory frameworks in the architectural profession.

The research will be based on all previous architectural knowledge, including academic and practical, within the limitations of this topic and the limitations of the academic institution. The potential outcomes of the research are a better understanding of the theory of sustainability and its relationship to architecture and the concept of adaptive reuse.

The aim of this paper is to examine the relationship between adaptive reuse and sustainability and its perceived corollaries, towards bridging the gap between education and practice.

> *"Heritage or conservation architecture can no longer be treated as the part-time hobby of some practitioners. The education of all architects should equip them with the fundamentals of conservation theory, design and technology, and a few new Michelangelos might emerge"* (Peters, 2007: 25).

1.2 DEFINITION OF THE PROBLEM, AIMS AND OBJECTIVES

1.2.1 Definition of the Problem

How can architecture and building contribute to a more sustainable context?

1.2.2 Aims

To research the relationship between sustainability theory and the concept of adaptive reuse in the context of architecture.

1.2.3 Objectives

- To find out how adaptive reuse of old building stock contributes to sustainability.
- To find out how social (anthropocentrism), ecological (environmentalism) and economic sustainability determines or delimits the concept of adaptive reuse.
- To find out how place and time (i.e. context) affect the approach to adaptive reuse.

1.3 SETTING OUT THE SCOPE

1.3.1 Delimitation of Research Problem

The research will focus on:

- sustainability theories in the field of architecture.
- on the history of the city as a sustainable centre.
- the concept of adaptive reuse.

The research will not focus on:

- the preservation of historic buildings.
- the detailed technical aspects of adaptive reuse.
- the dichotomy between theory and practice.
- the question of why (ethics of architectural research).
- the detailed components housing and mixed uses

The proposed research will reconcile sustainability theory, adaptive reuse, and Place theory and thereby provide insight into the role of architecture and building in the pursuit of sustainability.

1.3.2 Definition of Terms

Adaptive reuse is “a process by which structurally sound older buildings are developed for economically viable new uses” with the intent of either restoration or renovation (Woodcock, 1988: 49). In this paper, adaptive reuse will be synonymous with the process by which old materials and technological components are adapted for reuse in new buildings.

Architecture: “the art or practice of designing and constructing buildings”; “the style in which a building is designed or constructed, esp. with regard to a specific period, place, or culture” (URL001). In this paper, architecture will refer to a building which responds to “people, place and time” (Luckan, 2011).

Brackets: [author’s text inside quotations], (author’s text outside quotations)

Building: “something that is built, as for human habitation; a structure”; “the act, process, art, or occupation of constructing” (URL002). In this paper, a “building” is conceptualised as an artefact consisting of ‘physical *matter*, as gathered from *land,* shaped by *energy*, and paid for by *money*’ (author).

Carrying capacity: “the maximum population of a given species that can be supported indefinitely in a defined habitat without permanently impairing the productivity of that habitat” (Rees, 1996: 224).

City (artificial): Also known as a planned or designed city, an artificial city is one which is “set down at one moment, its pattern ... determined at once and for all by some overseeing authority” (Kostof, 1996: 43).

City (organic): Also known as a spontaneous city, the organic city is presumed to have developed without “a master plan, but [through] the passage of time, the lay of the land, and the daily life of the citizens” (Kostof, 1996: 43). Organic cities are ones that have “grown” over time, and are “geomorphic” (Kostof, 1996: 43).

Community: “interest groups with a common purpose” (Lewis, 2005: 40). “a group of people living in the same locality and under the same government” (URL009).

Concept: “a general idea derived or inferred from specific instances or occurrences” (URL004).

Context: “the circumstances that form the setting for an event, statement, or idea” (Soanes & Stevenson, 2004: 308).

Continuity: “unbroken and consistent existence or operation; a connection or line of development with no sharp breaks” (Soanes & Stevenson, 2004: 309).

Diurnal: The dictionary meaning of the word is “of or during the daytime; daily; of each day” (Soanes & Stevenson, 2004: 417). In the field of architecture, the word diurnal refers to activities during/throughout day *and* night.

Ecological footprint: “the total area of productive land and water required to produce all the resources consumed and to assimilate all the wastes produced, by a defined population, wherever on Earth that land is located” (Rees, 1996: 228-9).

Economics: “the branch of knowledge concerned with the production, consumption, and transfer of wealth” (Soanes & Stevenson, 2004: 453).

Economy: “careful, thrifty management of resources, such as money, materials, or labor”; “careful management of resources to avoid unnecessary expenditure or waste”; “the complex of human activities concerned with the production, distribution, and consumption of goods and services” (URL 003).

Eco-effectiveness: a concept regarding life-cycles of materials whereby the notion of waste is eliminated, therefore rendering industry as “regenerative rather than depletive” (McDonough, 1998: 86).

Eco-efficiency: “doing more with less” (McDonough, 1998: 83).

Ecosystem: “collection of organisms that live together, compete with each other, and rely upon one-another for food” (Salingaros, 2008: 264).

Effective: “producing a desired or intended result” (Soanes & Stevenson, 2004: 456)

Efficient: “acting or producing effectively with a minimum of waste, expense, or unnecessary effort” (URL008).

Embodied energy: “the energy already been expended in making, transporting, and erecting any building product or component” (Woodcock, 1988: 13).

Environment: “the surroundings or conditions in which a person, animal, or plant lives or operates” (Soanes & Stevenson, 2004: 477).

Fragment: “a small part broken off or detached; an isolated or incomplete part” (Soanes & Stevenson, 2004: 563).

Modern architecture: “...is above all a formal art, concerned with such abstract notions as the organisation of forms on space and the relationship of the different parts to each other and to the whole” (Cantacuzino, 1964: 7).

Place: In the *Oxford English Dictionary:* “a particular position or point in space; a location” (Soanes & Stevenson, 2004: 1094). In architectural theory, place is a space with significance.

Premise: a previous statement from which another is inferred, that is, an underlying assumption (Soanes & Stevenson, 2004: 1132).

Process: “a series of actions that produce a change or development”; “a method of doing or producing something” (URL005).

Recycle: “to put or pass through a cycle again”; “to extract useful materials from (garbage or waste)”; “to extract and reuse”; “to use again, especially to reprocess”; “to recondition and adapt to new use or function” (URL010). In this paper, recycling is conceptualized as an enviro-economic phenomenon at the root of sustainability.

Society: “the aggregate of people living together in a more or less ordered community” (Soanes & Stevenson, 2004: 1369).

Sustain: “keep (something) going over time or continuously” (Soanes & Stevenson, 2004: 1452).

Sustainable: “capable of being sustained”; “capable of being continued with minimal long-term effect on the environment” (URL007). Unless indicated otherwise, in this paper the word sustainable in all its forms will refer to the economic, social, and environmental aspects of sustainability, as is generally accepted in architectural theory and practice.

Symbiosis: in biology, it is “an interaction between two different organisms living in close physical association, especially to the advantage of both” (Soanes & Stevenson, 2004: 1458). In this paper, the word symbiosis in all its forms will refer to the (same) positive relationship, though not necessarily between two different organisms. *“No house should be on any hill, it should be of the hill, belonging to it, so hill and house could live together, each happier for the other”* - Frank Lloyd Wright.

Theory: “a set of statements or principles devised to explain a group of facts or phenomena”; “the branch of a science or art consisting of its explanatory statements, accepted principles, and methods of analysis, as opposed to practice” (URL006).

Urban: “relating to a town or city” (Soanes & Stevenson, 2004: 1591). In this paper, the urban environment is synonymous with the man-made, civic outdoor environment.

Value: “the regard that something is held to deserve” as well as “principles or standards of behaviour” (Soanes & Stevenson, 2004: 1597).

1.3.3 Stating the Assumptions

- statistical data from secondary sources are factual.
- this study will contribute to the body of knowledge regarding architecture and sustainability.
- in the field of architecture, new buildings are considered as 'solutions' to existing issues. According to Woodcock, "most professional people have an automatic tendency to find and use tools only from their own areas of expertise...and architects, especially since Le Corbusier, seek solutions by designing new buildings" (Woodcock, 1988: 11).
- modernist indoctrination results in a narrow minded approach to the role of architecture. That is, it is assumed that the contemporary approach to architecture and urban design is based on an ideological system which values new over old, production over re-production, and innovation over initiative.
- part of human civilization is in "the last stage in the classic cycle of civilization, before its complete disruption and downfall" and that the process and nature of the built environment coincides or is part of this path (Mumford, 1961: 525).

1.3.4 Key Questions

Researching within the context of architecture and building (urban form);

- What does sustainability mean?
- How have historical settlements and dwellings achieved sustainability?
- How has the Industrial Age and Modernism impacted on sustainable architecture?
- How do social (anthropocentric), ecological (environmentalist) and economic concerns determine the concept and practice of adaptive reuse?
- How does context determine the principles of "sustainability" theory in architecture?

The research problems are perceived as philosophical, theoretical and ideological.

1.3.5 Hypothesis

Recycling and rehabilitating through the process of *adaptive reuse* would result in sustainable architecture and building that responds to place and time. The ills of modern practices which have led to ecological destruction and social decay may be dealt with through an anthropocentric environmentalist approach to adaptive reuse in architecture.

1.4 CONCEPTS AND THEORIES

The following paragraphs are a summary of the primary concepts and theories used in this paper. Chapter Two contains the detailed Literature Review pertaining to these respective concepts and theories.

Sustainability Theory

Sustainability theory is a general theory concerning "those activities which can be continued far into the future, defining a way of life that will last" (McDonough et al, 1992: 28). Depending on the context, sustainable activities are generally considered to be of economic, environmental or social value.

Place Theory

Place theory is a qualitative theory, which attempts to explain the existential relationship between man and his environment. Place theory introduces the notions of memory and time, Norberg-Shulz's *Genius Loci,* or "spirit of place", with regard to both natural and man-made environments (Norberg-Schulz, 1971). In doing so, it provides the background to the ways in which buildings are linked to the psychological needs of people; and therefore to social sustainability with regard to architecture.

Theories of Urban Analysis and Design

Several theories of urban analysis and design are used. They are represented in two groups. In the first group are the theories of identification which examine the city as a physical phenomenon, and include theories of Alexander, Lynch, Trancik and Rossi. In the second group are theories of practice, specifically drawn from and related to the South African urban context. These include the works of Louw and Dewar, amongst others.

1.5 RESEARCH METHODOLOGY

The research aims to gather data pertaining to the process / concept of adaptive reuse. The delimiting factors include the issues raised by the background, concepts and theories. Specifically, the issues arising from economic, environmental and social sustainability; Place theory, and theories of analysis and design will guide the research.

The primary research methods include:

- Case Studies: These will be carried out by going to the building or site, and observing and recording through the methods explained below. The users of the building or site will be asked to complete questionnaires, for the purposes of gathering qualitative and quantitative data.
- In depth interview(s): The interviews will provide first hand information about the intentions and processes behind the buildings featured in case and precedent studies. These interviews will be semi-structured or unstructured.
- Questionnaires: These will serve to reconcile theoretical ideas about 'place' with actual experiences of a place. That is, they will focus on qualitative data. The questionnaire will be used in selected case studies. Questionnaires will be completed by the users on the site of the case study. A total of 11 questionnaires were completed.
- Still Photography: this will be used to capture single events and events over time, for the purposes of supporting or dispelling assumptions / theories.
- Freehand sketching and writing: this method will be used when photography is not an option, such as in restricted areas.
- Perceptual observation

The secondary research methods include:

1) Logic & the Law of Identity: The law of identity states that an object is the same as itself; A is equal to A; things are what they are (Rand, 1984: 18). Rand explains that "logic is the art or skill of non-contradictory identification [and that] Logic has a single law, the Law of Identity, and its various corollaries" (Rand, 1984: 20). This way of thinking demands clear, specific usage of words, thereby eliminating confusion. It also demands (not merely encourages) a clear and specific interpretation of words, by both author and reader.

2) Hermeneutics: In its barest sense, hermeneutics can be understood as "a theory, methodology and praxis of interpretation that is geared towards the recapturing of meaning of a text, or a text-analogue, that is temporally or culturally distant, or obscured by ideology and false consciousness" (Demeterio III, 2001). Of the various hermeneutic systems explained by Demeterio, critical hermeneutics and phenomenological

hermeneutics have been identified as being the dominant methods of interpretation for this paper. Critical hermeneutics, in essence, acknowledges texts as institutional and cultural constructs. Demeterio explains:

> *"Textuality can be infiltrated with power and forces that are formerly considered extraneous to it and practically innocuous. Specifically, Marx argued that textuality can be warped by capitalist and class-based ideologies, Nietzsche, by cultural norms; and Freud, by the unconscious. These extraneous powers and forces are capable of penetrating deep into the text, by weaving into its linguistic fabric"* (Demeterio III, 2001).

Textuality can be "veiled by ideology and false consciousness", implying that text needs to be critically and reflectively interpreted (Demeterio III, 2001). Simply put, this hermeneutic system is used to "diagnose the hidden pathology of texts and to free them from their ideological distortions" (Demeterio III, 2001). This system of hermeneutics is deemed appropriate by the researcher, as one of the objectives of this paper is to distil the ideological constructs which define the social, cultural and practical values held by the authors of texts (including the researcher as author), from the content of the text itself. After critical hermeneutics, the second dominant method of interpretation is phenomenological hermeneutics.

Phenomenological hermeneutics assumes that "in order for the object to be interpreted, a proper context, or a mental frame is needed" (Demeterio III, 2001). Demeterio explain that:

> *"To interpret a text ... means to methodically isolate it from all extraneous things including the subject's biases and allow it to communicate its meaning to the subject. The goal of phenomenological hermeneutics is to capture to truth of the text as it is" (sic)* (Demeterio III, 2001).

Phenomenological hermeneutics is essentially based on objectivist logic. Like critical hermeneutics, phenomenological hermeneutics is assumed to allow the rule of logic and law of identity to function without contradiction.

3) Literature Review:

- Journals: these provide recent data, knowledge and discussion relating to the topic.
- Newspapers: these provide recent data, knowledge and discussion relating to the topic.

- Books: these provide historical and theoretical information used to make sense of the recent data in journals and books.
- The Internet (e-books, e-journals, articles): the internet provides access to current papers from around the world otherwise unattainable in the traditional library.

1.5.1 Approach

- Critical analysis of literature, and all other texts, using the interpretative methods laid out by the aforementioned theories of interpretation (Law of Identity and Hermeneutics)
- Empirical / qualitative data gathering.

1.6 CONCLUSION

In this chapter, the pursuit of sustainability was revealed to be a global movement aimed at engaging the impending issues of resource security regarding social interests. It was established that contemporary cities function as linear metabolisms, and are fundamentally unsustainable. The pattern of resource and commodity consumption is considered finite with regard to the carrying capacity of the geographical locations which cities occupy.

The extent to which architecture can contribute to a more sustainable environment is limited by forces external to the field, namely the planning of cities, the processes of manufacturing (industry generates waste), and the process of delivery (architecture as a product). However, processes and incentives of architectural designers appear to address issues of efficiency, self-sufficiency, psycho-social security, and environmental impact, despite the counter-sustainable frameworks of governments and planners.

The following chapter suggests that recycling of buildings yields economic, environmental and social benefits ranging from the quantitative to the qualitative. The concepts and theories that are discussed suggest that the concept of a circular metabolism is fundamentally sustainable. The recycling (or upcycling) of buildings is regarded as a critical phase in the metabolism of the city. In other words, recycling buildings is seen as a point from which a linear metabolism may be transformed into a circular one. The problem is fundamentally one of conceptualisation.

CHAPTER 2 – CONCEPTS AND THEORIES

2.1 Introduction

In this chapter, sustainability is explained in terms of economic, environmental and social factors. The first section explores the definition and meaning of sustainability. In the second section, the economic factor of sustainability is explored through the processes of planning, construction, recycling and flexible design. The role of the informal economy is also discussed. Following on, in the third section, environmental sustainability is briefly discussed in terms of ecological, technical and design aspects. Lastly, social sustainability is examined by exploring the role of the street as the dominant social sphere by studying defensible spaces and the psychology of spaces/built form, and lastly through examining the role of participation. The significance of sustainability and its corollaries relating to the topic of adaptive reuse is defined throughout the chapter.

2.1.1 Sustainability Theory

Sustainability theory is a general theory of how people can ensure their survival into the future. It is a theory concerning "those activities which can be continued far into the future, defining a way of life that will last" (McDonough et al, 1992: 28). The pursuit of sustainability concerns the economic, social and environmental impacts of those activities on other human beings and on the planet as a resource giver. Genuine sustainability is considered to be a synthesis of *economic, social* and *environmental* factors or concerns. In architecture and buildings, each of these spheres has different meaning, usually defined by physical context, or by contextual use of the word.

William McDonough (1992) presents a number of definitions, which provide background to the theory as well as make it possible to delimit sustainability in this paper. With regard to *economic* activity, World Bank economist Herman Daly "proposes three specific rules of sustainability to make sense in economic terms:"

> *1. "Harvest renewable resources only at the speed at which they regenerate.*
>
> *2. Limit wastes to the assimilative capacity of local ecosystems.*
>
> *3. Require that part of the profit be put aside for investment in a renewable substitute resource"* (McDonough *et al*, 1992: 28).

From this definition the words *renewable resources, waste* and *ecosystems* are indicative of the umbilical link between economic sustainability, and that of the natural environment and its resources.

With regard to ecological activities, those which achieve environmental and social sustainability, the International Union for the Conservation of Nature suggests that sustainability means:

> *"…improving the quality of human life while living within the carrying capacity of supporting ecosystems"* (McDonough *et al*, 1992: 30).

Lastly, as a general definition, the World Commission on Environment and Development defines sustainability and sustainable development as:

> *"Meeting the needs of the present without compromising the ability of future generations to meet their own needs"* (McDonough *et al*, 1992: 28).

Sustainability thus is a theory which attempts to reconcile the spheres of ecology and society (organic spheres) with the forces of industry and technology (artificial spheres). For example, some authors (Girardet, 1996) forefront science and technology in the pursuit of sustainability, whilst others (Rees, 1996) argue that man's relationship with nature and "natural capital assets" is key to sustainability (Rees, 1996: 225). In essence, sustainability has a double meaning: the sustainability of the practice of building, which concerns environmental and economic factors and the sustainability of human life and wellbeing, which concerns social and psychological factors.

In context of this paper the three spheres of concern namely *economic, environmental* and *social,* are known as the 'triple bottom line' of sustainability, or the "three pillars" of sustainability (Jenks *et al*, 2006: 1). They apply to both architectural and urban sustainable concepts and practices. Each of the three pillars is broken down into two components, and given loose definitions:

1) Economic sustainability can be understood as a synthesis of:

   1.1) Socio-economic sustainability: in which the role of the economy is seen as a system of wealth distribution. That is, the sustainability of economies which constitute *livelihoods* of people as groups and individuals. The process of architecture and building is capable of a socio-economic sustainability, namely through active participation with users, and through a contextually derived understanding of public and private spheres.

   1.2) Enviro-economic sustainability: in which the role of the economy is seen as a system of resource management. That is, the sustainability of economies which are directly related to *land* and *energy* use. Buildings are essentially matter, gathered from the land, moulded by energy, and paid for by money: therefore the process of building and architecture is directly related to enviro-economic sustainability.

2) Environmental sustainability can be understood as a synthesis of:

2.1) Ecological sustainability, which is the sustainability of the natural environment and its ecosystems. As suggested in the background, cities (and hence buildings) are "entropic black holes drawing in energy and matter from all over the ecosphere" (Rees, 1996: 237). Girardet suggests that "cities, and their people, need to develop a clearer understanding of the implications of their *consumption* and *discharge* patterns" (author's *emphasis*) (Girardet, 1996: 156). McDonough (1998) argues it is the notion of waste itself (consume and discard) that needs to be eliminated, if a genuine sustainability is to be achieved.

2.2) Environmental sustainability is the sustainability of the man-made or built environment and its infrastructures. The built environment is conceptually, a mass of embodied energy, formed into patterns which support social activity. Recognising the man-made environment as a resource in itself is key to sustainability. Indeed, the notions of adaptive reuse (recycling of buildings) stem from such a concept.

3) Social sustainability can be understood as a synthesis of:

3.1) Enviro-social sustainability, which is the sustainability of "interest groups with a common purpose" with regard to both natural and man-made environments (Lewis, 2005: 40).

3.2) Psycho-social sustainability: the maintenance of an individual's psychological needs – safety, security, freedom etc. – with regard to both natural and man-made environments. In a sense, a psycho-social sustainability is the desired effect of Place theory, and indeed social sustainability in general.

The aforementioned terminologies and definitions attempt to demonstrate to the reader the complex, overlapping, multivalent nature of sustainability as a 'whole' theory. In turn, the general term 'sustainability' can be understood as a synthesis of the aforementioned economic, environmental and social 'pillars'.

2.1.1.1 Economic Sustainability

An economy is a system for the organisation of resources and money. A country's economy consists of a 'Primary sector' of commodity production (farming, livestock breeding, exploitation of mineral resources), a 'secondary sector' of manufacturing and processing (as paid work), and a 'Tertiary Sector' of service industries (URL012). The size (output) of each sector varies from country to country, and also from area to area within a country.

Each economic sector is sustained through the formal and informal markets – the former being taxed by government and the latter remaining untaxed. The distinction between formal and informal markets is important to consider, especially as many people in developing countries rely on the informal market for their livelihoods.

Figure 1.11: Formal street trade (Author, 2010).

Figure 1.12: Informal street trade (Author, 2010).

In sub-Saharan Africa, the informal sector accounts for 72% of employment (URL011). According to Davies *et al* (2004), in South Africa there are an estimated 1 451 000 informally employed workers (one can still be employed by an informal sector worker) and 2 351 000 informal sector workers (ISW), with the majority of employment spread out between services (57.7% of ISW), retail trade (34.3 of ISW) and agriculture (20.3% of ISW) (Davies *et al,* 2009: 6). It must be noted that these figures are estimates resulting from differing definitions of "informal sector", as well as from inadequate census methods (Davies *et al,* 2009: 4; Muller, 2003: 2; Go *et al*: 2009: 9-12).

Under current definitions, informal sector activities include garbage recycling, "guarding cars, brewing beer, regular work, contract work, domestic work, unpaid work in a family business, farming work (ploughing, harvesting), … catching fish/wild animals for food … [and] sale street vendors" as well as "larger, regular enterprises" like the minibus taxi transit systems found in urban settlements across South Africa (Muller, 2003: 4, URL011).

Informal Economy and Sustainability

To acknowledge the informal sector in the process of generating architecture/adaptive reuse is to directly contribute to a socio-economic sustainability. This is mainly achieved through communication, participation and inclusivity. Altman *et al* suggest that:

> *"Direct participation in designing, building, and managing environments has been found to increase user satisfaction in a variety of spaces including communities, the workplace, and open spaces such as parks and playgrounds"* (Altman & Zube: 1989: 157)

This can be demonstrated using a local example. In the building of 7 Fountains Primary School at Shayamoya, Kokstad, East Coast Architects conducted a census to identify types of skills the community could offer as a whole, through individual ability (figure 1.13). This participatory and inclusive approach was geared towards benefiting both the local community in the socio-economic sense, but it was also a way to mitigate costs associated with imported labour. Moreover, part of the building was achieved using locally sourced materials and in situ manufactured earth bricks.

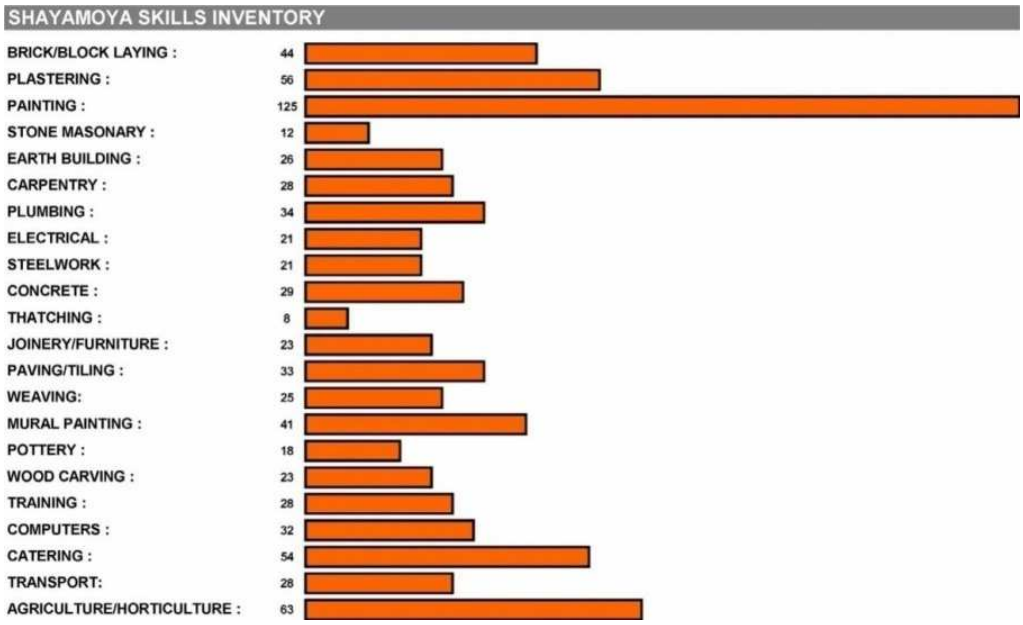


Figure 1.13: Shayamoya skill inventory (Conference paper, East Coast Architects, 2006).

Enviro-economic sustainability

As previously defined, enviro-economic sustainability refers to the economy as a system of resource management. In relation to architecture and building, enviro-economic sustainability refers to the efficient and effective use of *land* and *energy*. This efficiency and effectiveness may be achieved in planning and construction, and through the processes of recycling and its corollaries.

Planning and construction

The economy of a building may be understood as having two parts:

1) Initial costs of a building; namely construction, which includes additions and alterations.
2) Continuous costs of a building; namely maintenance, and services such as water, energy and waste removal.

Economic sustainability is related to reducing the costs of each of these. However, being economically sustainable is not about, for instance, choosing an inferior product because it is cheaper. Rather, it involves long term sensibility with regard to the buildings usefulness and performance. In the long term, economic sustainability is about making a building more of an asset than a liability. Hence, the process of adaptive reuse – the recycling of 'old' or redundant building stock – is considered to be fundamentally sustainable. Economic sustainability involving buildings is more than the question of money, but rather an issue of long term sensibility.

The Beddington Zero Energy Development (BedZED) (figure 1.14) in England is an example of sensible planning, which translates into an economic and social sustainability. According to Davey, the current reality is that "low density suburban housing [consumes] far too much land and energy" (Davey, 2001: 76). Simply put, the fundamental issue is one of "environmental control", and this can be further broken down into matters of *land* and *energy* – the basic motivators of enviro-economic sustainability (Davey, 2001: 76).

Figure 1.14: Beddington Zero Energy Development (Hodge *et al,* 2009: 7).

Land and energy consumption are matters of environmental control strategies. According to Davey, the environmental control strategy of the building "is based on a combination of compact planning, high thermal mass, use of photovoltaic panels to generate energy, and a wind driven heat recovery system" (Davey, 2001: 76). Through passive design, and alternative energy strategies (777m² PV panels, wind power, heat recovery) "houses on the estate are estimated to expend 90 per cent less energy than an average UK family home" (URL0007; Davey, 2001: 77). More specifically, energy consumption has been reduced to 10 per cent of "similar suburban homes built to 1995 regulations" (Davey, 2003: 44).

Through compact planning and an "integrated approach", the building provides the same dwelling density as the adjacent development (conventional), but with "a 35 per cent increase in space allowance" (Davey, 2003: 44). The extra space provides "valuable revenue earning benefits in the form of additional live-work units, and community facilities such as surgery, a community hall and a bar" (ibid).

Despite compact planning and the additional revenue generating live-work units, the BedZED manages to provide "100 homes per ha, providing 400 rooms and 200 jobs per ha, and 26 sq m of private garden compared with 8 sq m of public space per home" (Davey, 2003: 46). It is suggested that if replicated, this system would "reduce urban sprawl to about 25 per cent of the projected footprint over the next 100 years" (Davey, 2003: 46).

Another way that energy consumption is minimised is through material choice. Materials were intended to be sourced "within a three mile radius of the site, and … as far as possible … be recycled, minimizing environmental and embodied energy costs" (Davey, 2001: 77). However, this radius increased, with the final building materials being "selected from renewable or recycled sources within 35 miles of the site" (URL0007).

Recycling

Recycling is inherently an enviro-economic phenomenon, capable of 'saving' energy, material, and money. Moreover, there are ecological benefits to recycling, provided the term itself is clearly understood.

Simply put, to recycle something, is to use it again. In *The Next Industrial Revolution,* Bill McDonough explains that much recycling is in fact "downcycling", a process which "reduces the quality of a material over time" (McDonough, 1998: 85). In contrast, the term "upcycle" describes the "return to industrial systems of materials with improved, rather than degraded, quality" (McDonough, 1998: 85).

According to McDonough, human industry (directly linked to economics) largely follows a "one-way, linear, cradle-to-grave manufacturing line in which things are created and eventually discarded" (McDonough, 1998: 86). Thus, downcycling is a constant factor in this process. It is from the necessity of dealing with large amounts of waste from this one-way system, that the dictum 'reduce, reuse, recycle' arises. To contextualise, 'reduce, reuse, and recycle' is an encapsulation of eco-efficiency (doing more with less). Lewis suggests that:

> *"...on-site use of waste is an example of changing what is for most of us a linear process into a more efficient and more ecological circular one. It is much closer to both pre-historical and historical precedent"* (Lewis, 2005: 18).

Woodcock claims that "eight bricks in a wall have the approximate energy embodiment of one gallon of gasoline, the amount of new energy that would have to be used to replace them [Booz, Allen & Hamilton 1979, a, 7]" (Woodcock, 1988: 13). Whilst this statistic is based on contextual variables specific to time and place, it is nonetheless an indicator of the amount of energy and money that goes into production of building materials. Recycling or reclaiming of materials is therefore considered to be both economically and environmentally sensible, provided transport is taken into account.

However, given that different materials warrant different methods of recycling, they must be regarded as belonging to either the "biological" cycle or the "technical" cycle (McDonough, 1998: 87). In terms of genuine sustainability, McDonough suggests that technical and biological nutrients must be recycled in their own closed systems, to "avoid cross-contamination" (McDonough, 1998: 87). In the pursuit of sustainability, it is anticipated that:

> *"Biological nutrients will be designed to return to the organic cycle – to be literally consumed by microorganisms and other creatures in the soil…[and]…technical nutrients will be designed to go back into the technical cycle"* (McDonough, 1998: 87).

Understanding and differentiating between these cycles (and even the cycles within them) is key to the practice of an efficiency-oriented, and ecologically sensitive sustainability.

The author argues that an effective and efficient recycling of a building depends on the recognition of both material properties (biological and technical) and *spatial properties* (abstract properties) of a building. Referring to the latter, Diamonstein notes that:

> *"The* Bauhaus *taught architects to shape space to fit the function – 'form follows function.' That's and inductive process. But recycling is a deductive process. First you look at space and then deduce what kind of functions it will accept"* (Diamonstein, 1978: 28).

When recycling a building through adaptive reuse, both materials and spaces are conceptualized as recyclable.

Essentially, recycling is an attempt to eliminate waste, and it has been suggested that products and structures should be made "biodegradable and nontoxic to such a degree that they are no more harmful to the ecosystem when used or discarded than are, say, leaves" (Delancey, 2004: 154-5). Apart from recycling materials and buildings, and more efficient planning, another major aspect of economic sustainability is that of flexible design.

Flexible Design

Economic sustainability relies, in part, on the long term view. The issue is whether or not what is built today will have value and use tomorrow, in one year, in a decade. In order to minimise energy consumption and effort, buildings are increasingly being designed with adaptability in mind.

South African architects Vernon Collis and Anna Cowen in the design of "Three Houses on the Edge of the Inner City" (figures 1.15 – 1.17) opted for "loose fit" design in order to "accommodate a variety of lifestyles and functions with minor alteration" (Walton, 2011: 36, 39):

> *"The roof structure is designed to be easily removed and rebuilt to accommodate another floor, using only a screw driver and a number 19 spanner. In fact the entire house was built with a minimal use of machine tools, contributing to the low carbon footprint"* (Walton, 2011: 39).

Figure 1.15: Modular, designed for an additional floor or two (Walton, 2011)

Figure 1.16: Ad hoc staircase – bolted connections (Walton, 2011).

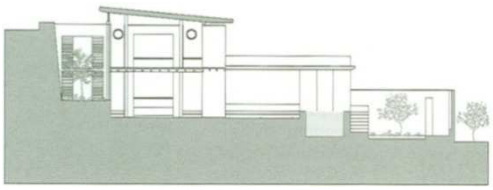


Figure 1.17: Sensitive to topography / slope (Walton, 2011).

In addition, Walton suggests that "…unplastered and unpainted materials, bolted timber connections, modular design (layout using brick modules; ceilings on ceiling-board modules etc) all contribute to minimising waste and making the materials easy to recycle at the end of the building's life" (*sic*) (Walton, 2011: 38). Flexible design offers an economy of time and energy, particularly on the 'domestic' scale. Other South African architects also opt for loose fit design, in the case of Koop Architects, the buildings take after furniture in the way they are prefabricated and assembled.

Another example of flexible design with not only enviro-economic, but significant social impact, is the Iquique housing model (figure 1.18) by Elemental Chile and Alejandro Aravena (Cooke, 2011: 46). This precedent demonstrates how mass produced, modular materials and components are used in an ingenious way to house large numbers of people, whilst also encouraging individual identity.

Figure 1.18: Architecture as functional, flexible, adaptable (Source: URL98).

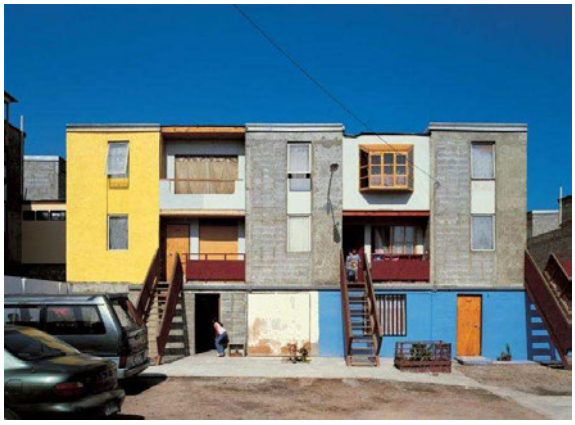


Figure 1.19: Incremental growth of dwellings within a framework. Power is in the hands of the user (Source: URL98).

Generally speaking, developing countries have large numbers of people living in informal settlements. Their dwellings tend to be "built on land that is illegally occupied, utilising materials that are 'found'" (Low, 2011: 46). In addition, state capital for housing is limited, which means that the quality of new dwellings will suffer at the expense of quantity, or *vice versa*. With this in mind, the Iquique housing model demonstrates a "genuine alternative approach to the questions of housing the poor, particularly in developing contexts" (Low, 2011: 48).

In keeping with the tradition of gradually building your own dwelling as your family grows, one of the core ideas of this design was to construct the parts of the building "that a family individually will never be able to achieve on its own, no matter how much money, energy or time they spent" (Low, 2011: 50). The result is a very basic modular triple story unit, which has running water on every floor, and ablutions on the first and third floor. This facilitates sub-letting and creates privacy, as the unit can effectively be divided into two independent parts.

The 'cavity' between adjacent units is gradually filled with added living space (figure 1.19). Importantly, the idea that each owner or tenant can personally extend their own dwelling within the structural framework, allows the units to gradually 'emerge' with individual identities, and in doing so contribute to the overall identity and character of Place.

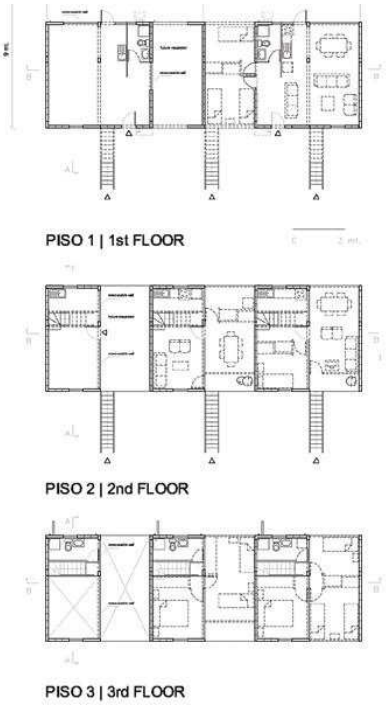


Figure 1.19.1: Plans, not to scale (Source: URL029).

The architects recognised that "scale and speed strategy", was fundamental in the delivery of housing (URL99):

> *"The key to increasing velocity lies in prefabrication. Historically, prefabricated systems have been criticized because of their inability to adapt to varied situations. However, if the goal is to prefabricate a half of a house, this problem disappears. Each owner, when building the second half of their house, is the responsible for customizing the final solution. Furthermore, while the first half becomes more strategic (concentrating on the difficult parts of the house) it becomes more universal a well, justifying and confirming the advantages of prefabrication"* (URL99).

The Iquique housing model addresses the psycho-social and economic needs of the end user, simply because it offers her more than one lifestyle choice in addition to certain freedoms otherwise absent in housing, such as the ability to add on living space without compromising structure or privacy, as well as the ability to sublet part of the living space (important in developing countries where income may be low and / or inconsistent).

The notion of flexible design in terms of incremental growth (i.e. 'adaptive reuse') stems from identifying the "potential for user-based growth [in] the 'in-between'" (Cooke, 2011: 49). Indeed the Iquique housing model is regarded by Cooke as having "relevance to the emerging South African housing condition" (Cooke, 2011: 46).

2.1.1.2 Environmental Sustainability

An environment is "the surroundings or conditions in which a person, animal, or plant lives or operates" (Soanes & Stevenson, 2004: 477). A person may operate in both the natural environment (habitat for most plants and animals), and in his own man-made environment, the town or city and its built forms. Golany defines environment as "all of the natural landscape as well as the socio-economic-physical and human-made environment surrounding us" (Golany, 1995: 1). Other man-made environments include the vehicle (plane, ship, bus, car etc.) and cyber-space (a virtual environment).

The following section examines environmental sustainability in two parts. The first part addresses the ecological aspects of environmental sustainability, and relates these to the overall theory of sustainability. The second part looks at the man-made environment and its relation to sustainability as a whole by briefly examining technical and design solutions and strategies. Note that adaptive reuse (recycling of building stock) is considered the archetypical way to achieve environmental sustainability. Adaptive reuse is discussed in the next chapter and so does not feature in this section.

Ecological sustainability

As previously defined, ecological sustainability refers to the natural environment and its ecosystems. This section examines the relationship between ecology and architecture, towards the pursuit of sustainability.

Rees claims that ecological economists regard "species, ecosystems, and other biophysical entities that produce required resource flows as forms of 'natural capital' and the flows themselves as types of essential 'natural income' (Rees, 1996: 225). He argues that "no development path is sustainable if it depends on the continuous depletion of productive capital" (Rees, 1996: 225).

Rees adds that the ecological footprint is a "surrogate measure of the population's demands on natural capital" (Rees, 1996: 228-9). In his paper, '*Urban Ecological Footprints: Why cities cannot be sustainable – and why they are a key to sustainability*', Rees provides the methods and formulae required to calculate an estimate of the ecological footprints of cities. However, he acknowledges the limits of this concept, suggesting that while ecological foot-printing "provides an index of biophysical impacts [it] tells little about the socio-political dimensions of the global change crisis" and "ignores many other factors at the heart of sustainability" (Rees, 1996: 232/233).

Nature offers many forms of "biophysical capital [which] perform critical functions that cannot be replaced by technology" (Rees, 1996: 226). Natural income may be conceptualised in many ways. For example, sunlight and rainwater are forms of 'natural income' with water having multiple uses.

Likewise, a carbon-trapping, oxygen-emitting, food, shade and material-giving tree is arguably one of the most useful of 'natural capital' assets afforded by nature (McDonough, TED Talks 2005 – URL 028). For architecture, buildings may be designed or adapted in such a way as to harness free resources (water, solar energy), as opposed to relying on the centralized life support systems (services) of modern cities. This includes passive solar design and passive design strategies in general. In this sense, building is conceived as part of an ecological system; that is, as an organism which depends on abiotic contingencies for the survival of its inhabitants.

An example of self-sufficiency through design, with a focus on accruing 'natural capital', is Michael Reynolds' Earthship (figures 1.20 & 1.21) set in the peri-urban/rural context. Earthships are marketed and sold as "radically sustainable" homes made from recycled materials, such as bottles and earth packed tyres (URL97, 95).

Figure 1.20: Earthships are the working experiments and pride of a small tribe of eco-warriors (Source: URL96).

Figure 1.21: Towards self-sufficiency; an island in the wilderness (Source: URL96)?

Earthships are considered ecologically sensitive for these reasons:

- The houses are designed for passive solar heating (figure 1.22) and "maintain comfortable temperatures in any climate" (URL97). The point of passive design is to reduce or eliminate the reliance on mechanical equipment for environmental control. Delancey (2004), McGeough (2004) and van Wyk (2009) consider passive design a sustainable practice as it uses "nature's energies in harmony with the building design and management" (van Wyk, 2009: 79).

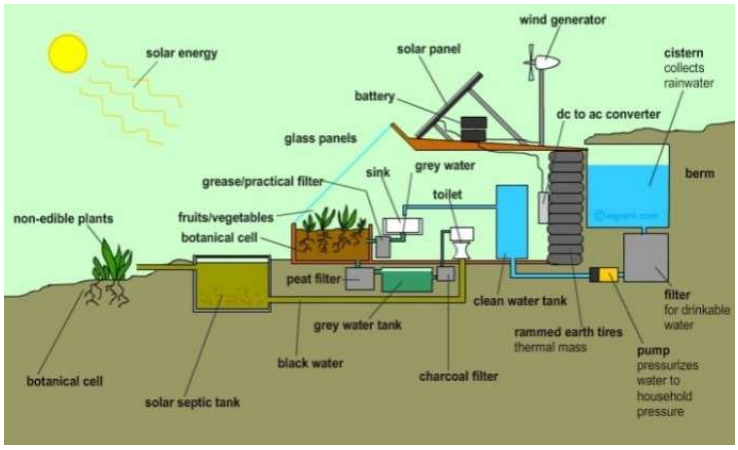


Figure 1.22: Passive solar heating through greenhouse effect. Desirable only in colder climates (Source: URL95).

- They "catch water from the sky and use it four times" (URL97). According to Pearce, regarding natural income:

  > *"…harvesting the rain was once a worldwide technology on which hundreds of millions depended. Every locality had its own systems. Almost everyone did it … for small tribes and communities in particular, rainwater harvesting made much more sense than the larger river-diversion structures of 'hydraulic civilizations'"* (Pearce, 2006: 306).

- They "contain, use and reuse all household sewage in indoor and outdoor treatment cells resulting in food production and landscaping with no pollution of aquifers" (URL97). In contrast, a 'typical' house is designed to remove grey and black water entirely, via a main sewage system.

The house itself is an "assemblage of by-products" (waste) such as tyres, but contains indigenous materials "occurring naturally in the local area" (URL97). Tyres are regarded as difficult to recycle, due to their heterogeneous composition. Figure 1.23 shows how tyres are recycled to form walls.

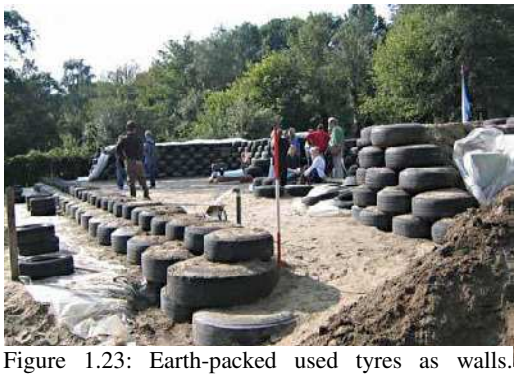


Figure 1.23: Earth-packed used tyres as walls. Labour intensive and time consuming (Source: URL95).

Technology is delegated a role in the maintenance of the modern lifestyle, and is not used for environmental control. Electricity is produced using photovoltaic cells / wind power system, and is stored in batteries (URL97). Significantly, some houses are tied into the existing power grid, and "can have city water as backup" (URL97).

In light of the global issues of sustainability, the extent to which Earthships function as stand-alone units, and their laborious method of construction render this approach only marginally useful / effective in the pursuit of genuine sustainability in terms of scale. Conversely, Alejandro's Iquique housing model is geared towards effectiveness in terms of scale. Prefabrication is embraced as an intermediary between quality and quantity, and ensures a flexibility which is not easily afforded by the tectonics of the Earthship (earth filled tyres in stretcher bond creating immovable walls).

Continuing with the notion of energy flows and ecological concerns, Rees claims that sustainability can only be achieved if each generation inherits an "adequate per capita stock of natural capital assets no less than the stock of such assents inherited by the previous generation" (Rees, 1996: 225). Of course, sustainability cannot truly be achieved if this inheritance is imported from abroad, if there is a "dependence on external flows" (Rees, 1996: 241). A dramatic example of the implication of external flows of resources with regard to the three pillars of sustainability is the management of water using dams. Pearce claims that Lesotho is:

> *"one of the most water-rich nations in Africa, with the tallest dam on the continent. That dam has enough reservoir capacity to give each of the country's two million citizens about 1,500 cubic metres of water each a year. But in early 2004, Lesotho faced famine as parched crops withered in the fields. The government appealed for food aid. Why? Because almost all the water stored in the mountain kingdom's two giant reservoirs* was earmarked for sale to its neighbour, South Africa. *The problem for Lesotho was not the absence of water or even of a dam; it was the absence of money"* (*author's* emphasis) (Pearce, 2006: 161).

This account highlights the value of self-sufficiency with regard to natural resources. The process of adaptive reuse is considered a point of departure towards self sufficiency. Indeed, the "dependence on external flows" is not simply an ecological matter, but a socio-economic one (Rees, 1996: 241).

Rees' overall argument suggests a need to assess ecological footprints of buildings, whether architectural or infrastructural, in order to develop policies and regulations for the use of land and energy in the local context. Many practicing architects take ecological footprints into consideration through efficient planning, such as BedZED, using "site-won materials" such as Collis' Houses, by recycling "industrial waste" (Cooke, 2009: 23), and by designing for a high level of self-sufficiency, as is exemplified by Reynolds' Earthships. Furthermore, according to Collis:

> *"in SA, just 6,5% of waste is recycled",* and *"In Cape Town 65% of landfill is from the built environment. It's a waste stream that will not easily run out and upon which we should capitalise"* (URL0008).

This statement implies that there are economic and environmental advantages to recycling. However, it is important to note that ecological sustainability is only a part of environmental

sustainability. This is because ecological sustainability refers to "natural capital stock", whilst environmental sustainability refers to both natural and man-made environments (Rees, 1996: 226).

Environmental sustainability and building

The recycling of buildings and materials is considered the primary means by which to achieve environmental sustainability and get the most out of embodied energy. The process of adaptive reuse is discussed in detail in Chapter Two. However, there are a plethora of products and design solutions which claim to have positive environmental impact, insofar as carbon emissions and energy generation is concerned.

As noted, recycling has both environmental and economic benefits. Similarly, 'green' technology is perceived in the same way. However, if the laws of thermodynamics have any value, it is not possible for any product to produce more energy than is used to create/sustain it. Furthermore, it is idealistic and naive to think that high technology is effective in *any* and *every* context, or indeed that it is sustainable in the long term. For example, on-site energy generation through photovoltaic cells and wind energy etc. is popularly perceived as a 'Green' (enviro-sustainable) practice. Van Wyk claims that:

> *"with current technologies and current South African building practice, on site building energy generation is highly ineffective and is a financially wasteful means of reducing CO2 emissions"* (van Wyk, 2009: 95).

Conversely, if C02 mitigation is understood as an industrial liability, such technology affords a level of autonomy from centralized electricity services.

The *Green Building Handbook* (van Wyk, 2009) is one of many publications containing data on green building rating tools, ecological building, passive energy strategies, energy generation, heating, ventilation and cooling, and materials, all with the aim of 'Green' design. Whilst relevant to the research problem, there is little point in repeating widely available data. However, some data requires mention, as it is directly related to the topic, the research question, and the local context.

As discussed, "passive energy strategies" (with regard to solar and wind energy) are regarded by many as environmentally sustainable, as they negate the need for extraneous energy consumption (van Wyk, 2009: 79). The aim of passive design is simply to ensure "indoor comfort" without the need of technical apparatus (ibid). The variables affecting passive design are scale and climate. A house can easily be made passive, whereas a skyscraper demands a different approach. For example as wind speed increases with altitude, so natural ventilation becomes a more demanding design issue. Climatically, some buildings require to be designed to retain heat (building envelopes, HVAC systems etc), whilst others require that heat is reduced (passive ventilation, passive solar

control). It is suggested that passive design strategies must approached with consideration and sensitivity, for instance:

> *"Admitting fresh outside air into a room short-circuits the barriers between indoors and outdoors potentially defeating the very object of heating/cooling"* (van Wyk, 2009: 85).

For solar energy, apart from passive heating of interior spaces or PV power generation, solar power may be used to heat water. Heating water constitutes a significantly large portion of running costs of an average household (sources suggest anything up to 60% of total energy usage), making solar water heating effective both economically and environmentally (Manganye *et al,* 2010).

Of all available technology and design strategies, green roofs are perceived as being one of the most efficient and effective means of achieving sustainability on a number of levels (van Wyk, 2009: 116). Green roofs, also known as turf roofs / brown roofs depending on their design, are considered advantageous as they absorb heat during the day, and radiate it at night thus insulating the building.

By design, green roofs are not necessarily high-tech or complicated, making them cost effective and highly adaptable (figures 1.24 & 1.25). A level of structural and technical sensibility is required to control water penetration and loading. Also, they require specialized maintenance, thereby creating a demand in the services sector.

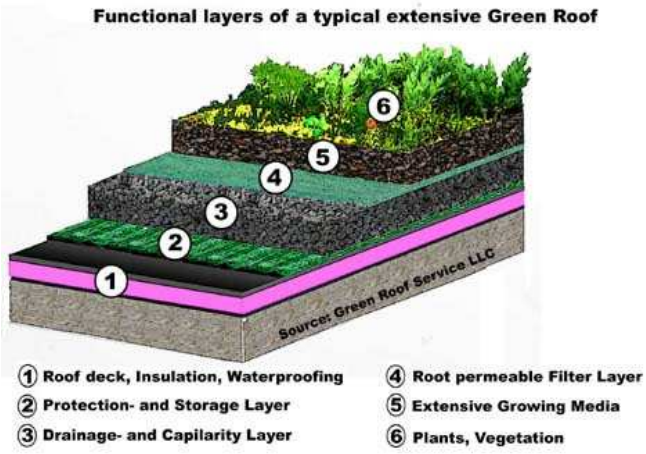


Figure 1.24: Functional layers of extensive Green Roof (URL013).

Figure 1.25: Green Roof as modular installation (URL014).

With regard to the ecological side of environmental sustainability, green roofs allow endemic and indigenous species to re-colonise the land on which a building has been erected (figure 1.26) (van Wyk, 2009: 85).

Figure 1.26: Green Roof as landscape (URL013).

Analysis and Discussion of Environmental Sustainability

Environmental sustainability is not an aim in itself. Rather, it is a by-product or result of design and technology which aims to reduce dependence on machines and machine made products to achieve human comfort. In short, environmental sustainability is a result of sensible exploitation of land and energy.

Landscape design and technology emerges as the agent for ecological preservation. On the other hand, Green technology development is motivated by efficiency with regard performance and reduction in long term costs. Currently, the idea of 'Going Green' is strongly advertised. Utilizing 'Green' products and design solutions to achieve 'environmental sustainability' appears to be a gross oversimplification. However, many of these products and design solutions are geared towards self-sufficiency and efficiency, thereby implicating positive social and economic outcomes.

2.1.1.3 Social sustainability

Social sustainability refers to both the collective needs of society and the community, and psychological needs of the individual. Kushner posits that social sustainability differs for each community:

> *"in some communities it will reflect the region's cultural and economic history; other communities will highlight their geographic resources; while still other communities might structure their social sustainability around sports and recreation or arts and entertainment"* (Wash. U, 2000: 851-2).

If society is defined as "the aggregate of people living together in a more or less ordered community" (Soanes & Stevenson, 2004: 1369) then a society in fact refers to a strata of many communities, sharing overlapping interests, but which also have distinct differences. Social sustainability in a multi-ethnic or multi-cultural setting (such as Durban) may therefore refer to upholding, reinforcing or even creating cohesiveness and positive relationships between the individuals and communities of a society, within a cultural and economic framework, whilst at the same time upholding each community's identity.

The first interpretation of community involves "the idea of physical environments where 'community' can be 'built'. The second, and more appropriate interpretation of the term 'community', involves interest groups with a common purpose" (Lewis, 2005: 40). Lahlou suggests that the notion of a strong community with regards to sustainable practice is critical:

> *"An observation of what does actually work in terms of sustainable consumption ... shows that people who engage, and stay, in sustainable behaviours do it because they do it in groups"* (Lahlou, 2009: 29-30).

To illustrate, the tenants of the aforementioned Beddington Zero Energy Development are encouraged (but not forced) to lead low-energy/ecologically responsible lifestyles. A report published by the BedZED organisation hints at this very notion:

> *"We have found that it is important to make it easy and convenient for people to take sustainable actions and difficult for them to take unsustainable ones"* (Hodge *et al*, 2009: 6).

Some ways in which planning and design encourages a sustainable ethic:

- "fitting homes with low energy appliances and trying to influence residents' energy use behaviour by having the meters on show" (Hodge *et al*, 2009: 5)
- "Because of BedZED's low-energy emission concept, cars are discouraged; the project encourages public transport, cycling, and walking, and has limited parking space" (URL01).

- "BedZED is serviced by the 127 bus on the Purley–Tooting route, via Wallington railway station and Hackbridge" and there is a "Tramlink service from Croydon or Wimbledon to Mitcham Junction station, which is within 15 minutes walk of BedZED" (URL01).

Davey adds that "despite (or perhaps because of) [the development's] prototypical nature, there has been an enthusiastic take-up of dwellings" (Davey, 2001: 77). This suggests that people are willing to engage with the environmental, social and economic responsibilities demanded by sustainability theory. However, sustainable consumption stems from enviro-economic incentives.

By the second definition of community, it is possible to see how a "mutual interest" may inspire people to *join together*, and possibly sustain "social relationships outside of one's physical neighbourhood" (author's *emphasis*) (Lewis, 2005: 40). Social sustainability is in part, about the way the built environment - that is the city and its buildings - facilitate this 'joining together' or integration. Lenz-Romeiss in *The City: New town or home town* (1973) suggests that the affordances of industry resulted in three "disintegration factors", mobility, organisation and politics (Lenz-Romeiss, 1973: 58). It is suggested that "mobility" has "reduced and abolished the locally self-contained" whilst "organization" around advancing industry resulted in "increasing division of labour" which in turn led to purely utilitarian organizations which had very little directly to do with the town as such" (Lenz-Romeiss, 1973: 59; 60). This notion is exemplified by the CIAM approach to city planning, whereby the "four functions: housing, work, recreation and traffic" are articulated (that is, fragmented), as separate zones (Holston, 1989: 31).

The following subchapters explore the street as an integrative space, the neighbourhood as an integrative domain, and participation as an integrative process, all in relation to a communal and individual social sustainability. The process and product of adaptive reuse is directly related to each of these subjects.

The Street in History & Theory

> *"Everything in architecture is temporary except one... buildings come and go, but the only constant is the street"* – Balkrishna Doshi (Luckan, 2008: 30).
>
> *"The simple social intercourse created when people rub shoulders in public is one of the most essential kinds of social "glue" in society"* (Alexander, 1977: 489).

The street has been identified as one of the most important factors affecting both 'social sustainability' and the approach to adaptive reuse. In order to create a solid point of departure from which to discuss the social implications of the street with regard to adaptive reuse, it is necessary to draw a comparison between the street and the road. According to Ronan:

> *"it was the Assyrians who first began to organize a road-building programme in earnest, and then it was for military reasons"* (Ronan, 1973: 107).

This example was followed by the Persians, who formalised roads creating "inland routes for trade and administration, as well as for military use", not unlike the Romans in Europe (Ronan, 1973: 107). In India, the Royal Road of King Asoka built in the third century BC, demonstrates how human needs were integrated with the largely utilitarian use of roads:

> *"It ran from the Indus in the west, across the Punjab, over to the river Ganges in the west, a distance of 850 miles…it was laid out with wells, rest-houses, shady places and gardens of herbs for the health of man and beast as they journeyed along it"* (Ronan, 1973: 109).

Roads, and especially highways and railroads, are typically non-pedestrian zones, and the flow of traffic forms an obstructive edge. Carmona suggests that a 'street' is distinct from a 'road' as "the primary purpose of the latter being a thoroughfare for vehicular traffic" (Carmona *et al*, 2003: 146). The street on the other hand is an urban phenomenon, "an open, articulated means of circulation" specifically *pedestrian* circulation (Mumford, 1961: 74). This articulation, Kelbaugh argues, is achieved by "sidewalks, street trees and architectural codes governing the basic profile of the building front" whereby the space of the street is perceived as a "figural public space or outdoor room" (Kelbaugh *et al*, 2008: 187). Gehl further suggests that the street is a spatial phenomenon which strongly linked to the social groupings and their hierarchies:

> *"The hierarchy of social groupings is reflected by a hierarchy of communal spaces: the family has a living room, residences are organised around two communal spaces, the outdoor square and the indoor communal house; and finally, the entire residential complex is built up around a public main street ... Visually, the social structure is expressed physically by placing the residences around group squares or group streets. Functionally, the social structure is supported by establishing communal spaces, indoors and outdoors, at the various levels in the hierarchical structure. The major function of the communal*

> *spaces is to provide the arena for life between buildings, the daily unplanned activities – pedestrian traffic, short stays, play, and simple social activities from which additional communal life can develop, as desired by the residents"* (Gehl, 1987: 59).

The notion of "life between buildings", or life on the street, is fundamental to social sustainability (Gehl, 1987: 59). Streets are the setting for formal and informal economic activity and social interaction on many levels. With regard to architecture and adaptive reuse, the successful relationship between public and private space, that is between inside and outside, depends upon the way hierarchy is created and maintained. Kelbaugh suggests that:

> *"Front porches, or stoops (depending on the regional architectural history of a place), are intended to enable sociability among neighbors; the close mixing of lot sizes and building types is intended to encourage socioeconomic diversity"* (Kelbaugh *et al*, 2008: 187).

Death of the Street

> *"The modern city dweller is forced to create a social life on personal, controllable territory instead of engaging in a communal existence centred around the street"* (Trancik, 1986: 10).

Despite the socio-economic importance of the street, the traditional street (figure 1.30) was seen by modernist planners as "a cesspool of disease" – one unable to "accommodate the needs of the machine age" (Holston, 1989: 101).

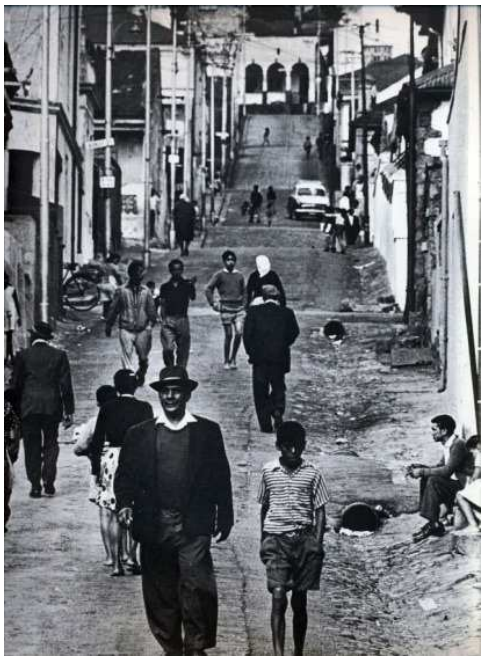


Figure 1.30: Street in District Six, Cape Town (Breytenbach, 1970: 83).

In the worst cases, this conviction has resulted in a monotony of urban form that hinders the possibility of district identity achievable through unique urban patterns (Holston, 1989). Holston's discovery of Brasília as a city without streets and street corners produced in him a "profound disorientation" (Holston, 1989: 101). He notes that Brasilia is "a city without crowds" having the reputation of a city that "lacks human warmth" (Holston 1989: 105). The planners of the city – who applied the functionalist "planning tenets put forward in CIAM" in an almost text-book fashion, intentionally separated vehicular traffic and pedestrian traffic movement systems, essentially creating exclusive, "independent paths" through the "elimination of intersections" (Holston, 1989: 31; Stäubli, 1966: 13). The "culture of congestion" associated with the living street is killed and replaced with traffic (Koolhaas, 1994: 257).

The implications of such an approach are discussed in the section Theories of Analysis and Design (page 54). In terms of architecture and adaptive reuse, designers appear to be faced with the task of reconciling fragments of authentic 'organic' city with the swift but brutal infrastructures of modern planning; a task which is more political / bureaucratic than architectural.

Life of the Street

Urban and architectural forms can have a direct impact on the psychological and social well-being of human beings. In the urban environment, civic outdoor spaces such as pedestrian nodes, public squares, parks, *streets* and so forth, are of significant social and cultural importance. Culture refers to the "customs, ideas, and social behaviour of a particular people or group" and civic outdoor spaces facilitate a large number of these practices (Soanes & Stevenson, 2004: 349). The formal arrangement of the urban environment and its phenomena has a direct impact on social sustainability, ranging from the individual to the group.

Woodcock argues that "streets are really the cores of 'small towns'" and that "the street is an urban living room bounded by buildings that have grown, changed, and modified over time" (figure 1.31) (Woodcock, 1988: viii). In terms of adaptive reuse and indeed architectural design, to ignore the street is to ignore human life itself.

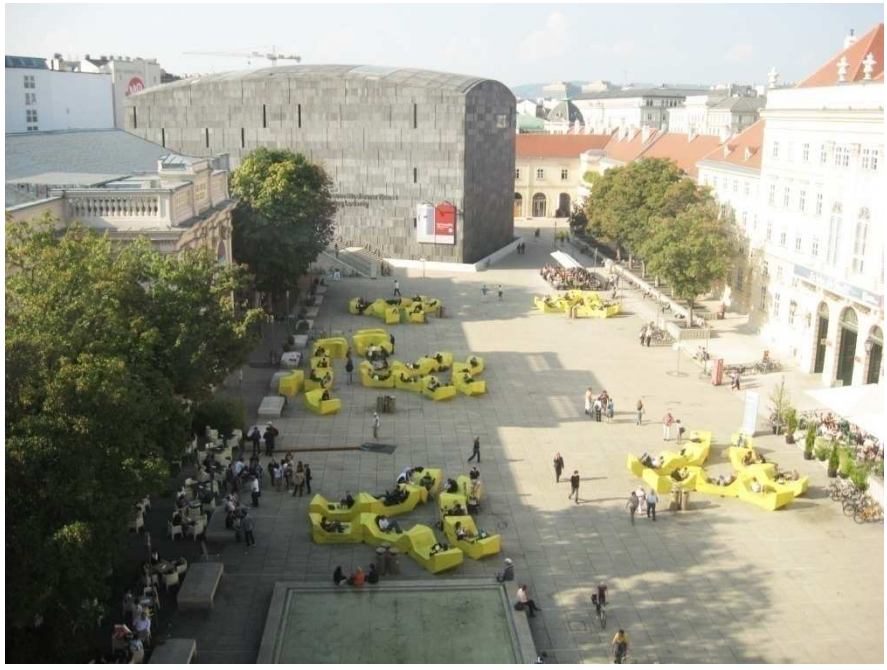


Figure 1.31: Square in Wien, Austria, having the characteristic of an outdoor lounge. Effectively a node (culmination of pedestrian streets), the 'lounge' is defined by buildings from different periods of time (Author, 2009)

If the urban environment is perceived as the stage of public life, then architecture can be seen as the backstage of public life. What connects these realms is the street, and a person walking along a street "sees practically nothing but the ground floor of buildings, the pavement and what is going on in the street space itself" (Gehl, 1987: 65). Thus the ground levels of buildings are the thresholds between public and private life. The pursuit of social sustainability through adaptive

reuse is partly an understanding of the complex relationships between spaces (the "ambiguous in-between realm"), or the threshold, between public and private (Alexander, 1977: 562).

Architectural forms augment spatial relations, and therefore have an impact on the way people relate themselves to their surroundings. Whether far apart (figure 1.31) or closely packed (figure 1.32), buildings define urban space – they are the *walls* of the "urban living room" (Woodcock, 1988: viii). In history, the wall:

> *"…served as both a military device and an agent of effective command over the urban population. Esthetically it made a clean break between city and countryside; while socially it emphasized the difference between the insider and outsider…"* (Mumford, 1961: 66).

Figure 1.33: Skyscrapers articulate urban space. Central Park, NY (Author, 2007)

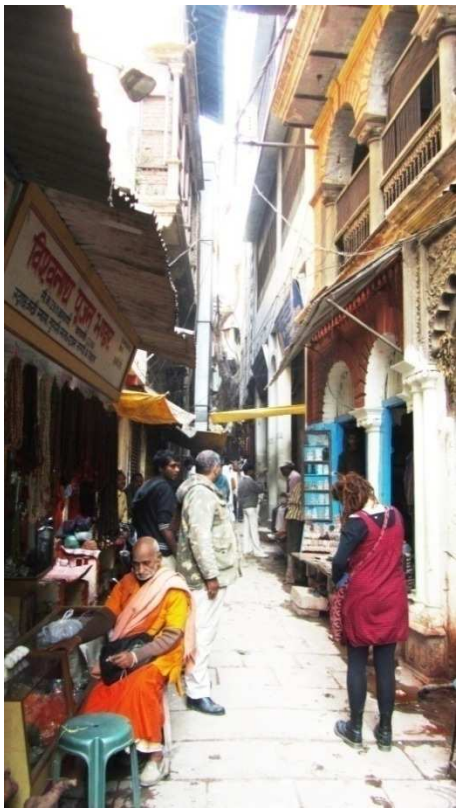


Figure 1.32: Street as a tight corridor, articulated by exteriors of buildings. Varanassi, India (Author, 2011)

Imagine a building in the centre of town, which has a blank sheer wall facing a lively street. The blank wall (figure 1.34) forms a physical, visual, and psychological barrier from inside and outside, negating any social and environmental connection between those inside and those outside. Not only does the wall forcibly separate people from one another and from their environment (could be a view), its significant form is suggestive of a "declaration of distrust of the city and its streets and the undesirables who might be on them" (Whyte, 1988: 222). Psychology of space is an important factor of social sustainability, and these types of architectural gestures (such as a blank wall) serve to break "the continuity that is so vital for the rest of the street" (Whyte, 1988: 226). This is both a spatial and social continuity, one that can be sustained or remedied through adaptive reuse.

Figure 1.34: World's tallest blank wall: AT&T's Long Lines building in New York City (Whyte, 1988: 223).

Another way that adaptive reuse can contribute to psychological and social well being is through the creation of defensible spaces. Defensible spaces (figure 1.35) are those which can be passively secured by simple human observation, that is; "by 'eyes on the street' from the windows of the buildings" (Coleman, 1985: 10). A courtyard is one example of a defensible space (figure 1.36). Cooke suggests that courtyards have "psychological value" and "Norberg-Schulz considers the courtyard the 'inner world' of the private dwelling since ancient times" (Cooke, 2007: 62). When buildings are recycled, there is opportunity to consider the idea of defensible spaces – whether relating to street or courtyard – in terms of user safety and connection to the outdoors. Cooke suggests that "from a contemporary perspective: the main advantage [of courtyards] is the ability to achieve relatively high densities with a good level of

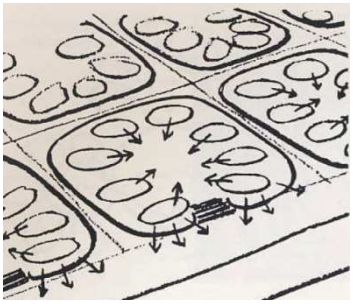


Figure 1.35: Defensible Space (Gehl, 1987: 13)

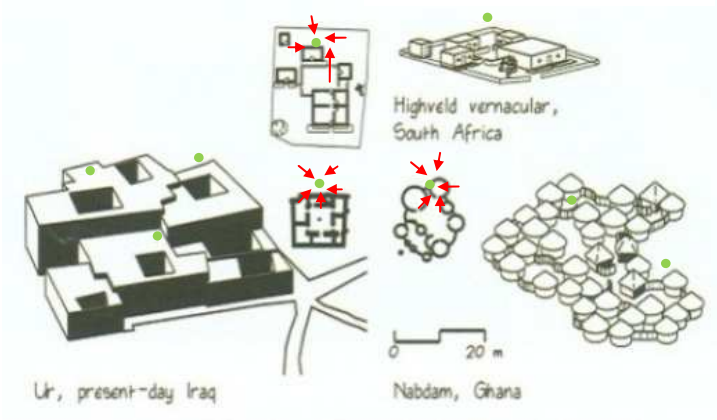


Figure 1.36: Courtyard house in Ur (Iraq), "compared with an African village and a Tswana homestead" (Cooke, 2007: 62). Irrespective of formal qualities (i.e. orthogonal vs. curvilinear), the concept of defensible space remains the same. To show this, the defensible spaces are marked with a green dot, while the 'defending' spaces (those which relate to/create the defensible space) are marked with red arrows.

privacy, and the provision of sheltered outdoor living space" (Cooke, 2007: 62).

The height of a building is shown to be directly related to the feeling of safety (Coleman, 1985). Both Alexander and Gehl note that anything up to five storeys high (figure 1.37) has significant positive impact on the life at ground level. Their studies show that the fifth floor is the "threshold", in that the floors thereafter leave people "out of touch with ground events" (Gehl, 1987: 100). In addition, Coleman suggests that:

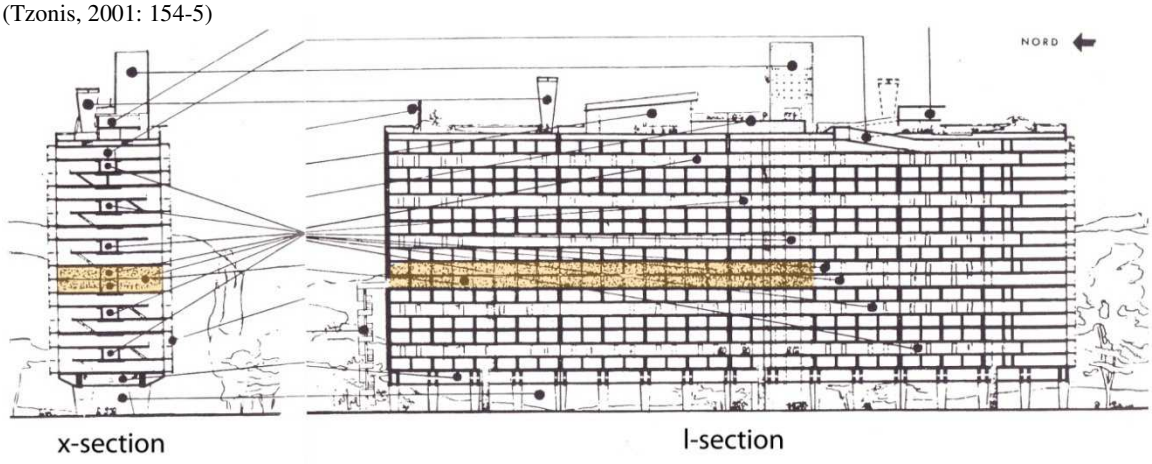
Figure 1.37 (above): Isolation threshold (Gehl, 1987: 25).

"high blocks are regarded as creating anonymity because they segregate people at different levels instead of allowing the normal interactions that take place on the street when houses are on the ground" (Coleman, 1985: 32).

In contrast, there have been many attempts to combine public and private life in housing (including "high blocks") to create a sense of community and autonomy. Referring to cohousing in Sweden, Vestbro claims that the 400m long corridor, the "intermediary" space between "private and collective", became a "free zone for children and youngsters, a place where 'they can develop their social life within their own group' – a space that 'provides excitement *at the same time as adults feel that it is a safe environment for the children'* (Pedersen 1991)" (Vestbro, 2010: 3).

The idea of an internal street above the ground was tested in the 1930's by Le Corbusier in his Unité d'Habitation, Marseille. The street, which is in effect a corridor (figure 1.38), is located "half-way up the building on the seventh and eighth floors" (Jencks, 1973: 147).

Figure 1.38 (below): Unité d'Habitation, internal 'street' shown in orange. Adapted by author from (Tzonis, 2001: 154-5)



Gans claims that the psychological impact on tenants in the Unité was "completed amid complaints ... from doctors [who claimed] that it would mentally damage its inhabitants" (Gans, 1987: 87). Jencks notes that the Unité "has always been faulted for being cut off from the ground, from the connection with the external life of the street... hence its supposed lack of life and financial viability" (Jencks, 1973: 147). The street as a social sphere, it emerges, cannot be crudely replicated or confined to a single purpose, because the street is quintessentially a mixed use realm – it offers more than just shopping, but the spectacles of daily life (figure 1.39). Referring to street traders in Warwick, Dobson observes that in some cases "items and quantities for sale vary depending on the time of day and the needs of potential customers" (Dobson, 2009: 17). This observation depicts the street as a dynamic arena for human activities.

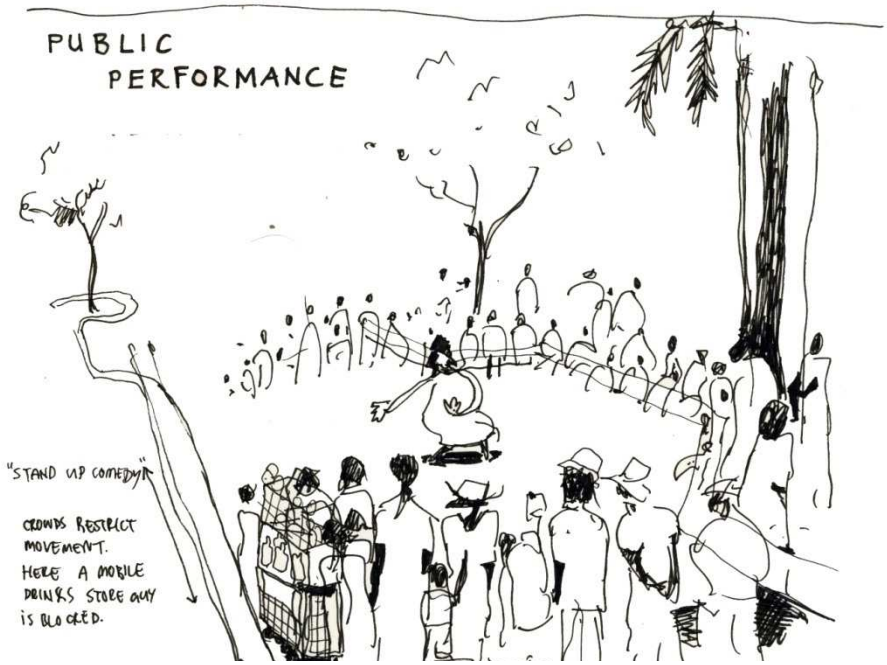


Figure 1.39: Sketch of spontaneous public performance, Gugu Dlamini Park, Durban (Author, 2010)

Another factor which is related to the street and its role in social sustainability is the notion of diurnal activity. It is generally accepted that activities occurring over day and night contribute to the factors of safety (human presence) inasmuch as they provide cultural diversity. The notion of social sustainability with regard to adaptive reuse in context requires research into the relationship between people and the process of building itself.

Participation

> *"Direct participation in designing, building, and managing environments has been found to increase user satisfaction ..."* (Altman & Zube: 1989: 157).
>
> *"Psychoanalysts show that men need to manipulate and form their local environment to sustain their identity and sanity. Again, the evidence supports the idea that an environment should allow for active, individual participation in its building*" (Jencks & Silver, 1973: 23).

Much of contemporary practice is prescriptive, or 'top-down'. In effect, participation is a "sharing of power" (Altman & Zube: 1989: 158). On a psychological level, participation connects the individual or community to an issue or artefact, in that there is accrued as sense of "citizen control...the ultimate goal of participation" (Altman & Zube: 1989: 158).

Participation may occur during the conceptual phase of development. As explained earlier, if a community is given an opportunity to expresses their concerns, needs and wants, it follows that future decision making can happen within a known social framework. Furthermore, participation may occur during construction phase. In a discussion with the architect of the 7 Fountains Primary School, Shayamoya, it was suggested that participation during conception and construction had lead to a sense of "sovereignty" or ownership over the buildings, thereby a sense of safety and responsibility was established (van Heerden, 2010). Participation is equally valid for adaptive reuse endeavours. For example, the BAT Centre in Durban (see pg. 82 for full case study) was conceived out of a participatory relationship with the client (a three day conference), where the clients were simply asked "what do you want?" (Mikula, 2011). Furthermore, the construction phase of the BAT was seen as a "training project" for the contractor, whereby underskilled builders would learn as they worked (Mikula, 2011). This approach to practice is geared towards education and empowerment through participation, with qualifiable socio-economic effects.

In short, the success of a participatory approach depends on the conceptual approach to participation, i.e. the framework of communication and interaction between parties. Adebayo explains succinctly:

> *"the debate on community participation has moved from a paradigm that sees communities as passive recipients of development products, who should not interfere with the process of delivery, to one that sees communities as active participants in the delivery of development products that affect their lives"* (Adebayo, 2002: 354).

Inclusive practice reinforces the relationships between different groups, such as between end users and professionals. However, in some contexts (particularly where there is a finite social hierarchy, such as in rural areas) participation may result in animosity between those who benefit (and those who do not) from the participatory process.

Analysis and Discussion of Sustainability Theory

It is both impractical and unnecessary to consider sustainability theory as a whole. As clearly demonstrated, all three spheres of sustainability overlap. Many have suggested that sustainability is a mindset, an attitude, and an approach which is "holistic, multilateral and versatile" (Slaev, 2004: 3). This supports the notion that sustainable practice is bound by context, concept and process. Contexts (climatic, topographic, urban, social, political, economic, etc) may be regarded as containing the primary determining factors, whatever they may be, while concept and process are dependent upon the intelligence and communicative skills of professionals, their political and ethical inclinations notwithstanding.

In one sense, sustainability is a reactionary theory against the 'abnormal' practices of the modernist system of centralization. 'Green' technologies sold as 'sustainable alternatives' are in effect perpetuating dependency on machines, services, products etc. at times when low tech or passive response may be equally effective. However, some of these products allow for self-sufficiency (a notion associated with personal freedom) and many of them are geared towards efficiency, equating to quantitative 'savings' of resources.

The pursuit of sustainability in many ways emerges as the pursuit of new markets, new economies and new industries. Whilst there is inherently little wrong with this notion, the major ethical concerns are those regarding 'Greenwashing' and the indoctrination of students to regard 'newness' and technology as the answers to relatively vague issues. 'Greenwashing' is a kind of 'camouflage and connotation oriented propaganda' (advertising) which literally paints everything green, and uses evocative symbols such as leaves, grass, trees etc. to sell products (lifestyles) which have nothing to do with their actual value.

Conversely, the media is nonetheless a powerful tool to spread results of significant experiments and methods in the pursuit of sustainability. Davey laments the fact that BedZED did not win the RIBA Sterling Prize for Architecture, as "being broadcast on national television … has the potential to send a message far beyond the limitations of the architectural world" (Davey, 2003: 48). Greater public exposure results in quicker uptake of the global issues surrounding the conception, creation and sustainability of the built environment. This in turn leads to more research, innovation, and eventually discovery. In a sense, 'green' developments need to actively compete against others in the image market, in order to gain recognition and support. Thus, in theory, the demonstration value (in real life and in the media) of a building becomes a powerful vehicle for pursuing change. Sustainability appears to be bound by context; therefore it makes more sense to interpret sustainability as a movement or an approach to practice.

Conclusion

In this sub-chapter, sustainability has been explained in terms of economic, environmental and social factors. The first section explored the definition and meaning of sustainability, namely that it is a mass movement concerning "those activities which can be continued far into the future, defining a way of life that will last" (McDonough *et al*, 1992: 28). In the second section, the economic factor of sustainability was explored through the processes of planning, construction, recycling and flexible design, with an emphasis on the role of the informal economy. It was shown that efficiency with regard to land and energy use plays a significant role in the pursuit of sustainability through architecture. In the third section, environmental sustainability was briefly discussed in terms of ecological, technical and design aspects, and it was suggested that passive design strategies are a realistic alternative to technological innovations.

Lastly, social sustainability has been linked to the role of the street as the dominant social sphere, to the psychology of built form, i.e. defensible spaces and urban forms, and lastly through examining the role of participation towards a socio-economic and socio-environmental sustainability. It was shown that the spatial quality of the built environment has direct impact on the well-being of users, thereby connecting the notion of social sustainability with the adaptive reuse.

2.1.2 Place Theory

> *"Sense of place is often discussed in terms of the Latin concept of 'genius loci', which suggests that people experience something beyond the physical of sensory properties of places"* (Carmona *et al,* 2003: 94).

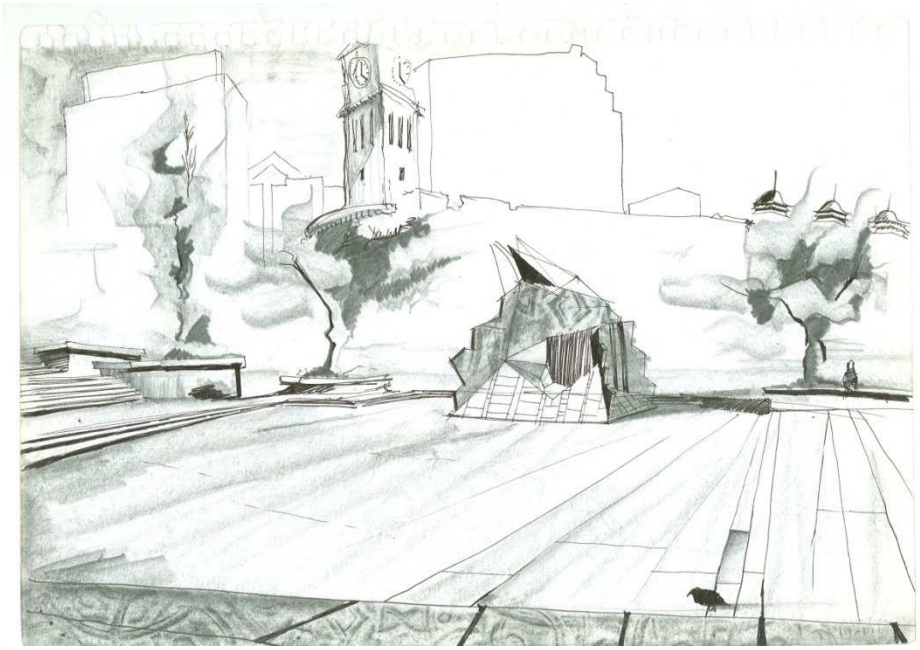


Figure 1.50: Drawing of Aotea square, Auckland, NZ – *Genius Loci?* (Author, 2008).

> *"Every place is potentially a brand. In every way as much as Disneyland and Las Vegas, cities like Paris, Edinburgh and New York are their own brands, because a consistent, clear image has emerged of what each place looks, feels like, and the story or history it conveys"* (Carmona *et al,* 2003: 94).

Place theory is a qualitative theory, which attempts to explain the existential relationship between man and his environment. Place theory introduces the notions of memory and time with regard to both natural and man-made environments. In doing so, it provides the background to the ways in which old buildings are linked to the psychological needs of people, and therefore to social sustainability with regard to architecture.

Lewis claims that sustainability is not only about a triple bottom line, "which uses the terminology of an accounting balance sheet and implies that we are merely statistics" but rather that sustainability "is more about combining the poetic and the material, the qualitative and the quantitative, the imaginative and the functional to create a quality environment for us now and in the future" (Lewis, 2005: 13). Furthermore, he suggests that "there should be nothing in a sustainable approach which is at odds with good place-making" (Lewis, 2005: 14). Broadly

speaking, place-making is considered sustainable because a personal connection with a place fosters the incentive to take care of it. Berleant defines place as:

> *"in its most basic, place is the setting of the events of human living. It is the locus of action and intention, and present in all consciousness and perceptual experience. This human focus is what distinguishes place from the surrounding space or from simple location"* (Menin, 2003: 42).

By these definitions, place may be anything from a water closet, to the tip of Mount Kilimanjaro. Roger Trancik suggests that place "adds the components of human needs and cultural, historical, and natural contexts" and that it imbues physical spaces with details that are "indigenous to its setting" (Trancik, 1986: 97). In this view is the fundamental concern for people as part of culture and history. Indeed, place is perceived as intrinsically tied to people, place and time - that is, context.

In reference to Lahlou's "the World as … an *installation*" theory, the concept of place may be easily understood as a psychological *installation* transcending the physical and social *installations* (Lahlou, 2009: 27). Lahlou's definition identifies that the creation of place is essentially a cognitive process. This is in fact Rapoport's own argument, noting that:

> *"one person's place is another's non-place' ... the meaning of 'place' can be so culturally and sub-culturally variable as to be indefinable, non-scientific and ... therefore irrelevant"* (Menin, 2003: 1).

In other words, place is a psychological construct that varies from person to person. But bar the amorphous meaning of place, there is no doubt that 'something like it' is experienced. It is therefore necessary to leave the theories of definition in their throes, and instead, focus on the way that place is assumed to be created with regard to the built environment.

There are several qualitative ideas of place, such as 'place-making', 'good-place', and 'placelessness'. 'Placelessness' is "the experience of *atopos* (literally meaning the 'no place')" (Menin, 2003: 2). Menin suggests that atopia is a place familiar to "psychiatrists and priests", as well as architects, landscape architects and planners, who have managed to build it (Menin, 2003: 2). It is often heard that architects create space, but how is it possible to create place?

A space becomes a place when it successfully provides the framework for the creation of human memories. According to Gehl, "a summary of observations and investigations shows that people and human activity are the greatest object of attention and interest" (Gehl, 1987: 31). These human activities can be anything from impromptu street performances, construction workers on a site, or a

parade down a main street. Essentially, there is always a positive association between activity and place, and as Sharr points out:

> *"Heidegger suggested that 'places' are the participants in rituals of everyday existence and human interrelationship. They report the presence of human life by accommodating and revealing necessities of subsistence, manifesting thoughtful experience"* (Menin, 2003: 131).

Just as physical structure and form define space, so human activity and memory define place. It may be that one of the criteria for good-place-making, is to optimise "conditions for seeing what is going on in the space" (Gehl, 1987: 165). Seeing may be the most direct way to take in one's surroundings, but is not the most comprehensive way of experiencing them. Pallasmaa presents the argument for hearing:

> *"Sight isolates, whereas sound incorporates; vision is directional, whereas sound is omni-directional. The sense of sight implies exteriority, but sound creates an experience of interiority. I regard an object, but sound approaches me; the eye reaches, but the ear receives. Buildings do not react to our gaze, but they do return our sounds back to our ears"* (Pallasmaa, 2008: 49).

Juhani Pallasmaa, in *The Eyes of the Skin* (2008) argues that Western civilization is biased towards vision; it is "ocularcentric". Pallasmaa's concern is that an ocularcentric value system undervalues or even neglects the other senses. The other senses are considered as important, as they allow us to locate ourselves – to *place* ourselves – in our environment, simply by being stimulated positively by the environment (built or natural). Pallasmaa's arguments for a multi-sensory experience have a direct relationship to place-making. Even if place is a cognitive construct, the senses are regarded as the trigger of the mind. To illustrate, Pallasmaa points to the sense of smell:

> *"The most persistent memory of any space is often its smell. . . A particular smell makes us unknowingly re-enter a space completely forgotten by the retinal memory; the nostrils awaken a forgotten image, and we are enticed to enter a vivid daydream"* (Pallasmaa, 2008: 54).

Alongside smell, sound and touch play an equally important role in creating, reinforcing or conjuring memories associated with a place. The senses work in conjunction, whereby for instance the sound of water, its cooling effect upon the skin, and the sight of its movement, all contribute to the creation of an image or feeling that reinforce the sensation of being 'somewhere' (i.e. a place).

But perhaps, even more significant than sensory stimulation and emotional and conceptual association to the idea of place-making — is the notion of time. Time, or rather the perceptible passage of time, is the factor which distinguishes space and place, as it provides a context for memory. The *Oxford English Dictionary* (2004) defines space "the dimensions of height, depth, and width within which all things exist and move" (Soanes & Stevenson, 2004: 1381). A dimension may inherently imply time (*moving* from A to B), but it does not have the capacity to *show the passage of time*, because it is abstract.

Natural phenomena, like trees for instance, show the passing of time. A tree grows, changes with the seasons, and eventually becomes big enough to affect the quality of space around it. It makes us *aware* by merely existing. Being aware of the passage of time is to be conscious of the present. To be conscious of the present is to have, to some degree, an immediate and intimate relationship with the world around oneself. One way in which buildings show the passage of time is through the positive weathering of their materials. Haptic materials are those which are "profoundly altered by the passing of time" (Davey, 2000: 43). But certain materials are more haptic than others, that is, certain materials weather positively over time, whilst others do not:

> *"As Pallasmaa makes clear, materials can speak evocatively and even pleasurably of the passing of time – stone of its geological origins, brick of fire and earth and ageless construction traditions, metals of ancient casting process and the patina of age, timber as a once-living tree"* (Davey, 2000: 43).

In contrast to this, composite materials (polymers, plastics, certain glass) are considered to become less 'evocative' with time. In their formal and material 'perfection', they literally showcase blemishes accumulated over time, such as scratches, deposits, deformations. Reflective glass (figure 1.51) is particularly significant, in that it renders the experience of *space* as dynamic with the 'image' of place changing as one is in motion.

Figure 1.51: Reflective glass renders the perception of the figural void as a dynamic optical spectacle (Author, 2010).

In terms of place-making, there is a need to question the qualitative aspect of materials. Do haptic materials contribute more to place than non-haptic ones? It depends on context. Davey explains:

> *"As increased industrial efficiency drove down production costs, interest in developing new and more widely available materials was aroused… Allied to the growth of mass transportation, this meant that many different sorts of non-indigenous materials could be easily moved around, so severing geographical and psychological links between locality and building"* (Davey, 2000: 43)

Another way in which buildings are able to (superficially) demonstrate the notion of lapsed time is through deliberate contrasting of forms and materials, or through partial historical preservation (figures 1.52 & 1.53).

Figure 1.52 & 1.53: The Reichstag, Germany. A seamless synthesis of old and new. Forms and materials are specific to time and place (URL015).

In applying adaptive reuse, the notion of memory (retaining a bit of the past) is considered critical in terms of place-making. Thompson has suggested that there are "logically only four possible relationships between any proposed development and its context: identity, similarity, difference and coalition" (Menin, 2003: 70). The author argues that the process of adaptive reuse is largely about the articulation of these relationships.

Place theory is an exploration of the "psychological links" that exist between man and his environment (Davey, 2000: 43). These links are afforded by human activity, human memory, the sensory experience, and the associative faculty of the mind. As true masters of language, poets are able to give yet another understanding of place: the relationship between man and his world.

The following is an extract from the poem by Gerard Manley Hopkins (1844-89) entitled *The Alchemist in the City* (Gardner, 1985: 3):

"My window shows the travelling clouds,
Leaves spent, new seasons, alter'd sky,
The making and the melting crowds:
The whole world passes; I stand by.

They do not waste their meted hours,
But men and masters plan and build:
I see the crowning of their towers,
And happy promises fulfill'd" (Gardner, 1985: 3)

Analysis and Discussion

As a flexible rendering of perceptual theory and phenomenology, Place theory enhances the notion of anthropocentric design by introducing the role of the human senses and memory in the making of buildings and places. Subsequently, human activity, relation to phenomena, and materials are considered significant. In terms of the hypothesis, Place theory explores the psychological links between man and his surroundings, which include natural as well as man-made phenomena. This has bearing on social sustainability on the individual and collective level. The case study in Chapter 3 shows that natural phenomena have significant value in terms of 'place' as perceived by the individual.

Conclusion

This sub-chapter examined Place theory, suggesting that the idea of place-making involves consideration of human needs, namely culture, history and natural context; indeed any such phenomena that are "indigenous" to setting (Trancik, 1986: 97). Nonetheless, the notion of 'place' was also revealed as a subjective cognitive process, determined by an individual's conceptualization of reality. To conclude, whether theorist, speculator or poet, one has to "recognize that it [place-making] is as much a process of creating selves as it is creating place [and] when the self is depressed, and cannot be creative in its 'being' in the world, how deadening are both beautiful and decrepit places alike" (Menin, 2003: 6). The following sub-chapter explores the theories associated with the phenomenology of the man-made environment, and links these to the notions of adaptive reuse and psycho-social sustainability.

2.1.3 Theories of Urban Analysis and Design

In this paper, the urban environment (the city) is the context for adaptive reuse of architectural artefacts. It is necessary to discuss those urban theories which help make sense of the complex nature of the city, and therefore, make sense of the connection between architecture and urban form. Moreover, the ideas presented here are significant to the analysis and design frameworks for both this paper, and the design component of the dissertation.

This sub-chapter is divided into two sections. The first section contains *theories of identification* which examine the city as a physical phenomenon – a man-made habitat for man. Selected theories are used to explain the spatial relations and elements which make up the urban framework, from the abstract (Alexander, 1977), to the phenomenological (Lynch, 1960; Trancik, 1986) to the typological (Kelbaugh *et al*, 2008). In terms of the topic, these theories are useful for relating patterns of the urban fabric to the patterns of architecture within the urban fabric, thereby providing a theoretical context for adaptive reuse. Alexander suggests that:

> *"…no pattern is an isolated entity. Each pattern can exist in the world, only to the extent that is supported by other patterns: the larger patterns in which it is embedded, the patterns of the same size that surround it, and the smaller patterns which are embedded in it"* (Alexander, 1977: xiii).

Similarly, Lewis claims that:

> *"Building design and urban design are inseparable. At every level from the social to the environmental the two are intertwined. The best spaces and buildings are designed from the 'outside' in and the 'inside' out simultaneously"* (Lewis, 2005: 18).

In the second section, two approaches to urban design are briefly reviewed within the South African context. The first of these deals with the design of the Ridgeside Development, and the second is an approach towards dealing with existing urban patterns. In this section, climate is introduced as a determining factor of urban and architectural form, and the relation between urban structure and adaptive reuse is hinted at.

2.1.3.1 Theories of Identification

In his paper *The City is not a Tree,* Alexander differentiates between the systems of natural and artificial cities, suggesting that the spatial relationship of the former facilitates a social/spatial freedom that is otherwise negated in artificial cities. He argues that natural (organic) cities have

evolved as a system of "overlapping sets" which, in graphic representation (figure 1.60), resemble a semi-lattice (Jencks, 1997: 31).

Figures 1.61 & 1.62 are the author's drawings demonstrating the fundamental difference in frameworks. As illustrated (1.61), a tree has a linear flow/distribution of nutrients (non-living things) along defined channels. As illustrated (1.62) the anthill has a semi-lattice framework, allowing multiple flows/distribution of living things. Artificial cities – those conceptualized by a handful of men – either contain fragments of this semi-lattice framework, or not at all, as they are modelled on the system of a tree. To clarify:

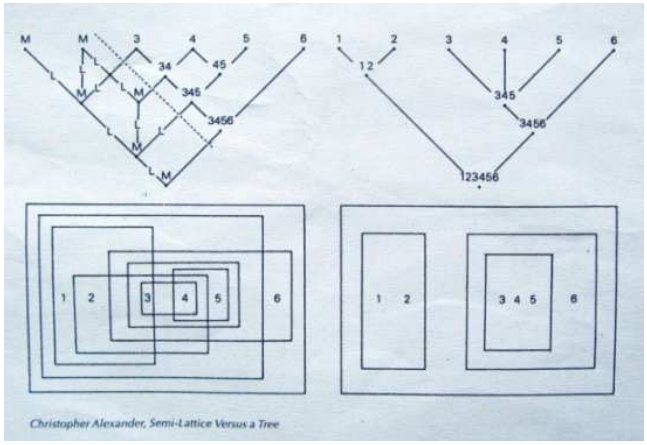


Figure 1.60: Semi-Lattice Versus a Tree (Jencks, 1997: 31)

> *"Both the tree and the semi-lattice are ways of thinking about how a large collection of many small systems goes to make up a large complex system. More generally, they are both names of structures or sets..."* (Jencks, 1997: 30).

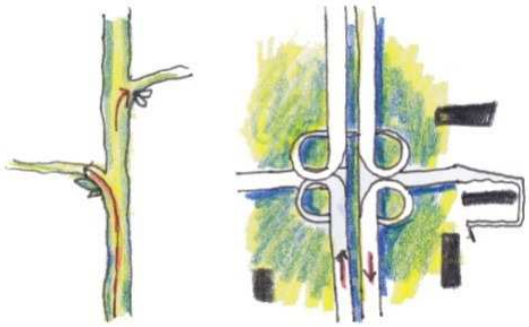


Figure 1.61: Author's sketch (2011).

It is not simply the overlapping units which distinguish the tree structure from the semi-lattice structure; still more important is the "fact that the semi-lattice is potentially a much more complex and subtle structure than the tree" (Jencks, 1997: 31). In a tree structure, no "piece of any unit" is ever connected to other units, "except through the medium if that unit as a whole" (Jencks, 1997: 31).


Figure 1.62: Author's sketch (2011).

When a tree replaces a semi-lattice, Alexander argues that the city as a structure facilitating social interaction and freedom takes a step towards dissociation. He suggests that the design of trees is equivalent to "trading the humanity and richness of the living city for the conceptual simplicity which benefits only designers, planners, administrators and developers" (Jencks, 1997: 31).

Figure 1.63: Modernist planning (Brasilia) resulting in buildings as objects around the framework established by megaform linkages (highway, roads) dedicated to motor-vehicles (Stäubli, 1966: 32/124)

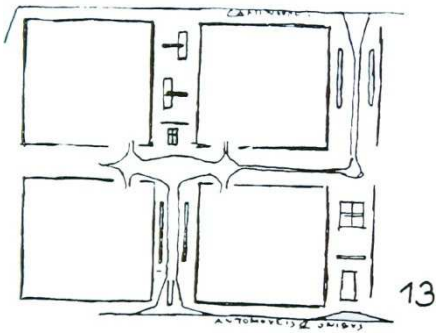


Figure 1.64: Cell/tree like framework of housing sectors in Brasilia (Stäubli, 1966: 14).

Figure 1.65: Budapest – An example of an organic city where the buildings, not the roads, define the urban framework (Enyedi *et al,* 1992: 37).

There are numerous theories which reduce the city into clearly defined components. It is important to point out that despite differences in appearance, these theories have obvious and significant overlaps. To begin, Kevin Lynch puts forth "the image elements into which we can conveniently divide the city image" (Lynch, 1960: 8). These elements are, in brief:

- Paths: anything that facilitates movement. Lynch defines paths as "channels along which the observer customarily, occasionally, or potentially moves" (Lynch, 1975: 47). Trancik qualifies three types of paths, or "linkages" (Trancik, 1986: 106).
- Edges: these are "the linear elements not used or considered as paths by the observer" (Lynch, 1975: 47). Edges may be a literal physical barrier such as a blank wall, a fence or

a river etc. The author posits that edges have psychological impact, or may themselves *be* psychological. A notoriously dangerous street, for instance, is an edge in the 'path' of an 'observer'.

- District: distinct or characteristic urban areas, which may include any number of paths, landmarks, edges and nodes. Zoning plays a significant role in the formation of districts (eg. industrial district), and as Lynch suggests, districts are "always identifiable from the inside...[and] are also used for exterior reference if visible from the outside" (Lynch, 1975: 47).
- Node: a culmination of paths, which form an "intensive foci" or centre at a junction (eg. a public square) (Lynch, 1975: 47).
- Landmark: an artefact that facilitates visual orientation and/or articulates urban space: "Landmarks are ... a type of point-reference but ... the observer does not enter within them, they are external" (Lynch, 1975: 48).

At least two of these five basic elements are common to all settlements, thus their universal application. A further set of theories, by Roger Trancik (1986) are also constructed so as to allow their application in almost any urban context.

In *Finding Lost Space*, Roger Trancik provides "three theories of urban spatial design", explaining the city in terms of "figure-ground", "linkage" and "place" (Trancik: 1986: 97). In figure-ground theory, the relationship between built form and space is translated into a two dimensional graphic illustration (figure 1.66). This graphic method is used to analyse urban form.

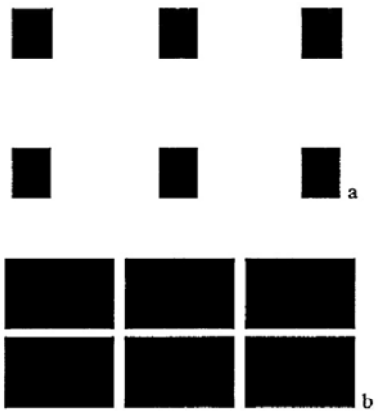


Figure 1.66: Conceptual figure-ground relations. When observing 1a, solids will appear figural, as objects in space, but when observing 1b, the void becomes the figure (Holston, 1989: 122).

The "figure" in black represents solid built form, whereas the "ground" or void is shown by white space. In Figure-ground theory, solids and voids have their own typologies (see Trancik, 1986). One crucial aspect is the notion of the "figural void": the perceived space between figures. Holston

posits that figure-ground relations "present a visual paradox that confirms the character of the street as a room" (Holston, 1989: 120). The concept of the "figural void" is key to analyzing the relationship between figure-ground patterns and the human experience as directly related to the size and nature of the figural voids and formal, urban solids (Holston, 1989: 120). Urban design and architecture can be loosely summed up as the composition of figural voids (rooms), a notion which encompasses the entire habitable man-made environment.

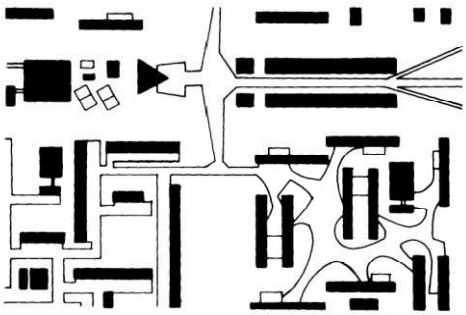


Figure 1.67: Figure-ground plan of an eastwest section of the 'South Wing', Brasilia. To scale with figure 1.68, this figure shows the city in compositional form (Holston, 1989: 124).

Figure 1.68: Figure-ground plan of Parma in 1830 covering an area of 350m x 530m. To scale with figure 1.67, this figure shows the city as group form containing various types of solid/void typologies (Holston, 1989: 124).

Simply stated, linkage theory is "derived from the lines that connect one element to another" (Trancik, 1986: 97). Essentially, links are the corridors for movement (Lynch's "paths") between urban solids. The emphasis of linkage theory is on circulation rather than the spaces created by the Figure-ground diagram, and its purpose is related to "finding lost space" (ibid). Trancik identifies three types of linkage systems: the "compositional form" in which "individual buildings are composed on a two-dimensional plane" (figure 1.67), the "megaform" in which "structures are connected to a linear framework ... where linkage is physically imposed"; and the "group form", resulting from an "incremental accumulation of structures along an armature of communal open space" (figure 1.68) (Trancik, 1986: 107). Group form patterns are considered "typical of the spatial organization of many historic towns" (Trancik, 1986: 107).

> *"In group form, linkage is neither implied nor imposed but is naturally evolved as an integral part of the organic, generative structure"* (Trancik, 1986: 107).

Given this notion, group form linkages may take topography, the human scale, and the sequential journey through space into consideration by default (Trancik, 1986: 107). Megaform and compositional form links, as the names suggest, are either grandiose linkages or abstract ensembles of form which do not necessarily take topography and human scale into consideration.

The purpose of these theories is "finding lost space" (Trancik, 1986). Lost space is defined as "leftover unstructured landscape", the "no-man's lands along the edges of freeways" as well as the abandoned "waterfronts, train yards, vacated military sites, and industrial complexes that have moved to the suburbs" (Trancik, 1986: 3).

> *"Generally speaking, lost spaces are the undesirable urban areas that are in need of redesign – antispaces, making no positive contribution to the surroundings or users"* (Trancik, 1986: 3/4).

Lost urban spaces (figure 1.69) are directly related to sustainability. Firstly, by definition lost spaces are a misallocation of land and energy, and secondly, they are only marginally useful to people as places (figure 1.7.0). Lost urban space may be considered an urban design problem, as well as an architectural one. The author argues that adaptive reuse is key to dealing with socio-economic and environmental issues, if there is a reinterpretation of the notion of site (figure 1.7.1).

Figure 1.69: "Freeway spurs" exist as a fragmented urban phenomenon (Dobson, 2009: 27)

Figure 1.70: The previously "disused freeway off-ramps" now function a "traditional medicine market" (Dobson, 2009: 70). The ramp was activated by linking it to existing pockets of activity.

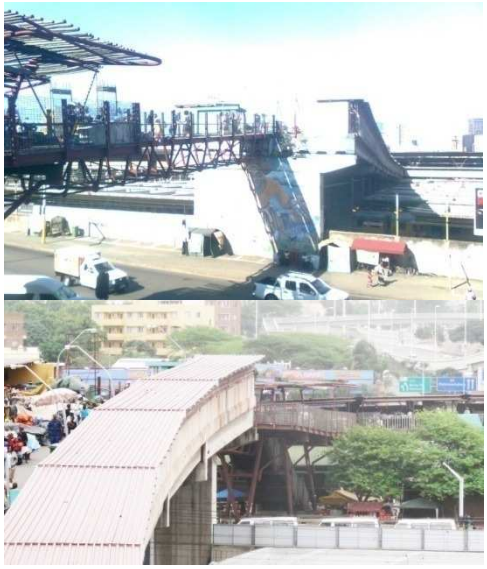


Figure 1.71: The primary link – a suspended pedestrian footpath / level change (Author, 2011).

The last of the theories of *identification* is Aldo Rossi's theoretical formula, which focuses specifically on architecture. He argues that the "city is a collection of two principal types of architecture, dwellings and primary elements" (Kelbaugh *et al*, 2008: 197). This is a notion which can be applied to almost any settlement or context.

Kelbaugh claims that "the dwelling builds what is to be the urban fabric" (Kelbaugh *et al*, 2008: 198). This is justified by the fact that housing makes up a significantly larger portion of the built environment. Dwellings, Kelbaugh posits, are a form of summary of the city's image, stemming from continuous mimetic responses (by architects) to the existing built environment (Kelbaugh *et al*, 2008: 198).

Rossi's second principal type of architecture (that forms the city) is the "primary element" (Kelbaugh *et al*, 2008: 198). The primary element is the "artifact of a city" that is, the "element(s) capable of accelerating the process of urbanization in a city" (ibid). Kelbaugh following Rossi, claims that a primary element,

> *"is a complete entity unto itself: it does not require an* immediate aesthetic relation *to its surroundings. In fact, primary elements are most often considered such because of their disassociation with previously established patterns"* (*author's* emphasis) (Kelbaugh *et al*, 2008: 198).

Kelbaugh asserts that cities attain primary elements as they "grow worthy" of them (ibid). That is, "when an aspect of its culture grows unique to that of a greater whole, a piece of architecture will be constructed to serve as an artifact, freezing that uniqueness in time" (Kelbaugh *et al*, 2008: 199). This line of thought leads to questions regarding the role of specialized or iconic buildings in the urban fabric – suggesting that building without a culturally "worthy" reason may not be desirable (Go'mez *et al*, 2001; Crumbaugh, 2001; Plaza, 1999).

By embracing adaptive reuse, there is an opportunity to consider the "notion of site" – taking into account both urban and architectural 'spaces' (Cooke, 2010: 50). Architecture exists in the context of urban forms, but also forms part of them – a blank wall can be an edge for instance. Blank walls can be transformed.

Taking usefulness into account, sketching out individual elements of the city enables the conceptual investigation of physical forms and spaces. These may be traced to their perceived roles in the urban environment, and therefore to sustainability and Place theory. This renders urban theories relevant to the topic of adaptive reuse and moreover to the design component of this paper.

2.1.3.2 Urban Theory and Practice in Context

In this section, ideas regarding contemporary urban practice are reviewed. Firstly, the compact city approach is briefly reviewed as a reaction to the segregated development resulting from the tenets of modernist and apartheid planning. The notions of density, multi-functionality and climatic determinism are discussed in terms of sustainability. Secondly, a contemporary approach to transforming existing urban structure is examined, with a brief look at the The Klipfontein Corridor Project by Louw and Dewar. With regard to the research problem and the topic of this paper, this section serves to demonstrate the relationship between planning and architecture, such that urban design decisions invariably bind architecture to a pre-determined urban framework, thereby affecting the way architecture can contribute to a more sustainable context. The demonstration of contemporary notions regarding urban (re)development in South Africa aims to provide a basic point of departure from which an approach to adaptive reuse in context may conceptualised.

Ambrose Adebayo, in his article entitled 'Viewpoint', claims that "cities in Africa have evolved from traditional cities, through the influences of colonisation and apartheid political ideologies, manifested in the spatial planning of monofunctional segregated city development" (Adebayo, 2002: 352). Segregated development has indeed been the case for South African cities. According to Jenks *et al:*

> *"The separation of land uses, urban elements, and racial and class groups leads to mono-functionality, rather than a mix of uses"* (Jenks *et al*, 2004: 211).

Mono-functionality is perceived as anathema to sustainability, from the point of view of efficiency as well as from an existential perspective as exemplified by Alexander's theories of overlapping sets (Jencks, 1997) and patterns (Alexander, 1977), and from a socio-cultural and socio-economic perspective. Mono-functionality is a characteristic of mechanical components in a larger mechanism – a cog in a watch for instance. Conversely, a mix of uses (multi-functionality) is regarded as integrative and sustainable, in that there is a greater diversity in relation to proximity.

Adebayo suggests that "sustainable African cities will only be achieved through approaches geared towards reducing dependency, efficient and realistic fiscal policies and a reversal of economic decline by African governments" (Adebayo, 2002: 351). He points out that urban sustainability is, in part and in *context,* about dealing with "high rates of urbanisation and population growth" (ibid: 352). On this basis, Adebayo champions a "compact city" approach to planning:

> *"Compact city planning aims at promoting high density, mixed used development, combined with integrated development planning for effective management of the city as an integrated whole"* (ibid).

Similarly, Wood also finds the "compact city" approach desirable, claiming that:

> *"There are many reasons to reinforce the principles of the 'compact city' in the sense that unbridled, senseless urban sprawl remains and is increasingly unacceptable as a sustainable urban pattern"* (Wood, 2008: 60).

Slaev (2004) gives reasons why the compact city approach may be considered sustainable and desirable:

> *"…housing density predetermines the value and the performance of the basic factors of urban sustainability – i.e. not only the consumption of land resources, but also much of the rest factors – the efficiency of urban services, the efficiency of the transportation options, etc. Density of communities is associated with efficiencies of infrastructure and with reduced automobile dependence, with ecological and economic implications which flow from that (Alexander & Tomalty, 2002)"* (Slaev, 2004: 7).

Even though Slaev does not make a direct reference to the compact city, the principles of high-density and mixed use, the characteristic pattern of urban centres in Southeastern Europe are similar (Slaev, 2004: 1). He explains that higher urban density is envisaged to "contribute to a range of ecological, social and economic benefits" such as:

> *"efficient use of land and less pressure to convert agricultural land to urban uses, reduced car use and reduced commuting distances; greater clientele and employee base due to more mixed land uses; better access to social services due to more mixed land uses and shorter distances; reduced consumption of water and energy; greater efficiencies in the provision and use of infrastructural systems; improved quality of life for a wide variety of people by providing services and amenities closer to home; improved variety of housing types and greater housing affordability"* (Slaev, 2004: 7).

In summary, the compact city approach is a based on efficiency and multi-functionality. The notion of proximity between dwelling and working is a vital factor, in that it reduces dependence on transportation, one of the contingencies associated with social and environmental degradation.

However, the compact city approach remains largely abstract if represented by efficiency quotas and planning principles alone. In order to transform the principles into tangible forms, there is a need for physical context. When planning, designing, or adapting, it is pertinent to consider environmental factors such as climate and location.

Golany suggests that "there is a strong correlation between urban climate and the urban design physical configuration and form pattern" (Golany, 1995: 148). For example, in a hot humid climate, good ventilation (figures 1.80 & 1.81) is highly desirable in the streets as well as in dwellings.

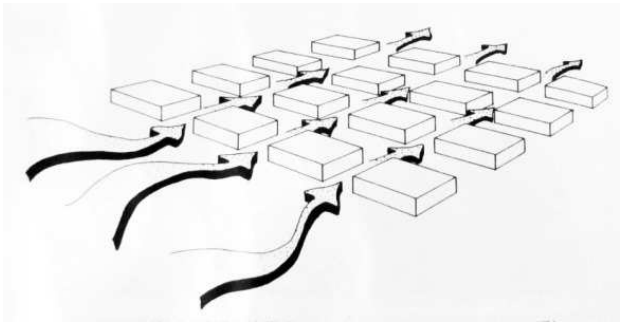


Figure 1.80: "Design for swift urban ventilation suitable for hot-humid city" (Golany, 1995: 164).

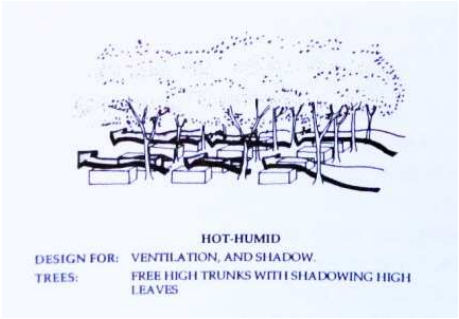


Figure 1.81: "Design for ventilation and shadow". Trees are used as a design element (Golany, 1995: 168).

Golany claims that taking climate into account "is not an issue of perception and comfort only. It represents the health, social well-being, and productivity of the inhabitants as well" (Golany, 1995: 170-171). Climate may be regarded as a determining factor in planning and architecture. For example, the "natural windbreaks, open park landscapes and urban cooling passages" of the Ridgeside Development in Umhlanga, north of Durban, resulted from a response to the local subtropical coastal climate (Cooke, 2008: 44). Figure 1.82 shows the urban layout in relation to predominant air movement.

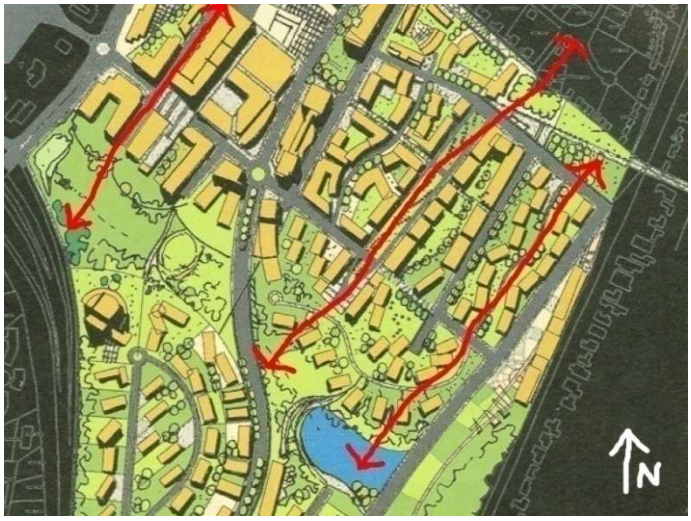


Figure 1.82: Partial site plan of Ridgeside Development. Drawing altered by author to show south-east/north-west winds (red) and north (Source: Cooke, 2008: 47).

Other contemporary practitioners are engaged with transforming existing urban structures in order to reverse the effects of apartheid planning. The "structural characteristics of the modernist and apartheid informed city" are based on the reductionist and functionalist philosophy of modernism, notably CIAM (Cooke, 2008: 20; Jenks *et al*, 2004: 210). As continuously suggested by the author,

context is important, that is; "*contextual realities* should inform the making and management of settlements", and so acontextual qualitative theories and viewpoints are of limited value (author's *emphasis*) (Cooke, 2008: 12). In 'The Urban Design and Planning work of Louw and Dewar', *Architecture South Africa*, (Cooke, 2008), Louw and Dewar share their approach to the 'The Klipfontein Corridor Project' (KCProject) in Cape Town:

> *"The initiative, it was argued, should be seen as a restructuring instrument to begin, over time, to reverse the structural characteristics of the modernist and apartheid informed city: promoting compaction, rather than sprawl; integration, as opposed to fragmentation; mixed-use, as opposed to mono-functionality; sustainability rather than waste; non-motorised transport (NMT) and public transport-dominance, as opposed to the dominance of the private vehicle; uniqueness, as opposed to standardisation; and choice, as opposed to imposition of a lifestyle"* (Cooke, 2008: 20).

The KCProject's aims towards increasing mobility whilst reducing movement *and* increasing choice, is an obvious manifestation of Alexander's 'tree vs. Semi-lattice' theory regarding the 'living', sustainable urban framework pattern (Cooke, 2008: 20). Significantly, this approach to planning requires a minimal amount of alteration to infrastructure and focuses on synthesising the "transportation spines" of the perceived "urban corridor" with new zoning and density amendments (Cooke, 2008: 18-20). For the latter, it is noted that high residential densities are a "prerequisite for achieving adequate thresholds of support for economic and social facilities" (Cooke, 2008: 20).

For this research, the most significant aspect of this approach is the way existing building stock is considered with respect to transforming public and urban space:

> *"Central to the issue of the quality of the spatial environment is public space - a primary responsibility of all buildings is to contribute to the quality of the public spatial environment and, in this, background buildings are as important as foreground buildings"* (Cooke, 2008: 19).

The designers' approach towards "optimising the assets of the place" and "promoting qualities of 'street', as opposed to 'road'" are considered as both urban and architectural issues (Cook, 2008: 19). Indeed, the role new and old building stock emerges as part of the overall urban transformation.

2.1.3.3 Analysis and Discussion

The theories of identification allow for critical analysis of urban forms and spaces. If architecture is considered in relation to the figural void of the city – i.e as the walls of the 'room' of the street – *and* as the articulator of both internal and external spatial and social domains, then the urban issues of lost space and continuity, the tree vs. semi lattice, can be addressed through adaptive reuse.

The structural characteristics of modernist planning are also embodied in existing urban and building stock (figure 1.83). The process of 'reversal' of the apartheid city plan, as insinuated by the KCProject, is not limited to the urban framework. The author argues that certain existing building stock is as a symptom *and* cause of urban and social fragmentation, thereby requiring interpretation from both urban and architectural theories and practices. Subsequently, the primary analysis and design concerns are typology and proximity.

Figure 1.83: The aforementioned urban intervention in Warwick Junction was aimed at connecting pockets of activity towards achieving a socio-economic sustainability. The concept of spatial continuity allowed 'lost' urban space to be transformed into an active public corridor. The author argues that the concept of spatial continuity can be extended to encompass building stock (the train station, centre of figure), thereby raising questions regarding approaches to adaptive reuse (Google Maps, 2011).

Conclusion

This sub-chapter constitutes the basic groundwork for the analysis and design components of this paper. It is considered significant in the dissertation in that it equips the reader with some understanding of the intimate relationship between urban design, architecture and the conceptual possibilities of adaptive reuse. In the first section, several theories were used to explain the city as a physical, spatial and typological habitat. The second section was a brief review of approaches to urban planning and design in South Africa, with an emphasis on the reversal of apartheid planning.

CHAPTER 3 - ADAPTIVE REUSE

3.1 INTRODUCTION

> *"Adaptive reuse is a process by which structurally sound older buildings are developed for economically viable new uses"* (Woodcock, 1988: 49).
>
> *Adaptive reuse includes the processes of "rehabilitation, remodelling, repair"* (Woodcock, 1988: 4).

Following the background on the issues to be discussed, this chapter is presented in three parts. The first part examines the approaches to adaptive reuse, namely preservation, conservation, and demolition. The second part studies the relationship between adaptive reuse and the three pillars of sustainability, and shows how the pursuit of sustainability is strongly linked to adaptive reuse. In part three, the notions of continuity and place relating to a broad understanding of social sustainability, are explored within the context of adaptive reuse.

3.1.1 Background

Cantacuzino, like many other authors, claim that there is "nothing new about buildings changing their function . . . because structure tends to outlive function" (Cantacuzino, 1989: 8). The evidence of this is all around us (figures 2.01 & 2.02). It is fact that throughout history, buildings have continuously been adapted to various new uses (Cantacuzino, 1989: 8).

Figure 2.01: Fort at Jaiselmer, Rajastan, India. The fort has been converted into hotels and other tourist facilities (Author, 2011).

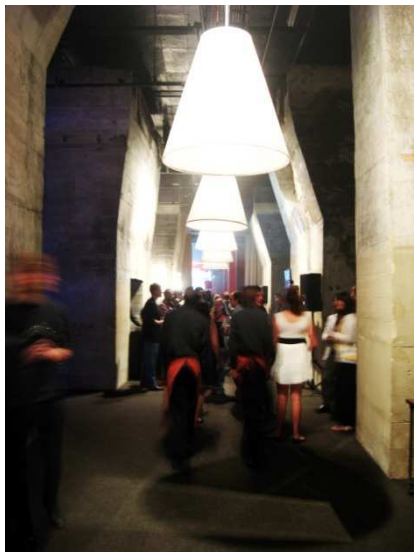


Figure 2.02: Turbine Hall, Johannesburg, South Africa. The old power station has been converted into an upmarket multi-purpose venue (Author, 2010).

Until the Industrial Revolution, the "common pattern was for buildings to be adapted to new uses; only since then has it become more usual to demolish and build new" (Cantacuzino, 1989: 8). In the US and Europe, adaptive reuse as an approach to redundant building stock has been practiced with vigour over the last 40 years. Fortunately state aid, participation, and public interest are significant

factors in the relative success of rehabilitation endeavours (Cantacuzino, 1989; Diamonstein, 1978; Woodcock, 1988). In South Africa, the architectural tradition of adaptive reuse appears to range from the utilitarian to the sentimental, such as the recent conversion of an historic Drill Hall in Cape Town into a City Library (Figures 2.03 & 2.04) (Cooke, 2007: 34-37). Built in 1885, the Drill Hall has lain unused for over twenty years. Now reused, the City Council of Cape Town is credited for instigating the project, although an "ongoing forceful encouragement from the Carnegie Corporation of New York" suggests that some local conservation projects are partial to international interests, perceivable economic and/or political (Cooke, 2007: 35).

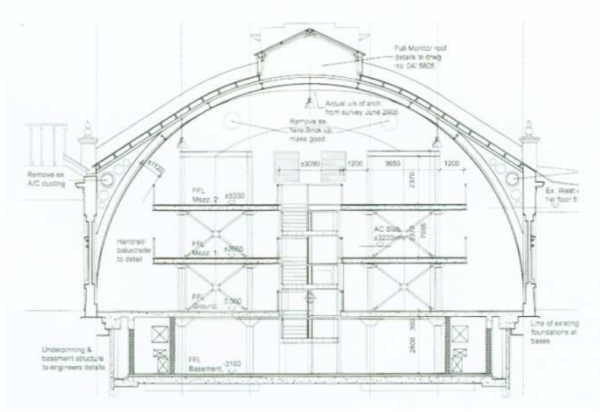


Figure 2.03: Maximising internal FAR in a functional, pragmatic way. Alteration is restricted to the interior of the shell (Cooke, 2007: 37).

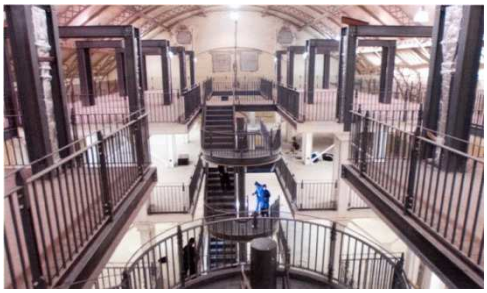


Figure 2.04: The alteration "still 'in the raw'" before "finishes, colour, handrails, the all important bookshelves, computer stations, furniture, signage and task lighting" are installed (Cooke, 2007: 37).

Conversely, other adaptive reuse projects are criticised for being out of touch with today's market "demand for resources" (Cooke, 2011: 19). The conversion of the Thesen Island Boiler House (once powering Knysna and Plettenberg Bay) into a 24 room hotel (figure 2.05) is an example of a hybrid approach between historic preservation ('mummification') and conservation in which existing materials and structures preserve a "sense of history", at the expense of potentially rentable floor area now showcasing mechanical "relics" (figure 2.06) (Diamonstein, 1978; Cooke, 2011:18).

Figure 2.05: South western view of hotel after conversion (Cooke, 2011: 17).

Figure 2.06: "Can the loss of so much space to museum pieces be justified by the objects they house? Is the preservation of so much embodied energy of the retained plant as museum pieces justifiable in today's market with its demand for resources?" (Cooke, 2011: 19).

Before the digression into local examples, it was stated that adapting buildings to new uses was considered normal practice until the Industrial Revolution. In essence, the efficiency of machine-work and industrial mass-production has facilitated the historically "common pattern" of changing buildings to diminish (Cantacuzino, 1989: 8). Frampton suggests that modern (contemporary) architecture became "conditioned not only by its own technical methods", which were made possible by advances in industry and technology, but also by "productive forces lying outside itself", namely political, ideological and market forces (Frampton, 1985: 9). In the past, Modernist social housing epitomised this notion (figure 2.07). However, formal purism eventually gave way to experimentation (figures 2.08, 2.09).

Figure 2.07: Politically and ideologically conditioned planning and architecture. Modernist social housing in Brasilia (1950's) based on Functionalism and a social/autocratic ideology (URL020).

Figures 2.08 & 2.09: The Metabolist's approach to design was to create large scale, flexible – "expandable" structures "that evoked the processes of organic growth" (URL 021; 022; 024).

Today, a prime theme in the field of architecture, encapsulating the combined forces of industry, technology, politics and the "lifestyle" market, is iconic architecture. This may be regarded as the fruit and loins of the "culture-ideology of consumerism" (Sklair 2006; 25). Yet, the idea of iconic buildings is not new. In the early 20th century, Germany was preoccupied with "designing cultural objects for an international middle class", with an emphasis on craft, mass production and high quality (Frampton, 1985: 110-2). Indeed, the spirit of the machine age brought about (and continues to do so) different conceptions of mans relation to architecture. Frampton posits that:

> *"while furniture and equipment as produced … ought to be accepted as the ready-made objects of the culture, the built environment itself could and indeed should still be made to conform to a higher order"* (Frampton, 1985: 147).

This "higher order" of Modernism was also one obsessed by the idea of the new, and the idea of buildings as finished "product objects" (ibid: 114). For cities, in the pursuit of the new...

> *"...modernist planners became thieves of memory. Faustian in their eagerness to erase all traces of the past in the interest of forward momentum, of growth in the name of progress, their 'drive-by' windscreen surveys of neighbourhoods that they had already decided (on the basis of objective census and survey data, of course) to condemn to the bulldozer, have been, in their own way, as deadly as the more recent drive-by gang shootings in Los*

> *Angeles. Modernist planners, embracing the ideology of development as progress, have killed whole communities, by evicting them, demolishing their houses, and dispersing them to edge suburbs or leaving them homeless"* (Sandercock, 1998: ii).

With regard to adaptive reuse, it is evident that the modern approach to architecture involved a denial of a past in which "re-use and reworking of architecture" was considered normal (Diamonstein, 1978: 14). Yet, the materials, technologies and tectonics developed by industry resulted in something which traditional means could not fully realise: structural and spatial flexibility leading to the "free plan" (Frampton, 1985: 164; 166). As demonstrated in the Cape Town Drill Hall, industrial materials and tectonics are now utilized to revitalize and upcycle redundant building stock. Moreover, the efficiency of mass production and the plasticity of industrial materials allowed for modulation and rapid construction, resulting in unprecedented building types and new ways of interpreting and integrating the new and the old (figures 2.10, 2.11).

Figure 2.10: Centre Pompidou in Paris. The "externalised skeleton" supports large spans which render the interior rooms extremely flexible – there are no internal supports, hence the notion of an "open structure" (Gössel *et al*, 2005: 458).

Figure 2.11: Roof Conversion for a Lawyer's Office, Vienna – Coop Himmelb(l)au (Gössel *et al*, 2005: 509).

Adaptive reuse is the name given to the normal practice of recycling buildings. Modern technology and construction has changed how and why this occurs. Indeed, some cases of redundant buildings are precisely because technology or industry has changed, for instance the Thesen Island Boiler House. Much the same can be said for rail stations, hangers, power plants, warehouses and so forth. The following section is a summary of the different physical approaches to adaptive reuse.

3.2 Approaches to Adaptive Reuse

When faced with an "existing historic resource", a building, there are three alternatives in dealing with it: "…*keep* it, …*change* it, or … *destroy* it" (Woodcock, 1988: 6). The fourth alternative is to "*return* a historic resource", that is to "re-create something that was previously destroyed" (ibid). The primary determining factor to any one of these approaches is money. Laurence E. Reiner suggests that before rejuvenating or restructuring a building, the actors involved must:

> *"first make sure that the finished product will serve the need of the market (whether expressed or latent), that it will be completely useful for its new purpose, and that it will be competitively priced"* (Reiner, 1979: 1).

Each of the three alternatives to adaptive reuse has different implications regarding sustainability and all its corollaries. As suggested, economic feasibility is the primary factor, but some suggest that project value may be "indirectly related to economic development", as in the case of unique preservation projects for instance (Wash. U, 2000: 851).

3.2.1 Preservation

To preserve something, is to "maintain [it] in its original or existing state" (Soanes & Stevenson, 2004: 1135). In terms of adaptive reuse:

> *"'Preservation' means the act of retaining all or any part of a structure, even if it is moved from its original location. "Restoration" refers to any treatment given to a building after the decision has been made to preserve it"* (Woodcock, 1988: 4).

This approach, when applied to outstanding or unique pieces of architecture, may be the most desirable. A successful preservation of an old church for example, renders the building a useful piece of history, whereby it has social value to those in the church, historic value to academics amongst others, and in some cases a tourist market value. Also, such a building may contribute to the greater urban framework by being a "landmark" or a "primary element" (Lynch, 1960: 8; Kelbaugh, 2008: 197).

Woodcock suggests that "the museum approach to preservation, while appropriate in some cases, will not work as a general pattern" (Woodcock, 1988: vii). The critique of the aforementioned Thesen Boiler House conversion was precisely along these lines. Indeed, for the majority of ordinary buildings, rigid preservation limits their usefulness, especially when there is a need to respond to a changing urban environment, contemporary user needs, and emerging or existing markets (Cooke, 2011: 16-19). Referring to the changing urban environment, Lewis claims that:

> *"Building design and urban design are inseparable. At every level from the social to the environmental the two are intertwined. The best spaces and buildings are designed from the 'outside' in and the 'inside' out simultaneously. Their designers imagine what the*

conditions will be for occupants and passers-by and the results are exciting, rewarding experiences" (Lewis, 2005: 18).

The notion of *rigid* preservation is, for ordinary buildings, antithetical to sustainability. This is perhaps because "preservationists think of preservation as an end in itself" (Woodcock, 1988: 8). Citing Lynch, Woodcock argues that to "preserve effectively, we must know for what the past is being retained and for whom" (Woodcock, 1988: 12). To keep a building without reason is to arrest its life cycle thus denying its usefulness. Diamonstein suggests that buildings have been kept alive by "consciously changing their roles" (Diamonstein, 1978: 14). Indeed, the examples cited so far have been demonstrative of the second approach toward adaptive reuse: *change*.

3.2.2 Conservation

Old buildings are changed or renovated "to provide stimulating environments for uses unheard of at the original time of construction" (Woodcock, 1988: viii). Changing a building involves adapting an existing structure to meet the needs of the new tenants or users. Change could involve elements of restoration, recycling, rehabilitation, remodelling and so on, and the phenomenon is referred to as "conservation" (Woodcock, 1988: 6).

In summary, conservation or change of a building is perhaps the most common approach to adaptive reuse, because it is often the most economically efficient and the most sensible (Woodcock, 1988; Diamonstein, 1978; Cantacuzino, 1989). However, Reiner suggests that the success of this approach depends on an "intelligent developer" (Reiner, 1979: x). The following is an example of such an instance.

The Gasometer in Vienna (figure 2.20), Austria is a prime example of conservation of redundant structures, with a focus on both architectural and urban issues. The four "monumental brick cylinders" which originally housed "tanks for the gas supply of Vienna", were converted into housing in 2001 (URL50).

Figure 2.20: Gasometer, Vienna (Source URL50)

The adaptive reuse process of the Gasometer towers involved dividing the building's framework into "several zones for living, working ... entertainment and shopping", while conserving the "historic exterior wall" (figure 2.21) (URL49). According to architects Coop Himmelb(l)au, "it was only the concept formulating the transformation of monuments into a center ... that enabled to preserve monuments economically" (URL50). The project as a center includes "a music hall...movie theatre, student dormitory, municipal archive, and so on" (URL49). In effect, the monumentality, or 'singularity', of the structures did not necessitate a single approach to their use, but rather, the scale of the structures allowed for the creation of a "city within a city" or "village" (URL49, 50). The scale and form of the existing brick cylinders was used as a point of reference for the new adjacent structures, informing the quality and articulation of urban space emerging from the dialogue of forms (figure 2.22).

Figure 2.21: 3D Section, Gasometer, Vienna (Source URL50)

Figure 2.22: The new abuts the old – the figures articulate a gateway creating a positive outdoor space (URL023).

This approach to adaptive reuse and urban design is highly efficient and effective, and may be considered sustainable from an enviro-economic point of view. More importantly, it is an example of socio-economic sustainability and place-making resulting from the creation of an unique cultural icon; characterised as a city within a city. Kushner argues that social sustainability is achieved by creating an environment that "both attracts investment and generates a sense of community" (Wash. U, 2000: 851). A key element of this "revival" is the notion of generating a "sense of excitement and optimism among the community's population", and this can be done by "activities such as historic preservation...or the development of unique projects that reflect the community's history and offer recreation for residents and tourists" (Wash. U, 2000: 851). This notion is inherent in the adaptive reuse approach to the Gasometer cylinders. In short, intelligent conservation of redundant structures results in economic, social and environmental sustainability. However, approaches to adaptive reuse vary significantly.

In contrast to the aforementioned precedent, the Culver City Colony (figure 2.23) is an example of another post-modern approach to dealing with existing building stock on a far smaller scale. In this case, only "a brick wall and regimented rows of double bow-string trusses" have been retained and the rest demolished, thereby diminishing the environmental and economic benefits of reuse (Davey, 1999: 56). However, in terms of 'place', the notions of continuity, history, time and material are strongly expressed through a highly artistic articulation between old and new (figures 2.23, 2.24), between past and present.

Figure 2.23: Culver City Colony, CA (Davey, 1999: 56).

Figure 2.24: Interior (Davey, 1999: 58).

While the Gasometer in Vienna is a prime example of conservation through adaptive reuse, the Culver City Colony cannot be considered such. While the Colony incorporates pre-existing elements through reuse, the 'new' nevertheless supplants the 'old', reducing the latter to ornament. Consequently, this precedent serves as an introduction to the following section.

3.2.3 Demolition

When neither keeping nor changing a building is an option, there is the choice to *destroy* it. In the case of Pruitt-Igoe in St.Louis, U.S., the buildings (figure 2.30) were demolished because they were considered as contributing to the "qualitative decline" of living conditions (URL48). Coleman, in *Utopia on Trial* argues that the high blocks of modernist housing "are regarded as creating anonymity because they segregate

Figure 2.30: Demolition of Pruitt-Igoe (URL48).

people at different levels instead of allowing the normal interactions that take place on the street when houses are on the ground" (Coleman, 1985: 32).

The conventional view is to regard the destruction of a building as generating an enormous amount of waste. However McDonough in *The Next Industrial Revolution* (1998) suggests that there is a need to reconsider the meaning of waste (McDonough, 1998: 86). He posits that "waste" is actually "food"; that is, "waste" is a resource (McDonough, 1998: 86). Waste implies uselessness, yet there is nothing useless about a good brick, a good window frame, or indeed any sound material or component - new or old.

Given this notion, it is more useful to consider the process of destruction as a process of dismantling. To clarify, "destroy" means to "put an end to the existence of (something) by damaging it or attacking it", whereas to "dismantle" means to "take to pieces" (Soanes & Stevenson, 2004: 389, 412). While it is possible to destroy a building, it is not possible to "put an end to the existence" of the materials and components from which it was constructed (ibid). When a building is taken to pieces, what is left are the materials and components from which it was constructed. It is not only possible to reuse these resources, it is sensible to do so from an economic and environmental point of view.

However despite the reusability of so-called waste from dismantled buildings, a lot of existing building stock (especially old building stock) may contain hazardous material, such as asbestos, vinyl, adhesives, paints and other materials containing volatile organic compounds (VOCs), thereby limiting reusability or warranting demolition (Gerretsen, 2011: 4).

The following sub-chapter is a summary of the advantages and disadvantages of recycling buildings – in whole or in part – with regard to sustainability theory.

3.3 Adaptive Reuse and the Three Pillars of Sustainability

The concept and process of adaptive reuse is strongly linked to sustainability. Both adaptive reuse and sustainability are concerned with the efficient and effective use of available resources, whether directly or indirectly. This section reviews some of the advantages and disadvantages of adaptive reuse from the economic, environmental and social aspects of sustainability theory.

Adaptive reuse has flexible application. As a concept or process, adaptive reuse may apply to a garden gate, a 10 storey apartment building, and work just as well for "mediocre 20th-century buildings as for glamorous Victorian mansions or colonial warehouses" (Diamonstein, 1978: 21). Despite this, Woodcock suggests that for the designer:

> *"…reusing and adapting handsome old houses and commercial buildings requires relatively little imagination* [but] *industrial structures require greater consideration, though they can also offer greater flexibility for new applications"* (Woodcock, 1988: 20).

Arguably, it is the availability and quality of knowledge about a building that triggers 'imagination'; whereby the more one knows about the building, the more effective the conceptual faculty becomes at formulating response to the perceived issues. Yet as Woodcock points out, for old houses and commercial buildings, it is not so much about imagination as it is about knowledge. Woodcock claims that "compatibility between old and new demands an in-depth knowledge of previous methods of construction" (Woodcock, 1988: ix). In addition, from a qualitative point of view, the 'new' is sometimes required to act as a "respectful backdrop" and at other times "encourage the best of 'new' and 'old' to be foils to each other" (Woodcock, 1988: ix).

Highfield suggests that "it should not always be assumed, because a building is old and of traditional construction, that its structural quality is high" (Highfield, 1987: 2). This leads to the notion of *economy* in adaptive reuse.

3.3.1 Economic

> *"There is little point in rehabilitating and reusing old buildings if the costs are going to be greater than those of a new construction, unless, of course, there are overriding environmental benefits as in the case of buildings of architectural or historic interest"* (Highfield, 1987: 3)

> *"The economic argument for rehabilitation is a powerful one...conversion work is labour-intensive, employing thousands of small builders, whereas new building tends to be capital-intensive. New building is energy-consuming, where conversion work is energy saving"* (Cantacuzino, 1989: 11).

There are multiple economic advantages to reusing a building rather than starting from scratch. Highfield argues that "there are often architectural advantages, which can be translated into financial advantages, in keeping attractive old buildings and rehabilitating them to provide modern accommodation" (Highfield, 1987: 8). These architectural advantages are:

i) Old buildings are considered by many to be "more attractive to certain users" (Highfield, 1987: 8).
ii) An attractive old building adds "potential value" to buildings and places in its close proximity (Highfield, 1987: 8).
iii) "in the majority of cases, the 'new' accommodation will be available in a much shorter time" (Highfield, 1987: 2).

With regard to material costs, Diamonstein claims that:

> *"Recycling means big savings in re-used materials, and savings of another kind as well, because new buildings generally employ large amounts of materials like glass, steel, and aluminium, which are energy-intensive – that is, they consume inordinate amounts of energy to produce"* (Diamonstein, 1978: 26).

Conversely, there are several economic disadvantages to adaptive reuse. Diamonstein suggests that:

> *"…adapting a building usually means installing modern heating, cooling, electrical, plumbing, and fire prevention systems, all of which are apt to eat up the savings realized elsewhere"* (Diamonstein, 1978: 26).

In more detail, there are costs involving:

1) "upgrading internal surfaces" (Highfield, 1987: 42)
2) "upgrading the fire resistance of existing elements of structure" (ibid: 26)
3) "upgrading thermal performance" (ibid: 47)
4) "upgrading the acoustic performance" (ibid: 61)
5) "preventing damp penetration" (ibid: 67)
6) "preventing condensation" (ibid: 74)
7) "eradicating timber decay" (ibid: 81)

Lastly, Highfield suggests that:

> *"The most important factors that determine whether or not rehabilitation is viable are: the expected rental income (in speculative developments); the estimated cost of development; the cost of acquiring the leasehold or freehold of the site; the cost of finance"* (ibid: 3).

All of these factors contribute towards the overall feasibility of conservation over demolition or dismantling. With regard to "installing modern heating [and] cooling", this may vary according to climate (ibid: 3). Further, depending on the size of the building, heating and cooling may be achieved through passive design in the process of adaptive reuse. For cooling, passive design aims to "enhance natural air circulation" (as opposed to mechanical or 'active' air conditioning), and in the case of heating, relies on good orientation and thermal mass (McGeough, 2004: 24). Reusing badly orientated buildings, for instance, may be more costly as they necessitate the use of mechanical equipment for environmental control.

3.3.2 Social

> *"conservation projects are labor intensive and create jobs … often these jobs require the learning of new techniques … programs that help participants develop permanently useful skills"* (Woodcock, 1988: viii)

> *"Shaping the local environment towards desired ends is a key to mental health; the present environment, blank and unresponsive, is a key to idiocy and brainwashing"* (Jencks & Silver, 1973: 15).

Highfield suggests that "medium and large scale rehabilitation of existing housing has important sociological advantages" (Highfield, 1987: 8). Firstly, he posits that the "creation" of new communities is a complex process, *Utopia on Trial* (1985) providing evidence of this, and that preserving established communities is "preferable to the alternative of wholesale clearance and new development" (Highfield, 1987: 8). As suggested earlier, economic viability is widely regarded as the primary determining factor for reuse. Yet, Woodcock argues that the social implications of recycling redundant buildings outweigh the financial burdens:

> *"If a community can encourage reinvestment in the fabric of the inner city, creating jobs during construction, jobs in revitalized businesses, greater stability and safety in the community, an improved visual environment, and an ultimate increase in tax base, then the use of capital improvement funds would seem a small cost to pay"* (Woodcock, 1988: ix).

Perhaps the most obvious sociological benefit of adaptive reuse, apart from the upgrading of a building to meet the contemporary needs of the client, is the reinterpretation and articulation of the relationship between the building and the street. As mentioned in the concepts and theories, the street is considered a key factor of social sustainability. Woodcock suggests that the recycling of redundant buildings is an "important first step in changing the character of the area from one of disrepair and neglect to one of vital pedestrian activity and a sense of safety for residents, workers, and shoppers" (Woodcock, 1988: 96). He acknowledges the role of adaptive reuse in transforming the "street environment" (Woodcock, 1988: 96). As stated, "building design and urban design are inseparable", meaning that adaptive reuse has the capacity to affect both public and private spheres of society (Lewis, 2005: 18).

One of the social disadvantages of adaptive reuse, particularly with regard to class discrimination, is the notion of gentrification. Woodcock suggests that in the US there is a "...typical displacement of the poor or minority residents due to the 'gentrification' of a neighbourhood through the influx of predominantly white, upper-middle-class residents" (Woodcock, 1988: 13/14). Diamonstein suggests that gentrification in some cases has resulted in the "forcing out of established residents, often the poor, the elderly, the racial minorities, from neighbourhoods that have been rediscovered and revitalized" (Diamonstein, 1978: 22-23). Despite this perceived class discrimination, gentrification "has proved to be good for cities by increasing tax revenues, encouraging retail shopping, and improving the physical fabric" (Diamonstein, 1978: 23). It is evident that in some cases, there may be conflict between economic and social incentives.

A local example of gentrification of existing building stock is the regeneration of the Point Waterfront in Durban (2003), where "six utilitarian warehouses" were converted into upmarket mixed-use housing (figures 2.35) (Cooke, 2007: 42-45). As part of the greater Point Waterfront development, the old warehouses were adapted to respond to the perceived future needs of the whole precinct, hence the mix of uses and retail on ground level (Cooke, 2007: 44). With

Figure 2.35: A long history of change: "The building was altered in 1901 when a portion of the building was increased from single to double storey and an elaborate cast iron veranda was added to both floors. This veranda no longer exists, but will be reconstructed in accordance with the original drawings" (Cooke, 2007: 44).

regard to the qualitative aspects of gentrification, namely those associated with privacy and 'place', one of the design considerations was capturing views of the harbour mouth, and an additional "two floors of loft units" were to be added at roof level, set back from the street elevation to achieve a level of privacy (Cooke, 2007: 44-45).

3.3.3 Environmental

> *"Preserving a limited number of outstanding buildings, while failing to retain and enhance the more modest streets and space that form their proper setting, has been likened to keeping the cherries out of the cake and throwing the cake away"* (Diamonstein, 1978: 13-14).

The preservation of the natural environment and its resources is strongly tied to the economic sensibility associated with recycling buildings. The rationale is logical:

> *"Recycling means big savings in re-used materials, and savings of another kind as well, because new buildings generally employ large amounts of materials like glass, steel, and aluminium, which are energy-intensive – that is, they consume inordinate amounts of energy to produce"* (Diamonstein, 1978: 26).

Woodcock argues that "the total energy embodied" in existing buildings "represents a real resource that is non-renewable" (Woodcock, 1988: ix). The concern over embodied energy (and indeed renewable energy) is central to the environmental agenda, in that resources are considered finite and therefore valuable. To demonstrate, Woodcock suggests that "eight bricks in a wall have the approximate energy embodiment of one gallon of gasoline, the amount of new energy that would have to be used to replace them" (Woodcock, 1988: 13).

The environmental disadvantages associated with adaptive reuse are parallel to the economic disadvantages. Some of these are, as stated, the installation of new heating and cooling systems, fire prevention systems and the upgrading of internal spaces to meet the demands of current building and safety standards (Diamonstein, 1978; Highfield, 1987). Also, as mentioned, old building stock may contain hazardous materials.

3.3.4 Analysis and Discussion of Sub-Chapter 3.3

> *"The* Bauhaus *taught architects to shape space to fit the function – 'form follows function.' That's and inductive process. But recycling is a deductive process. First you look at space and then deduce what kind of functions it will accept"* (Diamonstein, 1978: 28).

The economic and environmental implications of recycling buildings suggest that adaptive reuse is a fundamentally sustainable practice – in terms of efficient and effective use of resources. Insofar as this research is concerned, there is a need to critically analyse adaptive reuse *in context.* Much of the literature reviewed is alien to the local context in terms of place and time, although an attempt has been made to use local precedents as support. This gives significant meaning to the idea that

decisions regarding adaptive reuse, "must be made locally, based on … recognition of events of local significance" (Woodcock, 1988: 12). Apart from market demand, determining factors of the feasibility of adaptive reuse include labour, material costs, material availability and skills. In addition, Woodcock argues that adaptive reuse endeavours "often touch on the issues of identity, scale, and continuity of the urban fabric", thereby rendering the designer's capacity to design as another determining factor (Woodcock, 1988: viii). The aforementioned issues of identity, scale and continuity, the author argues, are part of a social sustainability which is specific to culture, place and time. The following section addresses these notions.

3.4 Adaptive Reuse, Continuity and Place

> *"…whatever the life, spirit, activity, or achievements of the city may be, they are expressed in the mass of asphalt, brick, stone, marble, steel, and glass that has accumulated during the city's existence"* (Diamonstein, 1978: 13).

> *"Because their structure tends to outlive their function, buildings have continuously been adapted to new uses – a fact which has enabled generation after generation to derive a sense of continuity and stability from their physical surroundings"* (Diamonstein, 1978: 15).

Highfield suggests that "one of the principal reasons for the rehabilitation of non-domestic buildings is obsolescence" (Highfield, 1987: 19). Yet, the "built environment is the most tangible record" in man's possession, and is "the most palpable proof of civilization's continuous evolution" (Diamonstein, 1978: 13). How is the process of adaptive reuse able to reconcile "obsolescence" of structure and space, with the notion of continuity, and how can the old be adapted to the new (or *vice versa*), in order to evoke or demonstrate a feeling of the "continuous evolution"?

As demonstrated previously with the Culver City Colony (Davey, 1999: 56-59), the notion of continuity may be pursued with a post-modernist creative flair. On the more practical side, the idea of continuity with regard to adaptive reuse may simply be a case of rehabilitating a structure for a new purpose, as demonstrated with the Drill Hall to Civic Library conversion (Cooke, 2007: 34-37). A local example which achieves continuity between interior and exterior spaces, as well as between the past and the present, is the Workshop in Durban CBD (figures 2.40, 2.41).

Figure 2.40: The East side of The Workshop (Brett, 2010).

Figure 2.41: The north side of The Workshop – an urban in- between space buffers the park (left) from the building (right). Seating ensures its usefulness (Author, 2010).

Originally a railway station, the Workshop building was converted into a "shopping complex with mezzanine floors added at strategic points" and was connected to the public or urban realm on three of its four sides (Howe, 2003: 8). The sensitivity with which the building was adapted is reflective of a culture which places value and significance on the past.

The forthcoming case study examines in detail, the notions of place and continuity. As discussed, time and memory are central to the idea of place-making, therefore existing buildings may be regarded as valuable in that they have a "familiarity" which makes for "livability and comfort" (Diamonstein, 1978: 15). Diamonstein suggests that to preserve the past, is "to provide an anchor for our collective memory" (Diamonstein, 1978: 13).

3.5 Analysis and Discussion of Chapter 3

The literature and precedents reviewed reveal each approach to adaptive reuse as unique to its setting and determined by project specific requirements, rendering no two rehabilitation projects alike. Subsequently, the ways in which adaptive reuse can contribute to a more sustainable context depends upon several factors. These can be better discussed in terms of their qualitative and quantitative value.

From a quantitative perspective, the recycling of buildings as opposed to demolishing and rebuilding, results in the conservation of materials, energy and capital. Recycling is primarily an economic issue, to which environmental and ecological benefits are corollary. Conservation of the environment whether natural or man-made, does not emerge as the primary incentive of adaptive reuse, only a result. Perhaps only historic preservation is the exception, in which the incentive to keep buildings for the sake of history or culture overrides the possibility to transform a building into an economically geared asset. However although this is also variable, such as the tenement of Sigmund Freud in Vienna, Austria preserved for the esoteric interests of paying tourists.

From the qualitative perspective, the recycling of buildings has several significant impacts. Firstly, the conservation of structures, entire or partial, allows an experiential continuity between the past and present and between old and new. With regard to the psycho-social aspects of Place theory, the various creative approaches to keeping the 'old', even in fragments, reinforces the notion that to preserve the past is "to provide anchor for ... collective memory" (Diamonstein, 1978: 13). Secondly, the adaptation of old structures to suit contemporary demands overlaps with a similar need to reinterpret the urban realm, as suggested by the concepts and theories. The recycling of buildings to suit new functions coincides with the incentive to reform urban spaces and frameworks

in order to make them more socially and economically valuable and attractive to the contemporary urbanite, such as the Gasometer.

According to the literature reviewed, the value of 'place' is determined by sentiment, curiosity, history, memory and conditioning. Its qualitative meaning pertains to the human faculty which encompasses emotion, feeling and irrationality. It appears that, without the notion of 'place' there is no value or criteria by which to analyse or discuss anything other than the dry quantitative 'benefits' of conserving materials, energy and money. Significantly, the purely subjective notion of 'place' is found and articulated in almost every precedent, suggesting that this is the fundamental significance of adaptive reuse.

In environmental and economic terms, the quantitative and material value of *all* man-made structures renders the recycling approach the obvious choice in terms of the circular metabolism that is characteristic of genuine sustainable patterns and systems as in nature (Golany, 1995; Girardet, 1996). In sociological and psychological terms, the material, spatial and philosophical richness of evolved and adapted buildings renders the experience of place simply more intense and interesting. It is precisely the difference between architecture conceived as active and changing and architecture as static, a complete product object, that partly determines the process and product of recycling buildings. The case study on page 82 explores the former conceptualisation of architecture as continuously evolving, alongside the tenets of place and sustainability.

Conclusion

This chapter defined adaptive reuse as "a process by which structurally sound older buildings are developed for economically viable new uses" (Woodcock, 1988: 49). Also covered in this chapter – and illustrated where possible, were three basic approaches to adaptive reuse: preservation, conservation and demolition. These approaches were briefly assessed in terms of the three pillars of sustainability, and it was shown that economic sensibility with regard to recycling existing building stock results in environmental, social, and economic benefits. Also, the relation between adaptive reuse and social sustainability through 'place' was explored, and it was shown that conservation projects result in historically and culturally rich environments which support the notion of place through memory: i.e. they contain a certain "familiarity" associated with the notion of place (Diamonstein, 1978: 15).

4.0 CASE STUDY – Adaptive Reuse in Durban – Bartel Arts Trust (BAT) Centre – 'The BAT'.

From – sea rescue / naval cadets & sea scouts (SAS Inkonkoni building)
To – art development and community centre (retail, restaurant, bar, performance hall, exhibition hall)
Location – small crafts harbour, Victoria Embankment, Durban, South Africa
Year of completion – 1994
Architect: Paul Mikula (Architects Collaborative, Durban)

This study has been carried out using the following research methods: site visits; interview with architect; user questionnaire and participation; the internet and its resources; the library and its resources.

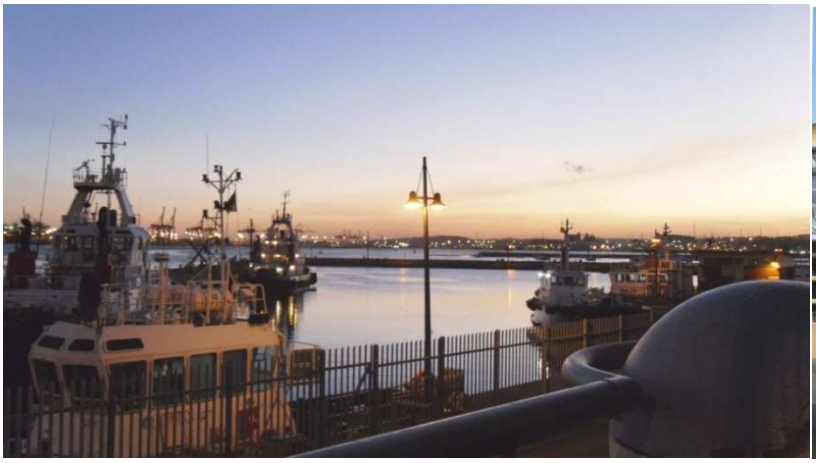


Figure 3.00: View from the terrace (Author, 2011).

Figure 3.01: Street entrance (Author, 2011)

4.1 Introduction

Part one of this case study contains documentation from primary secondary sources, which provides historical, cultural, climatic and visual data aimed at giving the reader a better understanding of the nature and context of the case study. In part two, the case study is related to the primary concepts and theories, thereby providing a theoretical context for the analysis and discussion. Briefly, these concepts and theories are sustainability, place, and theories of analysis and design.

Drawing from the issues discussed in the literature review the following case study seeks to address some of these and establish criteria for analysis and design. Briefly, these are the need for conceptualization of the process of adapting existing buildings and the evaluation of methods and incentives of adaptive reuse, with regard to sustainability theory (emphasis on social aspect), and Place theory.

4.2 Justification

The BAT Centre was chosen as a case study because of its history and socio-cultural value. The development of the BAT Centre as an adaptive reuse project ties strongly with the social and economic factors of sustainability. In addition, it has acquired something of an iconic status as a

venue for the arts, and as a piece of distinctly contextual design, thereby initiating the enquiry into those phenomenological or qualitative values which make it a 'place'.

4.3 Historic and Cultural Setting

It was during the time of democratic change in South Africa (1994) that the BAT centre was conceived (Mikula, 2011). The building was to be on "neutral ground", somewhere not exclusive to a particular group, but accessible to all people (Mikula, 2011). According to the architect, Durban is an unique case in that it has always been "securely racially divided" (ibid). Before people of different colour were forcefully segregated by the law, they were already living in their own communities and districts, all of which converged in the hub of the city of downtown Durban. Hence a site (figure 3.10) in the small-crafts harbour was chosen, as it was accessible to both harbour and downtown Durban. Today the BAT Centre is a place attracting many publics; a place where, as one user described, people of "all ages, races and sexes come together for a party" (Appendix A, pg. 109).

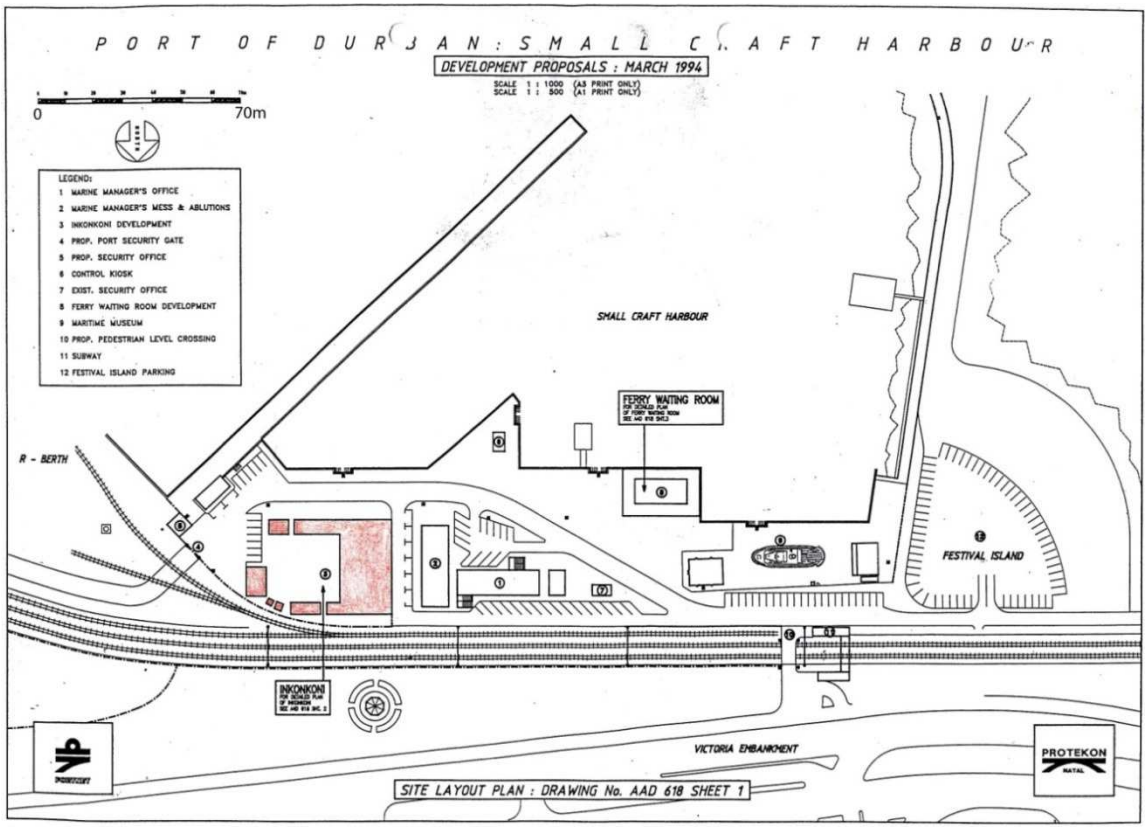


Figure 3.10: Site plan showing existing SAS Inkonkoni building in red. Scale bar edited by author for clarity (Architects Collaborative, 2011).

4.4 Climatic Setting

The BAT Centre is located in the Small Crafts Harbour in the coastal city of Durban, kwaZulu Natal. This region experiences a mild sub-tropical climate (humid in summer), with rainfall distributed throughout the year (annual rainfall: 1009mm), although heavier in summer (figure 3.11) (URL025). There is an average of 2343 hours of sunlight per year with an average of 6.4 hours of sunlight per day (URL026). As a result of this climate, natural growth is vigorous, and occurs all year round. A high number of evergreen species means that Durban stays green in the winter months. The effects of the warmer Indian Ocean are such that mild temperatures are experienced in winters. This climatic setting is undemanding on people as temperatures never drop below freezing, and uninterrupted rain periods rarely last longer than two weeks.

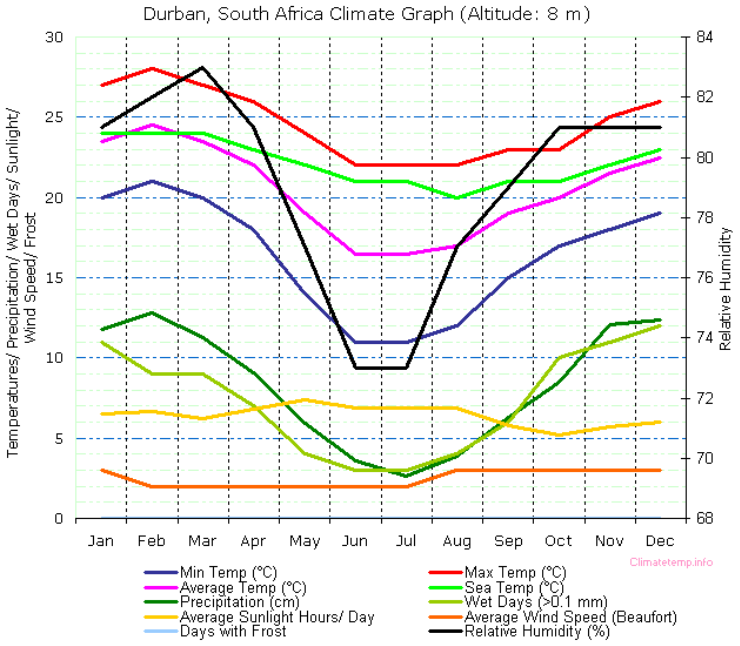


Figure 3.11: Durban Climate Graph (URL026).

4.5 Architects Proposal - Motivation & Design Intentions

As established in the literature review, the recycling of buildings is largely about the processes leading up to the eventual artefact as 'final' product. Therefore it is necessary to examine the motivations and design intentions, in order to delimit and inform the evaluation of the study in the analysis and discussion.

One of the primary agendas and concepts was inclusivity, from the conceptual process, to construction, to the building's function. In the architect's design report, a motivational statement refers to catering for fisherman, harbour workers, tourists, school children, visitors from "wherever" and businessmen (Mikula, 1994: 2). It is also stated that the BAT Centre "must not become elitist nor must it degenerate into a beer drinking, loud raucous den" (Mikula, 1994: 2). Clearly the aim was one of social integration across gender, age, profession and social class.

Catering for so many groups would allow the BAT Centre to function diurnally, having a positive impact on security and business and providing a socio-economic benefit across many sectors. Moreover, the notion that people from considerably different backgrounds would share the same space, leads directly to the question of architectural language, informing a spatial and aesthetic language. More specifically, the challenge was in creating an environment that is physically and conceptually accessible to all: an environment that can become a *place* for all.

Planning and design intentions were also based on a premise of inclusivity. It was envisaged that the "Harbour Cafe" (BAT) and the Maritime Museum would "complement each other in terms of scale and expression, and would be connected by a tree'd 'square'", however this proposal was never realised (Mikula, 1994: 3). Other urban design intentions include more trees in the parking lot, conceptualised as an extension of the "square", outdoor furniture and lighting in the "square" itself, and pedestrian links across the railway tracks which were also never realised.

According to the design report, "Harbour Cafe" (BAT Centre) has been designed as a "low key verandahed pavilion" (figures 3.20, 3.21) (Mikula, 1994: 4). This approach considers climatic as well as historic context. The report suggested that users would "take advantage of the all around views" (ibid). This is strongly reflected in user responses to the author's questionnaire, with many references to "great view", the "breeze" and the "verandah" as a favourite place within the building (Appendix A, pg.112).

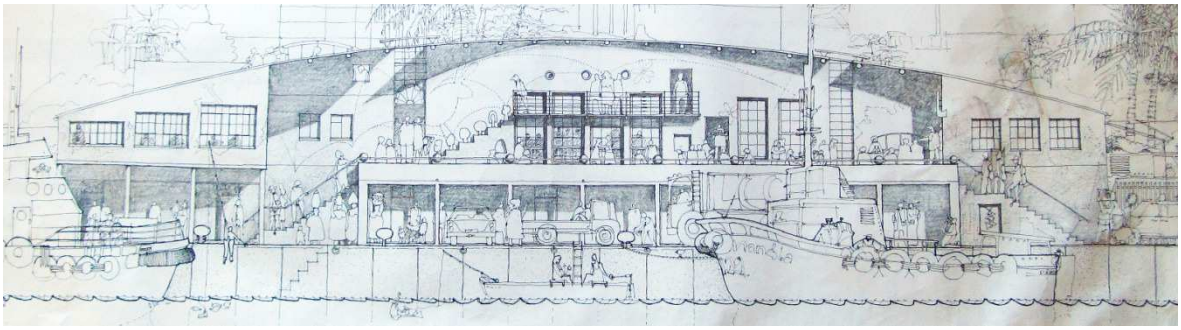


Figure 3.20: Architects rendering of elevation showing verandah overlooking small-crafts harbour. Not to scale (Architects Collaborative, 2011).

Figure 3.21: The BAT in 2006 (URL027).

4.6 Approach to Adaptive Reuse

The BAT Centre was integrated into the existing SAS Inkonkoni Building (figure 3.30), of which the architect claims nothing was demolished (Mikula, 2011). This follows from the architects philosophy that the "art of architecture is to use resources sparingly and make the most out of the least" (ibid). Recycled windows are used as design feature elements (figure 3.31, 3.32)

Figures 3.31 (left), 3.32 (right): Different types of recycled windows characterise the new building (Author, 2011; Architects Collaborative, 2011).

Figures 3.30: SAS Inkonkoni Building before additions and alterations (Architects Collaborative, 2011).

During the interview, the architect explained how for months, people were "scrounging around" for materials to recycle into the new building whilst at times, "contributions ... just happened" (Mikula, 2011). Some of these materials have tangible histories, like the 1930's Union Period Cape Dutch doors for instance (ibid). Technical apparatus such as industrial "fans used in chicken houses" have also been reused and fitted as an alternative to air-conditioning (Mikula, 2011). For Place theory, the qualitative value of historic phenomena such as the Cape Dutch doors, the significant form of which evokes the notion of time, ought to contribute to a sense of place. However such an assumption is yet to be tested.

Today, there is an agreement between the architect and the BAT Centre, whereby the architect is allowed to "take elements of the building away...so long as they are replaced" (Mikula, 2011). The architect also notes that the building was designed to last for 20 years. This mentality towards

adaptive reuse and design rejects the idea of buildings as homogenous, but instead supports the notion that buildings are part of a continuous cycle, that they can change – and *have to change* – with new needs and that they are heterogeneous artefacts in continuous evolution. The notion of a cycle, more specifically a closed cycle or circular metabolism, is central to the idea of eco-effectiveness and sustainability.

4.7 Social significance

The project has significance in the history of the makings of the New South Africa, in that the clients of the BAT Centre, artists from the city and outlying rural areas, were also its trustees (Mikula, 2011). This step ensured the welfare of both artists and the future of building itself.

The BAT Centre was conceived, in part, out of a participatory relationship with the client at a three day conference, at which the clients were simply asked "what do you want?" (ibid). Moreover, the construction phase of the BAT Centre was seen as a "training project" for the contractor, whereby builders would learn as they worked (Mikula, 2011). This participatory approach is sympathetic to the notions of social sustainability, in that the building programme was partly generated by the end users own needs and desires, just as the construction itself was geared towards education through participatory practice.

It was never the aim of the BAT to be a centre for excellence, but rather a place where "talent" can gather from all corners of the greater Durban area including rural areas to "feed off each other" (Mikula, 2011). In a sense, the aim was to support the *unknown* community, and not the established one, the latter being – in theory – an already established group of artists.

The spatial organisation and open circulation (figure 3.40), of the BAT Centre allows for various user groups to interact. Patrons have direct access to resident artist's studios, and there are no 'exclusive' areas, allowing for integration. In addition, the performance space (17) is acoustically and visually linked to the verandah overlooking the harbour, the bar, and the artist's studios, effectively providing a shared experience to a cross section of users. Despite this, the functionally different parts of the building have their own spatial character and provide specifically to the requirements of users, not unlike rooms of a large house.

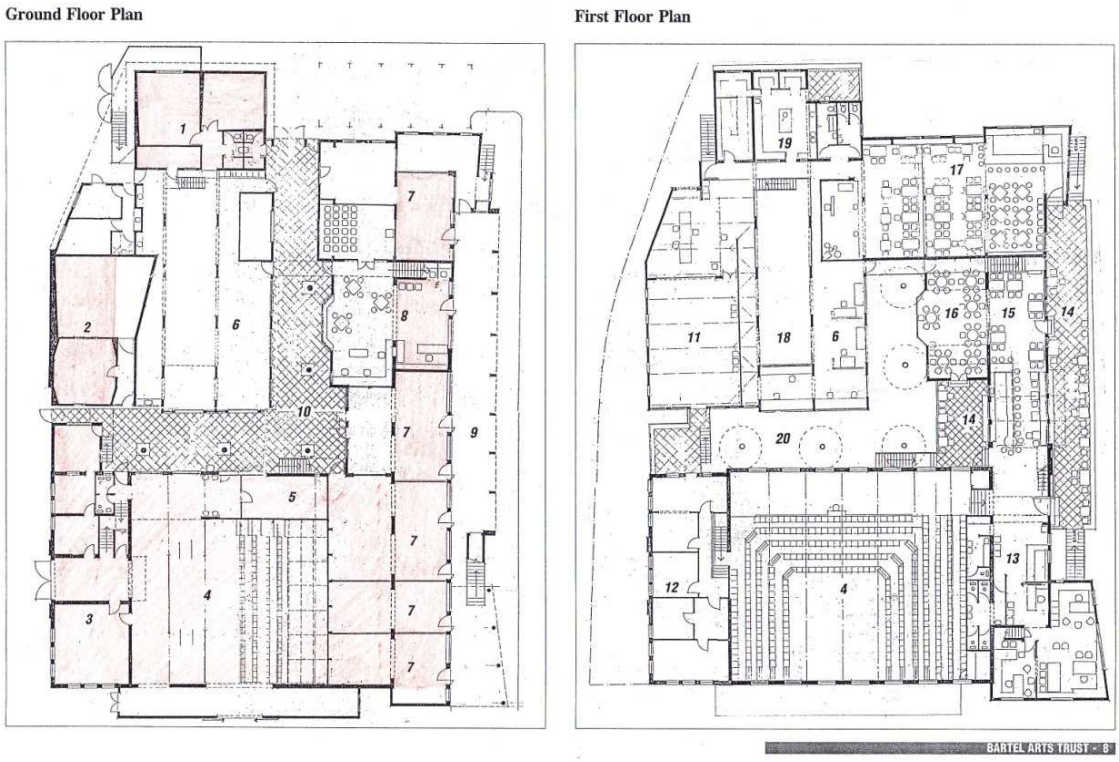


Figure 3.40: Ground floor and first floor plans of the BAT showing existing SAS Inkonkoni building in red. Note the L-shaped courtyard shown by a red dashed line. Not to Scale. (Architects Collaborative, 2011).

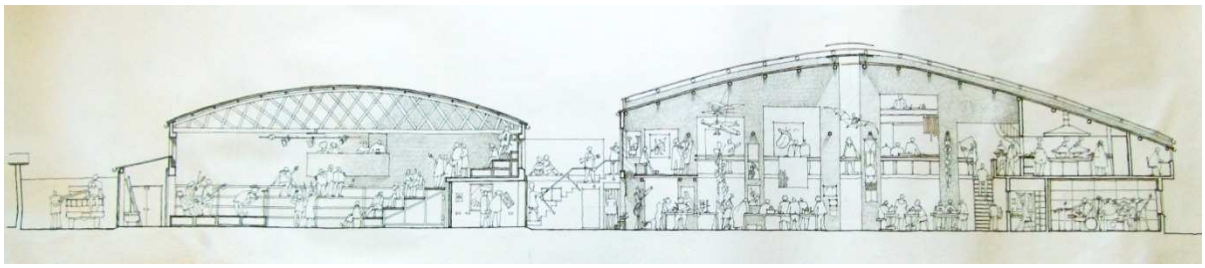


Figure 3.41: Cross section showing spatial relationship geared towards social interaction. Not to scale (Architects Collaborative, 2011)

4.8 Analysis and Discussion

In the case of the BAT Centre, adaptive reuse has been about process as well as product. The process is based primarily on anthropocentric values such as place over space and people over artefacts, and basic ideas of social sustainability. Dr. Walter Peters suggests that even in its genesis, the BAT Centre had the aspect of "some human development programme" (Peters, 1996: 1) With regard to process, the following were emphasised:

Participation: direct contact with the clients resulted in a brief that is sensitive to end users needs. In addition, the architect perceived a need to create identity starting at the earliest stage in that people needed to know they were building a "symbol of the new South Africa" (Mikula, 2011).

This process is sympathetic with criteria for good place-making, in that from inception of the project, the clients or end users, have a personal connection with the artefact. This is of course assuming there is such a thing as criteria for place-making. User participation and education from the point of building inception creates positive relationships between user types which range from the professional to the semiskilled artisan or labourer. Participation is central to social and economic sustainability.

Recycling: reusing building materials and components is enviro-economically sensitive in terms of embodied energy and costs. However it is a labour intensive process, and travel costs mitigate any value based on embodied energy.

Sensitive adaptive reuse (abstinence from demolition): This process affirms the conservationist notion that history has unquantifiable worth and contributes positively to place. That there was no notable attempt to distinctly differentiate between new and old suggests that the overriding social issues at the core of this project were more important than a superficial rendering of the past, or that the original structure held no architectural merit. Peters describes the remodelling as an "eating up" of the existing building, "with additions informed by the former and then thoroughly metamorphosed" (Peters, 1996: 1). The design is thus an example of an organic synthesis or integration between old and new.

With regard to building as product, The BAT Centre currently supports many local artists both visual and musical, providing them facilities for production, and performance or exhibition. The BAT Centre's economic strength is in its status as a cultural icon, providing a wide range of experiences, for a variety of user types. As an arts centre and performance venue, it contains all the necessary facilities to sustain a local and macro economy centred on production, reproduction, retail and exhibition and performance.

With regard to the enviro-economic notions of sustainability through water harvesting and alternative sources of energy, this case exhibits neither approach. A limited budget and anthropocentric ethic meant that the primary focus was on design, not resource security. However, in terms of future alterations or additions, the roof design allows for efficient harvesting of rainwater, as it directs water onto either sides of the building (east-west), where facilities such as toilets and kitchens are located. The architect's philosophy of using resources sparingly to "make the most out of the least" is both environmentally sensitive (in terms of embodied energy and waste) and economically sensible in terms of expenditure and return (Mikula, 2011).

Insofar as materials and building components are concerned, in the context of design and tectonics (figure 3.50), the approach to adaptive reuse may be considered a type of *ad hoc* Critical Regionalism – one that demonstrates the "possibilities of our polygot, multi-cultural society" and is a "resource which will grow" (Peters, 1996: 3). In terms of design, there is apparently less emphasis on the building as a "free-standing object" but instead, there is a "stress on the territory" which is established by the erected structure (Frampton, 1985: 327). Figures 3.51 - 3.53 show the transformation of an amorphous lot to an internal courtyard, which now serves multiple users/uses at different times.

Figure 3.51: L-Shaped courtyard before addition/alteration (Architects Collaborative, 2011).

Figure 3.52 & 3.53: After addition alteration. The L-shaped courtyard (refer to plan) has the characteristic of an internal street (Author's photographs, 2010).

Figure 3.50: Artist's studio interior. According to Frampton, critical regionalism "tends to treat all openings as delicate transitional zones with a capacity to respond to the specific conditions imposed by the site, the climate and the light" (Frampton, 1985: 327). The opening shown in this photo, as signified by the *gradient of light* in the underside of the corrugated sheeting - facilitates cross-ventilation in the hot-humid climate, and also allows one to sense the natural passing of time (Author's photograph, 2010).

4.9 Conclusion

This first part of this case study looked at the historical and cultural setting of the BAT Centre. It was shown that the approach and process contained a strong social agenda, within the socio-political context of 1994. This was revealed in the motivation for the building to be on "neutral ground" (Mikula, 2011). Secondly, the approach to adaptive reuse was examined, revealing that a

synthesis between old and new was achieved with minimum impact on the existing building stock. Climatic factors, as well as those associated with *genius loci* (such as the harbour view) were, apart from the existing framework of the SAS buildings, important determining factors in the design of the new building.

In the analysis and discussion, the issues of environmental sustainability concerning natural income were raised. By current standards, the adaptation would have been considered more environmentally sustainable 'Green', had it incorporated passive solar systems, water harvesting mechanisms and the like. Such measures, the author posits, are an unnecessary expense of energy and capital, until they are desired by the users. As previously suggested, it requires the participation and motivation of groups engaging in "sustainable behaviour" to render it feasible in the long term (Lahlou, 2009; Hodge *et al*, 2009).

5.0 ANALYSIS AND DISCUSSION - Comparative Findings of Summaries.

In order to avoid unnecessary repetition, this section is exclusively dedicated to 'answering' the research question and testing the hypothesis against the literature reviewed (inclusive of the concepts and theories). For the benefit of the reader, the research problem and the hypothesis are restated:

- *Research Problem:* How can architecture and building contribute to a more sustainable context?

- *Hypothesis:* Recycling and rehabilitating through the process of *adaptive reuse* would result in sustainable architecture and building that relates to place and time. The ills of modern practices which have led to ecological destruction and social decay may be dealt with through an anthropocentric environmentalist approach to adaptive reuse in architecture.

Firstly, in reference to the research problem, the recycling of buildings (adaptive reuse) is implicit in the idea of 'architecture'. In order to demonstrate how adaptive reuse would contribute to a more sustainable context, there is a need to identify what existing and/or obsolete buildings *represent* in context. The following interpretations are chronologically related to the issues raised from the start of this document:

- In the context of the global pursuit of sustainability, existing and/or obsolete buildings represent embodied energy; that is, an existing resource with quantitative value.
- In the context of the global phenomenon of increasing urbanisation, existing and/or obsolete buildings represent objects of conceptual, entrepreneurial and socio-economic value.
- In the (hypothetical) context of Place Theory, existing and/or obsolete buildings represent the manifestation of *the passing of time relative to man*; that is, an existing resource with qualitative value.

Similarly, there is a need to identify what the process of adaptive reuse *represents* in context:

- In the context of socio-economic sustainability, adaptive reuse (as a *process*) represents opportunities for different groups of society – as relating to the stages of the process. Moreover, if the approach to recycling buildings is towards self-sufficiency, the *product* of adaptive reuse represents long term socio-economic and environmental security/sustainability.
- In the context of environmental conservation or preservation, adaptive reuse represents an opportunity to revitalise/rehabilitate (be it man-made environments or natural) the very context in which the building exists.
- In the context of urban regeneration or rehabilitation, the recycling of buildings represents an opportunity to create a synthesis and symbiosis between forms and functions across scales and realms (ie. private, semi-private, semi-public, public).

The hypothesis emerges as principally true from a quantitative point of view. There are economic benefits, which translate into environmental (embodied energy) and socio-cultural ones (place – continuity, history, memory). However, the author posits that the notion of 'sustainable architecture' is the Achilles' Heel of the hypothesis, in that Sustainability is a fundamentally misunderstood and bankrupt ideology, over and above the fact that much of the time, the word sustainable is used in paradoxical and contradictory fashion (*The Next Industrial Revolution,* McDonough, 1998).

When considered objectively, the pursuit of sustainability in architecture is an idea seeded by those who control information in the media and in educational institutions. The idea of sustainability, now more of an ideal, attempts to render the interest of the collective, an ambiguous group of people who have unquantifiable expectations, and the ecological welfare of the earth which sustains us, not *vice-versa*, as the primary concern of designers (architects). It appears that there is a subconscious attempt to consign architecture as a servant of ideology which seeks to undermine the craft and practice of designing and building by placing before the student or practitioner a set of rules or moral incentives to which to comply. Perhaps the question is: has architecture ever been free of an ideological or political tainting? By the standard of our times, and by the authors understanding and experience, the answer is no. However, as free individuals, future architects are left only with a self-realised and self-prescribed ethics and philosophies to guides their actions (Delancey, 2004; Golany, 1995). Therefore, sustainability as an approach cannot be considered more or less *correct* than any other, even though the quantitative and qualitative results may be deemed 'right' or 'good' by those who hold interest in the matter.

As for adaptive reuse, the historically normal practice remains in the shadows of architectural education. Indeed, the so called 'ills of modern practice' are perpetuated in the institution. Students of architecture are indoctrinated into believing that a building has a final form, a single purpose, one life, and that it is a consumable product. As this dissertation has shown, buildings *are* consumable products, but unlike Gucci underwear or an Audi TT, buildings can and *must* change, in order to continue being useful, and therefore contribute to a more 'sustainable' context.

6.0 CONCLUSION AND RECOMMENDATIONS – Test Research Questions and Hypothesis

Adaptive reuse, if understood as a process guided by ethical incentive(s), which in turn determine(s) the approaches to conceptualisation, communication, and action, invariably results in a sustainable architecture related to context. Irrespective of the value of the ethic, which may be anthropocentric, or phenomenocentric and inclusive of the natural and man-made environment, and anything that qualifies as a resource (other than people), there are always quantifiable and qualifiable outcomes, which invariably support either one or more of the agendas of the pursuit of sustainability.

If Place theory is regarded as implicit in social sustainability in terms of its psychological impact, then the integration or synthesis of 'old' and 'new' is perceived as resulting in a valuable qualitative continuity of human experience 'through' time. Simply put, by reusing buildings and other structures, history and memory are allowed to remain within the context of our daily experience of Place, thereby enriching the perception of the world around us.

It is 'recommended' that existing buildings, whether used or not, be revaluated in terms of their *contexts.* That is, if buildings are perceived as part of social, economic and environmental frameworks or systems or metabolisms, it is possible to gauge the impact of their rehabilitation, recycling or redesign, using the appropriate criteria (utilitarian, sentimental, economic etc.). The author concludes that if the approach to adaptive reuse is considered as holistic, not unlike sustainability, and is determined by the realistic needs and opportunities arising from specific context, architecture emerges as both a process and a product inherently linked to the tenets of sustainability.

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APPENDICES

APPENDIX A – Questionnaire & Responses to Case Study: BAT Centre

Sample 1/11:

AGE: 32 GENDER: F EMAIL: taryn.10@hotmail.com

RESEARCHERS DETAILS: Name: Dimitar Dobrev. Cell#: 0715812568. Email: thedobrev@gmail.com

TAKE NOTE

i) This questionnaire is for academic purposes only.
ii) Confidentiality: Efforts will be made to keep personal information confidential. Your real name / identity are not needed. Absolute confidentiality cannot however be guaranteed. For example, personal information (in this case age, gender, and contact detail) may be disclosed if required by law.

Please answer the questions to the best of your ability. You do not have to answer all the questions, but it is preferred that you do. There are no wrong or right answers. Use your instinct.

1: Is this your first time at the Bat Centre? If 'YES', ignore the questions you feel you are unable to answer.

NO

2: On average, how often do you come here, and why do you come here?

Very often – for the music

3: What would you say gives the Bat Centre its character or spirit?

Bright, colourful building, decor, people, and for being right on the ocean (A)

4: Do you think the look of the Bat Centre contribute at all to this character, and why? (place).

YES! I commented on my way in, that these are my favourite toilets ☺ Homely, yet vibrant

5. What do you think of the look of the Bat Centre building?

See above (?)
I guess, from the outside, its a bit mis leading.) ! external app. is important. • legibility from outside.
Way more character inside

6: What words do you think best describe the atmosphere, or feeling of being here?

Relaxed, Chilled, Bright

7: Please describe / identify your favourite place (e.g. bar, verandah etc.) in the Bat Centre building, and give a short reason why. If you wish, you may identify more than one place. (place)

Toilet ☺, and the balcony → the sea
↳ bright

8: Do you think the Bat Centre is successful as an arts venue (visual, music)? Please give a short reason why.

Im involved in the music side, so can only comment on that, and its great for that

:) End. Thank You ☺

Sample 2/11:

AGE: 26 GENDER: Female EMAIL: thabsile.nombe@kznhealth.gov.za

RESEARCHERS DETAILS: Name: Dimitar Dobrev. Cell#: 0715812568. Email: thedobrev@gmail.com

TAKE NOTE

i) This questionnaire is for academic purposes only.
ii) Confidentiality: Efforts will be made to keep personal information confidential. Your real name / identity are not needed. Absolute confidentiality cannot however be guaranteed. For example, personal information (in this case age, gender, and contact detail) may be disclosed if required by law.

Please answer the questions to the best of your ability. You do not have to answer all the questions, but it is preferred that you do. There are no wrong or right answers. Use your instinct.

1: Is this your first time at the Bat Centre? If 'YES', ignore the questions you feel you are unable to answer.

Yes.

2: On average, how often do you come here, and why do you come here?

The atmosphere is good and there's not much crowd and the breeze feels good especially to overlook the sea. CLIMATE. PLACE/SETTING.

3: What would you say gives the Bat Centre its character or spirit?

The venue itself. [PLACE].

4: Do you think the look of the Bat Centre contribute at all to this character, and why? [AESTHETIC, PLACE]

Yes because the place and the way it's presented it gives it the vibe.

5. What do you think of the look of the Bat Centre building? ie. THE BUILDING FACILITATES ART.

It's perfect for the way it's presented and the paintings give very artistic.

6: What words do you think best describe the atmosphere, or feeling of being here?

Extraordinary

7: Please describe / identify your favourite place (e.g. bar, verandah etc.) in the Bat Centre building, and give a short reason why. If you wish, you may identify more than one place. [CLIMATE]

Verandah, because you can feel the breeze and overlook the harbour. It's a pleasant view at night. [PLACE]

8: Do you think the Bat Centre is successful as an arts venue (visual, music)? Please give a short reason why.

:) End. Thank You ☺

Sample 3/11:

AGE: 25 GENDER: FEMALE EMAIL: Bonnie@mobileGMAIL.redufone@gmail.com

RESEARCHERS DETAILS: Name: Dimitar Dobrev. Cell#: 0715812568. Email: thedobrev@gmail.com

TAKE NOTE

i) This questionnaire is for academic purposes only.
ii) Confidentiality: Efforts will be made to keep personal information confidential. Your real name / identity are not needed. Absolute confidentiality cannot however be guaranteed. For example, personal information (in this case age, gender, and contact detail) may be disclosed if required by law.

Please answer the questions to the best of your ability. You do not have to answer all the questions, but it is preferred that you do. There are no wrong or right answers. Use your instinct.

1: Is this your first time at the Bat Centre? If 'YES', ignore the questions you feel you are unable to answer.

2nd

2: On average, how often do you come here, and why do you come here?

Once or Twise a month

3: What would you say gives the Bat Centre its character or spirit?

It a good Place to be, many talent and its fine.

4: Do you think the look of the Bat Centre contribute at all to this character, and why?

It Fine at the moment. It Okay to be at all times

5. What do you think of the look of the Bat Centre building? [PLACE].

I love it, it has a greate view and the breeze is Supure cool!
└ CLIMATIC.

6: What words do you think best describe the atmosphere, or feeling of being here?

Cool, Exciting, Relaxed and fun to be.

7: Please describe / identify your favourite place (e.g. bar, verandah etc.) in the Bat Centre building, and give a short reason why. If you wish, you may identify more than one place.

Verandah.

8: Do you think the Bat Centre is successful as an arts venue (visual, music)? Please give a short reason why.

It a good Place to be and it very popular to the youth and others. And most People tell each other about it.

:) End. Thank You ☺