



**THE ROLE OF ARCHITECTURE IN DEVELOPING URBAN
SELF-SUFFICIENT LIVING: A PROPOSED YOUTH
DEVELOPMENT CENTRE FOR DURBAN'S INNER-CITY**

TAHIR SEEDAT

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ABSTRACT

The study investigates the role of architecture in developing urban self-sufficient living as an alternative to a lifestyle of consumerism, and the negative effects of consumerism and materialism on people's health and environment predominantly in urban areas. The study is justified because by researching what the role of architecture is in developing urban self-sufficient living and proposing an appropriate architectural intervention, we can encourage an alternate lifestyle to consumerism and develop urban self-sufficiency by utilising theories of minimalism and voluntary simplicity. There will be a reduction of the environmental footprint of living in urban areas, a sustainable and self-reliant community and an improvement in the quality of life.

A literature review is conducted which reviews literature concerning minimalism and voluntary simplicity with autonomous buildings, biotecture, permaculture, eco-minimalism and the small house movement as sub-theories. The literature review investigates the philosophies of these theories which concern various aspects of lifestyle. The literature further investigates the effects of consumerism and materialism on consumer behaviour and culture within the South African context. A conclusion is reached that the proposed architectural intervention is to be a youth development centre within Durban's inner-city.

Precedent studies are conducted which are based on their practical application of the theories and concepts investigated within the literature review.

Case studies of two projects, within the South African context, are conducted in order to expand on the information uncovered within the literature review and precedent studies. It was concluded through the case studies that the role of architecture in developing self-sufficient living, we also understand the importance of living a minimalist or simplified lifestyle as an alternative to consumerism.

Finally, the summary of the research document finds conclusions of the applicability of the key theories, based on the comparison of the literature review and precedent studies to the case studies. Recommendations are then made of the utilisation of these theories in the proposed youth development centre within Durban's inner-city.

DECLARATION

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

.....

Tahir Seedat

13th of June 2014

DEDICATION

To my Wife and Son

ACKNOWLEDGEMENTS

First and foremost, I thank my Creator, the possessor of all knowledge, for giving me the ability to undertake this research study.

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CHAPTER 1: BACKGROUND RESEARCH

1.1. INTRODUCTION

1.1.1 Background Statement

The following study is conducted on the role of architecture in developing self-sufficient living. This is due to the impact of consumerism on society and its subsequent effect on the way some people live their lives. It has been noted by personal observations that the impact of excessive consumption is far reaching and becoming self-sufficient can be seen as possible alternate lifestyle choice. It is hoped that this study may reveal information to encourage self-sufficiency within urban environments on a larger scale.

1.1.2 Motivation/Justification of Study

As stated in the background of this investigation, the effects of excessive consumption, which can be observed within all parts of the society, can be alleviated or reduced if self-sufficiency can be sustained within urban environments. By studying the role of architecture in self-sufficient living we may further understand the benefits and disadvantages of this lifestyle within urban areas and its ability to create sustainable living environments. This in turn may reduce the ecological footprint of buildings as occupants would consume less. The quality of the lives of people is an important aspect of well-being and one aspect of addressing this problem facing the many people could possibly be through improved architectural design. This study, if successful in the Durban area could possibly be adopted in other areas.

1.2. DEFINITION OF THE PROBLEM, AIMS AND OBJECTIVES

1.2.1 Definition of the Problem

Due to the system of capitalism and excessive consumption that is prevalent in most societies today, people have largely become materialistic and have developed an insatiable desire to accumulate material possessions. This has resulted in degeneration of health, community and home environment (Alexander, 2011: 1). Subsequently if some are to adopt a contrary approach, such as self-sufficient lifestyle, already mentioned, that sees people focusing their time and efforts on the essentials of life rather than the luxuries of life where preference is given to the qualitative and meaningful aspects of life such as family, hobbies and a stress-free lifestyle. However, they would not be able to achieve this due to the current design of buildings, the prevalence of consumerism in society, consumerist-orientation of the infrastructure that exist today, such as transport, housing and leisure. Often, people are forced to live in a certain way due to the existing services and architecture that are available to them, thus forcing them to adapt their lifestyle accordingly. The ecological footprints of buildings are ever-increasing and so are the needs of people, resulting in an unsustainable lifestyle (Trainer, 2009). A model of architecture whose primary objective is to encourage and develop a self-sufficient lifestyle within urban areas does not exist. Furthermore, the increase in urbanisation has resulted in an ever-growing need for affordable living. The effects of this problem are prevalent within urban and developed areas.

1.2.2 Aim

The aim of this study is to analyse the role of architecture in developing a self-sufficient lifestyle. This could provide guidance on the viability of creating a model of architecture for people to develop self-sufficiency within urban areas.

1.2.3 Objectives

To achieve the above aim, the specific objectives of this study are set:

- To investigate the design of established buildings, which promote self-sufficient living, in selected areas.
- To design, set up and test out an architectural model of self-sufficient living in the Durban area.

1.3. SETTING OUT THE SCOPE

1.3.1 Delimitation of Research Problem

The study is limited to the context of the Durban inner-city, South Africa, as the effects of the problem introduced above are largely evident within the urban context rather than the rural. The study will not delve into the idea of simplicity as a design style and its use as an aesthetic in architecture; rather it would explore the role of architecture in developing self-sufficient living.

1.3.2 Definition of Terms

- *Capitalism*: An economic system based on private ownership driven by endless growth.
- *Consumerism*: A social and economic phenomenon that encourages the continuous purchase of goods and services in increasing amounts.
- *Minimalism or Voluntary Simplicity*: Minimalism or Voluntary Simplicity encompasses a number of different voluntary practices to simplify one's lifestyle. These may include reducing one's possessions or increasing self-sufficiency, for example. Minimalism may be characterized by individuals being satisfied with what they need rather than want. Although asceticism generally promotes living simply and refraining from luxury and indulgence, not all proponents of Minimalism are ascetics. Minimalism is distinct from those living in forced poverty, as it is a voluntary lifestyle choice.

- *Self-sufficiency*: Self-sufficiency is the state of not requiring any aid, support, or interaction, for survival; it is therefore a type of personal or collective autonomy. The term self-sufficiency is usually applied to varieties of sustainable living in which nothing is consumed outside of what is produced by the self-sufficient individuals. Examples of attempts at self-sufficiency include simple living, homesteading, off-the-grid, survivalism, Do-it-Yourself ethic and the back-to-the-land movement.
- *Sustainability*: Sustainability is the capacity to endure. For humans, sustainability is the potential for long-term maintenance of well-being, which has ecological, economic, political and cultural dimensions.

1.3.3 Stating the Assumptions

The assumption is made that a self-sufficient lifestyle is a possible solution to the problem of capitalism and consumerism; furthermore it is assumed that there is a substantial amount of people who require a self-sufficient lifestyle.

1.3.4 Key Question

What is the role of architecture in developing an urban self-sufficient lifestyle?

1.3.5 Hypothesis

It is assumed by researching the role of architecture in developing urban self-sufficient living; we can encourage an alternate lifestyle to consumerism and develop urban self-sufficiency. There will be a reduction of the environmental footprint of living in urban areas, a sustainable and self-reliant community and an improvement in the quality of life.

1.4. KEY THEORIES AND CONCEPTS

This section explains the research of existing theories and concepts which will be used to facilitate this research project. The value of this research, it is hoped, will be to design and test out an intervention which might aid parts of society to adopt a self-reliant approach and minimise consumerism to improve the living conditions within urban areas.

The theories that are to be used within this research project are that of minimalism or voluntary simplicity. It can be seen as reducing material consumption and de-cluttering one's life. Voluntary simplicity can be defined as the lifestyle maximizing the individual's control over his own life and minimising the consumption and dependency. It is sometimes considered a sustainable lifestyle phenomenon, as it is characterised by less work, less consumption, and more time dedicated to leisure and meaningful activities (Argan, Argan and Sevim, 2013: 1).

The works of Trainer, Thoreau, Alexander and others are studied in order to gain an understanding of these concepts. Thoreau (1982) has discussed in depth his theories of a simplified lifestyle on a micro scale, concentrating on the individual and his needs, while Trainer (2009) has discussed with great detail the movement of society from our current system to that of voluntary simplicity on a global scale. The broad range of theories proves to be useful within this research project. In addition, ideas of self-sufficiency, sustainability and shelter amongst others are to be analysed in detail.

Sub-theories such as permaculture, autonomous buildings and the small house movement will be researched and analysed to further understand these concepts. These theories of a simplified lifestyle are paramount when designing a working model for self-sufficiency, which is to function within an urban environment.

1.5 THESIS STRUCTURE

1.5.1 Chapter 1: Background Research

A presentation of the background statement, motivation of the study, definition of the problem, aim and objectives is made. The scope of the study is set by the delimitation of the research problem, definition of terms, assumptions stated, key question and proposed hypothesis. Additionally the key theories and concepts of this study are stated.

1.5.2 Chapter 2: Research Methods

This chapter is an explanation of the method and process of research explained along with the research materials employed within the study.

1.5.3 Chapter 3: Literature Review

This chapter is a review of existing literature regarding self-sufficiency. In addition, a building typology is proposed. Existing concepts and theories of minimalism and voluntary simplicity are reviewed. Furthermore research is conducted to analyse the problem within the South African context.

1.5.4 Chapter 4: Precedent Studies

This chapter reviews, investigates and analyses existing buildings and projects that incorporate and have been designed around the concepts and theories investigated within the literature review.

1.5.5 Chapter 5: Case Studies

This chapter reviews, investigates and analyses existing local case studies of buildings and projects within the South African context.

1.5.6 Chapter 6: Conclusions and Recommendations

This chapter summarises the findings of this research document, it outlines the conclusions, while keeping the hypothesis in mind, and compares it to the aims stated at the onset of this research project. The conclusions made are presented with recommendations.

CHAPTER 2: RESEARCH METHODS & MATERIALS

2.1 RESEARCH METHODS

This section describes the methods that were adopted within this research project in order to determine the role of architecture in developing urban self-sufficient living.

The research is broken into primary and secondary sources. The secondary sources are firstly investigated, in the form of a literature review, in order to determine the existing information available and research conducted within this research topic. The information is sourced from journal articles, scholarly works and published books. Appropriate precedent studies of existing buildings which incorporate the theories and concepts which are researched in the literature review are then conducted in order to understand the practical application of these theories. The literature review analyses the parts of society which have already adopted a self-sufficient lifestyle as well as those who are faced with the research problem within the South African context in order to identify a target party. By identifying a target party we can design accordingly for their social, physical and psychological needs.

The primary sources are then utilised in order to expand upon the precedent studies. Case studies are conducted to analyse existing locally built structures which are self-sufficient in nature in order to learn from their construction and ideologies.

2.2 RESEARCH MATERIALS

Interviews are conducted with principal agents involved within the case studies. A questionnaire is presented to the principal agents that analysed their particular undertaking of urban self-sufficient living in order to fully investigate and

understand the background, underpinning ideas, process and future projection of their project.

2.3 CONCLUSION

The ideas that are presented by the secondary research are compared to the current context of Durban via primary research such case studies and interviews, in order to inform the architectural design of a working model of urban self-sufficiency.

The next chapter will be a review of the literature which was researched in order to facilitate the research project.

CHAPTER 3: LITERATURE REVIEW

3.1 INTRODUCTION

In this chapter a review of existing literature regarding self-sufficiency is conducted with emphasis on the role of architecture. In addition, a building typology is proposed that would aid in achieving this within Durban's inner city. Existing concepts and theories of minimalism and voluntary simplicity are reviewed in order to facilitate the design approach by relating them to the problems encountered and key questions stated earlier. Furthermore research has been conducted to analyse the problems of materialism and consumerism within South Africa. A target party (youth and low-income earners) is then identified, via research of collected data, such that an appropriate working model may be proposed to respond to the problem within the South African context.

3.2. OUTLINE OF THEORIES AND CONCEPTS

The following is an introductory description of the theories and concepts which relate to the theory of minimalism or voluntary simplicity and which have been researched and expanded upon within the literature review.

3.2.1 Consumerism and Unsustainability

In most western or developed regions of today's world, decades of unprecedented economic growth, has long since solved the problem of securing the basic necessities of life. There is little visible poverty when seen from the perspective that most people are prosperous beyond the dreams of their grandparents. Many citizens have enough money to spend on luxuries such as entertainment, take-away food and fashionable clothes. In addition, average wages can be seen as well above subsistence levels. This is evidence of an excess of wealth, which although harmless in itself, may be easily taken for granted. Many of the middle-class are still under the impression that they are deprived yet statistics show that they are no-more satisfied with their lives that

the generation preceding them (Hamilton and Dennis, 2005: 4). As previously written, it seems apparent that consumer culture has taken away many of the aspects of life on which our well-being depends, such as, community life, a work/life balance, spiritual and aesthetic experience and a healthy and natural environment. Alexander poses the question that if an increase in consumption really is the answer (Alexander, 2011: 1).

Alexander and Ussher (2011:5) claim that high-consumer lifestyles are often seen as a pinnacle of human development. It seems that orientating one's life around high-levels of consumption often lead to time poverty, stress, physical and mental illness, loss of community, disconnection from nature, general unhappiness and ecological degradation.

In addition, Trainer (2009) states that a serious fault in the present society is its commitment to an affluent-industrial-consumer lifestyle and to an economy that is expected to have constant and limitless growth in its output. This lifestyle is increasingly unsustainable while the level of production and consumption will always be inaccessible to mass populations. The depletion of resources is slowly but surely having an irreversible damage to the environment.

The following are key points that support limits to growth, as mentioned by Trainer (2009):

- Richer countries which contain one-fifth of the world population consume three-quarters of the world's resource production.
- Petroleum appears limited.
- Depleted ecological resources.
- Water shortage.
- Food shortages in some countries, which cause political unrest.
- Depleting Phosphorus supply.
- Scarcity of certain minerals, such as platinum, copper and zinc.
- The ecological footprint of developed areas are too high to maintain.
- Greenhouse gasses.

- The problem of over-population is overshadowed by the problem of over-consumption.

In addition, to the resource and environmental problems, most developing countries are experiencing social breakdown and a decrease in the quality of life (Trainer, 2009).

3.2.2 Minimalism and Voluntary Simplicity

Voluntary simplicity or Minimalism can be seen as reducing material consumption and de-cluttering one's life. "Voluntary simplicity can be defined as the lifestyle maximizing the individual's control over his own life and minimizing the consumption and dependency (Argan, Argan & Sevim, 2013:1)". It is sometimes considered a sustainable lifestyle phenomenon, as it is characterised by reduced work time, less consumption, and more time dedicated to leisure and meaningful activities (Argan *et al*, 2013).

Voluntary simple living does not mean that one has to undergo hardship or deprivation; rather it is to focus on what is sufficient for comfort, hygiene, efficiency etc. Most people's basic needs may well be satisfied by cheap and simple devices as opposed to luxurious and wasteful ones which are idolised by the consumer society. This lifestyle should not come across as a sacrifice for the safety of the environment; rather they can provide a source of satisfaction in one's life (Trainer, 2009).

Some Benefits of a Minimalist/Voluntary Simplified Lifestyle as indicated by Trainer (2009):

- Living in a community and community support
- Ample free time and more time for leisure and personal development
- Excellent and healthy food
- Stress-free lifestyle
- Varied work choices
- Contribution to society and the environment
- Opportunity for a spiritually rich life

The following section provides an introduction to some of the concepts which are usually linked or form part of the theories of Minimalism or Voluntary Simplicity. The details and architectural implications of which are discussed further on in the next section.

3.2.2.1 Autonomous Buildings

Vale and Vale (1975: 7) describe the autonomous building as a building that functions independently off any input except from that of its immediate environment/site. The building does not rely on the local municipal supply of water, electricity or drainage. It is dependant upon sun, wind and rain to service the building and process waste. This means that an autonomous house would have less dependence on fossil fuels and the carbon dioxide (CO₂) emissions would be decreased, thus a reduced contribution on global warming. It can be likened to a land based space station which creates its own life-supporting environment which is disconnected from the existing infrastructure (Figure 1).

Alshammari (2013) provides an example of natural ecological systems such as termite mounds which employ principles of passive design. Alshammari explains that the historic journey to autonomy was a result of a concern for secure sources of energy, heat, water and food supply. Nowadays it is more out of a concern for the environmental impact of living. The use of on-site resources increases security and environmental impact by utilising sun and rain which are usually wasted. The costs, inefficiencies and impacts of supply networks are reduced by short circuiting them to be sourced on-site. By being energy efficient, autonomous buildings are cost effective and are therefore easier to supply off-grid and on-site although they are not necessarily environmentally friendly.

Alshammari (2013) further explains that an autonomous house requires customised construction or extensive retrofitting in order to work within different climates or locations. Designs such as alternate sewage systems, thermal massing, energy storage and energy efficient glazing

require specialised skills, construction, maintenance and experimentation in order to succeed.

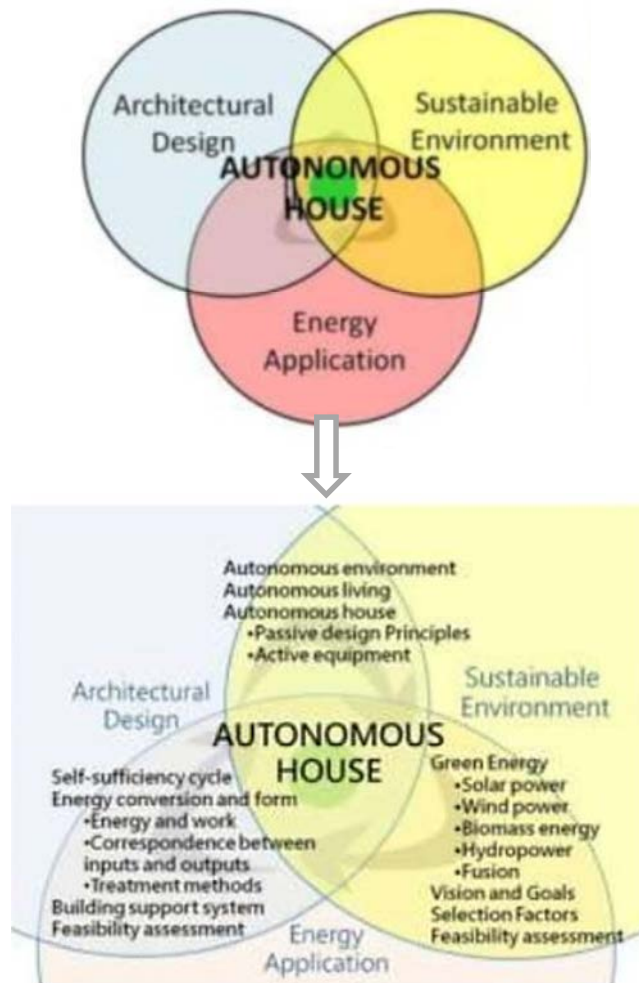


Figure 1. Diagram describing autonomous buildings (Alshammari, 2013: 1).

3.2.2.2 Biotechure and Earthships

Earthships are a form of biotechure, it refers to a building designed to be autonomous and self-sufficient. The concept was conceived by architect Michael Reynolds who has been a pioneer in green architecture since the 1970's and has conducted 40 years of research in the field. Earthships are constructed primarily out of recycled materials such as tires and bottles which are combined with rammed earth (Figure 2). The idea is to create a building which utilises passive solar power, sustainable power and minimises waste during construction and the buildings lifespan (Terranova, 2013). Earthships are a form of autonomous buildings which

consider all aspects of sustainability; the name is derived from the idea of the earth being viewed as a 'spaceship'. A ship is known to be totally independent of a local supply, instead it provides its own food, water and energy, and can survive a long time without docking at land. Similarly, unlike the conventional house, an earthship is an off the grid system which aims to achieve a zero carbon footprint (Everson, 2014).



Figure 2. Typical earthship (Lejuwaan, 2012).

3.2.2.3 Permaculture

The concept of permaculture was first introduced by Mollison and Holmgren in the 1970's and was described as an "integrated, evolving system of perennial or self-perpetuating plant and animal species useful to man (Mollison and Holgren, 1978)".

The current concept of permaculture, as mentioned by Holmgren (2002: 3) can be seen as "Consciously designed landscapes which mimic the patterns and relationships found in nature, while yielding an abundance of food, fibre and energy for provision of local needs." The organisation of people and buildings are imperative to the concept of permaculture, hence the vision of permaculture has evolved into creating permanent or sustainable agriculture (Figure 2).

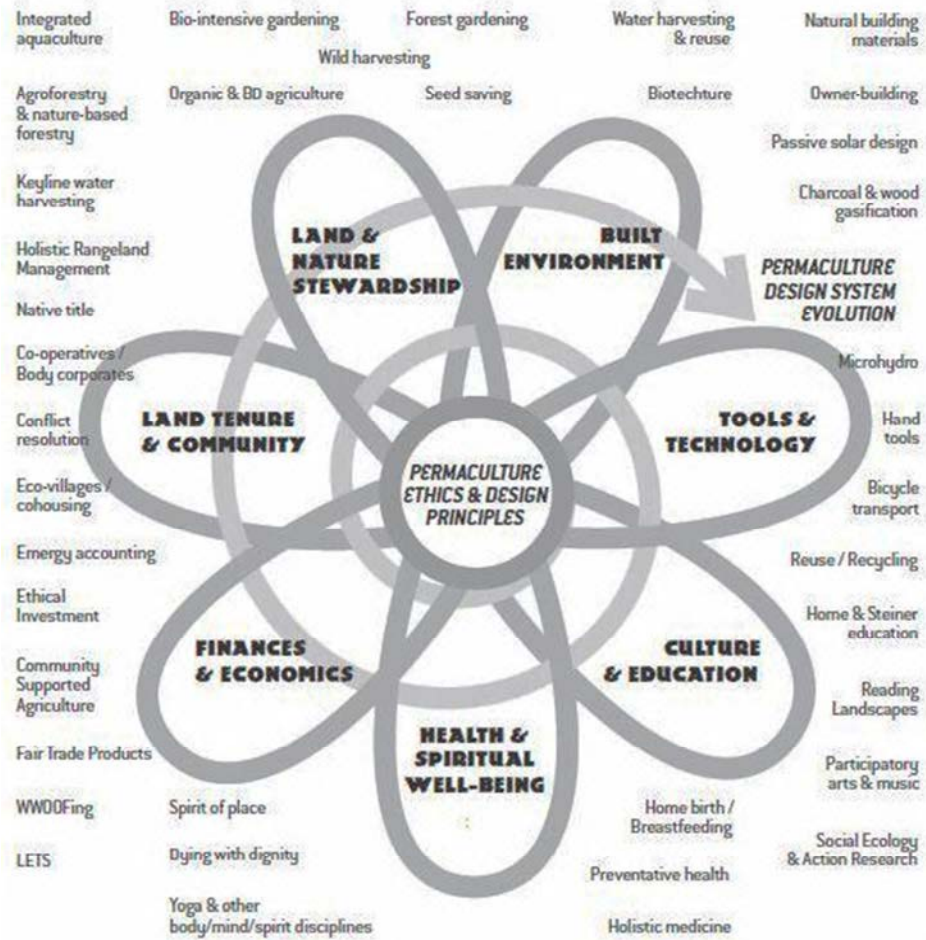


Figure 3. The Permaculture Flower (Holmgren, 2002: 3).

3.2.2.4 Eco-Minimalism

Eco-minimalism is a phrase which has been coined by Architect Howard Liddell. He has questioned the idea of thoughtlessly applying eco-clichés such as photovoltaic panels, heat pumps and wind turbines to buildings, he finds are most often inefficient and the cost implications outweigh the benefits. Grant (2007:1) explains that more than an outward style or aesthetic of a building, eco-minimalism refers to the way in which a building minimises its environmental impact while maximising human benefit. It is explained as an approach which strips a design to its essentials and rethinks green clichés. Grant further explains that studies have shown that “complication tends to be the enemy of good performance (Grant, 2007:1)”.

Technology is usually applied thoughtlessly and inappropriately to a building which has been carelessly designed, to counteract a buildings overconsumption, which creates an illusion of sustainability (Grant and Liddell, 2002: 1).

However, these issues sometimes conflict with the techniques used in autonomous building design already mentioned.

3.2.2.5 The Small House Movement

The small house movement is aimed at creating awareness of how smaller homes can be designed and are able to fulfil our needs for shelter and housing (Susanka, 2001).

Susanka is a lead architect within this movement, who attempts in changing the way people think about their homes. She believes that consumers often mistakenly make decisions on their homes based on two dimensional plans, which creates unnecessarily large and impersonal spaces, rather than considering how height, scale and personal details can create comfort within a home. She refers to this concept as thinking in the third dimension.

3.3 THEORETICAL AND CONCEPTUAL ASPECTS OF SELF-SUFFICIENCY IN RELATION TO ARCHITECTURE

This segment of the literature review aims to identify the links between architecture and self-sufficiency. In order to understand the role of architecture in developing self-sufficient living in Durban's inner city, a study of existing practices and technologies is conducted.

3.3.1 Simple Living

Simple living is the practical application of the theory of Minimalism or Voluntary Simplicity. It is hoped that a review of the current practices of simple living may provide a practical understanding of the theoretical framework that may be applied to the design proposal.

3.3.2 Mindfulness and Attitude

Alexander, Trainer and Usher within their Simplicity Institute Report (2012: 1) suggest a change in thinking before attempting a transition to a different way of living. They explain that one must adopt a set of attitudes and a frame of mind. People should reassess the financial and material dissatisfaction that it currently claims, people may realise that they are wealthier than they think. The report further explains that there is a point where an increased standard of living cannot improve one's quality of life or well-being. Conversely, the pursuit of material wealth may even lower one's quality of life rather than improve it; rather a simplified lifestyle promotes 'sustainable abundance'. It states that the ethos of consumerism is that 'more is always better', while the ethos of a simplified lifestyle can be defined as 'just enough is plenty'. In addition, the pursuit of status has led to 'status anxiety' when people regret spending their lives trying to impress others. Rather one may be liberated by impressing oneself rather than others. The report proposes an experiment that if one were to imagine oneself on one's deathbed, then the value of material possessions would pale in front of the value of people and experiences. The report puts forward the proposition that even though effort is required to embrace self-sufficiency, frugality and moderation, people will be rewarded by emotional and spiritual well-being.

People may now understand by this report that in order to sustain a self-sufficient lifestyle, we need to adopt a mind-set and a way of thinking along with the practical aspects of self-sufficiency (Alexander *et al*, 2012).

With regard to autonomous buildings, Alshammari (2013) states living in an autonomous house may sometimes require a change in lifestyle, personal and social behaviour. People may or may not be able to adjust, and some may find it inconvenient, isolative or irritating. Therefore an autonomous building requires good design and thoughtfulness regarding these issues. Vale and Vale (2010) conclude that if the movement of autonomous buildings, which was introduced in the 1970's, was adopted, then there would have been a significant reduction in energy demand. However modernist thinking at the time prevailed over autonomous buildings because the ideas ran parallel to the norms and industrial

mind-set at the time, without encroaching on people's lifestyles, thus the movement of autonomous buildings and thinking was overshadowed and ignored. It is now clear that a movement towards autonomous buildings is even more urgent since the consumer mind-set and an increasing desire to own more possessions and space has resulted in drastically increased energy consumption. It is now apparent that there is a need to concentrate on a change in lifestyle and domestic behaviour and not just the method of building construction.

3.3.3 Money and Economy

Trainer (2009) explains that the central idea to a minimalist economy is a local economy. The economy would be run for people's benefit and the driving force would have to cease to be profit. The concern would be to identify what is sufficient rather than maximising wealth and efficiency. These ideas contradict the current economic system of capitalism. It is suggested that this economic system be created as an alternative to the current system on a small scale. The existing system would then be slowly phased out.

With regard to personal or micro scale finance, Alexander *et al* (2012: 2) claim that how people spend money is actually tantamount to voting what is available within the world. By making a purchase, it is actually an affirmation of the product, its manufacturing process and its ecological impact. In order to achieve change, a consideration is needed to spend money wisely. Additionally, this translates to supporting businesses such as local, organic, green and fair-trade products. On the contrary, 'green washing' should be kept in mind; 'green consumerism' is still consumerism. It is also emphasised that one should live not only live within ones means but that one should consume less than ones means. Furthermore by avoiding debt one may gain financial independence which would promote the idea of self-sufficiency.

Holmgren (2005: 4) indicates that local trading systems retain the energy of locals within the community, while locals retain control of economic well-being instead of contributing it to unstable macro monetary systems.

3.3.4 Work and Time

It is stated by Alexander (2011: 10) that with increasing productivity one is often faced with the question of whether to consume more or to have more free time. If one increases their material standards the instant they obtain more money, working hours may never decrease. Studies show that people in developed areas are working more than they did fifty years ago. Thus the minimalist movement encourages the exchange of increased pay or productivity for increased free time.

It is further explained by Alexander *et al* (2012: 3) that if ones overall consumption expenditure can be reduced then one may find a reduction in the need for paid employment. This would free up an individual's time for the pursuit of personal passions and community related activities, one's material wealth may be reduced but the quality of one's life may increase. A consideration should also be given to working a part of one's working hours from home; which would reduce commute time and make one less oil-dependent.

Vale and Vale (2010) extended this idea by explaining that the aim of living in an autonomous building is not to commute to work every day to earn ones living, rather one should source ones needs from ones immediate environment be it food, water or energy etc. and supplement this with occasional, part-time or home-based work. Similarly, Lejuwaan (2012) explains that because earthships are designed to provide with all basic needs, therefore there are no bills to pay. So effectively one would not have to work to survive, rather more time can be dedicated to self-improvement and hobbies.

Teo (2010) quotes an example that if one grew 75% of one's food supply, it would take two hours a day, and to buy the same amount of food it would take four hours to work to earn the money required for the food. Sustainability and consumerism cannot work together as the global financial crisis has shown what happens when people live beyond their means. People live on credit with the notion of working later to support the expenses; this has contributed to the financial crisis. Simpler living is therefore necessary for a sustainable future.

3.3.5 Sustainability

Trainer's (2001) view of sustainability is that the current industrial-affluent-consumer society is unsustainable. The consumer mind-set is simply incompatible with sustainability. Therefore a radical change in lifestyle is required.

Key characteristics of a sustainable lifestyle:

- Simpler and less affluent lifestyles.
- Self-sufficiency on a local and national scale.
- Communal lifestyle and participatory ways.
- Alternate technologies such as windmills and permaculture.
- A new economic system independent who's development is independent of profits.
- A new social value system that is supportive of a sustainable society.

Vale and Vale (2009) claim that the current thinking trends regarding sustainability are flawed because we all believe that society can continue to have limitless growth by just adopting 'green' products and that the only change in behaviour that is required is to change from plastic bags to cloth bags for supermarket visits. With regard to architecture, Vale and Vale state that the focus on details such as material choice have caused people to forget about more important issues such as the energy consumption of houses and their sizes. Vale and Vale further state that through their analysis they have concluded that it is more effective to reduce a house's ecological footprint or greenhouse gasses by changing the way in which a building is used rather than how and what it is constructed of. They state an example that a dog has a higher ecological footprint than a 4x4 vehicle, people should be aware of the impact of every aspect of their lives even if it is to keep a pet. They are non-negotiable in the fact that all buildings should be constructed for zero-energy.

Vale and Vale (2009) hold a similar view to eco-minimalism that the belief that the solution to sustainability lies in fitting a house with advanced technology. Their research shows that this is not necessarily true and architects still believe

so due to fascination with technology and novelty. The approach should rather be to achieve the maximum with the least resources.

Teo (2010) explains, with regard to the views of the autonomous house movement, that in order to live on earth we have to manage our resources with a mind-set of sustainability. The example is given that if one has a vegetable garden one would tend to ensure that all is used. If one is responsible for one's own resources then all would be used. Rather than wasting surplus, it would be given away rather than go to waste. On the contrary, if food is bought then one does not appreciate the effort that has been put into it, and surplus would be thrown away. Mass production has saved time for consumers, but that does not mean it is more efficient, the different stages of mechanical production such as processing, storage, retailing and distribution all consume energy and resources.

Vasilski and Stevović (2009) state that Minimalism in architecture allow for building facades with high energy efficiency that promote cooling via natural ventilation without the use of air-conditioning. The rational constructions and simple volumes, which are found in minimalist architecture, take advantage of the sun's rays passively through thermal massing or high-efficiency glass or actively through photovoltaic cells. They claim that about 40% of the running costs over a building's lifespan can be reduced due to the optimisation of energy conservation systems. Minimalism gives the designer the opportunity of optimising a building for minimum energy consumption while maximising the comfort of a building.

Grant and Liddell (2002: 1) see eco-minimalism as an "antidote to eco-bling" or eco-clichés, referring to the slap-on, one-size-fits-all products that seem to dominate sustainable design. Rather they explain that the nature of a problem is to be identified and analysed and common-sense and quality scientific thought is to be applied to a problem rather than pre-empting off the shelf solutions.

An example is stated (Grant and Liddell, 2002: 1) of the Granada house, which was built for a television series "House for the Future". The visually apparent sustainable additions, such as a solar roof and wind turbine, to the building performed poorly while the unseen additions to the design such as super-insulation and low-embodied energy materials, performed exceptionally. The

solar roof contributed to 2% of annual energy input while the heat recovery of the cooker outdid all other additions due to the house being super-insulated. Another example is offered where the reduction of a fax machines standby energy was achieved with a cheap circuit addition that allowed the fax machine to turn itself only when receiving a fax, resulted in a saving of half the annual output of a photovoltaic installation.

Grant and Liddell (2002: 4) state that the task of delivering a sustainable building is being complicated far beyond the need, while the general population is not knowledgeable enough to resist eco-goodies. They encourage the adoption of common sense and good practice while questioning man-made ecological remedies.

Biotope claims to be the most sustainable form of architecture, as stated on the official Earthship Biotope website "... the Earthship is the epitome of sustainable design and construction. No part of sustainable living has been ignored in this ingenious building (Earthship Biotope)." It is also stated that "Earthships can be built in any part of the world and still provide electricity, potable water, contained sewage treatment and sustainable food production. The Most Versatile and Economical sustainable green building design in the world (Earthship Biotope)." This is important because if sustainability is to be taken seriously and is expected to save our resources from depletion for the next generation then every aspect of sustainability would need to be considered.

3.3.6 Food

Alexander (2011: 9) explains that eating locally and organically while eating in moderation and eating less or no meat are key characteristics of simplified food consumption. One should grow their own fruit and vegetables as far as possible. It is now being discovered that a nutritious and environmentally sensitive diet can be obtained a low cost.

Alexander *et al* (2012: 4) further explain that previously, people grew all or most of the food they ate which made them largely self-sufficient. Today most and if not all peoples food needs are outsourced to large global corporations that are concerned with large profit margins rather than providing nutritious and

sustainable food. Therefore, the re-localisation of food production is imperative. The report further states that one should grow as much of one's own food as possible, even if it may be a windowsill garden. Additionally, if society is to re-localise its food production, then lawns or parts of lawns have to be given up in place of vegetable gardens, chickens and fruit trees. There is also room for community gardens within neighbourhoods, which sees food production as a communal effort. The local farmers market could be used to supplement food production, rather than supporting supermarkets, the local economy can be strengthened. Besides the mere production of food, consideration should be given to eating healthy and organic food, artificial and processed foods are not only harmful to one's health, and they are also costly. The increased need for the production of dairy, meat and fish have had negative impacts on the planet, by reducing consumption we may aid in achieving a balance that would reduce impact on the environment as well as save money thereby increasing self-sufficiency. The preservation of food is also important in reducing 'food miles'. Rather than making multiple trips, food can be bought at once and preserved.

Vale and Vale (2010) stated from the 1970's when the autonomous house was first defined, growing food at home was a way to maintain topsoil via composting waste. Self-sufficiency in food was seen to have a direct impact on the reduction in use of fossil fuels. It is stated (Vale and Vale, 2010) that in the UK, the energy needed to grow and transport food to consumers was five times the amount of energy actually contained in the food. On the contrary, by producing at 75% of a family's food supply on 1.75 acres of land had a reduction of 14 tonnes of CO₂. Thus growing food at home was as effective in reducing energy consumption as insulating ones house.

Furthermore, Lejuwaan (2012) explains that earthships are built to take care of one's entire food supply, by outfitting an earthship with a greenhouse it means food can be grown in any climate all year round. This means that one would not need to leave their home to source food and neither would food need to be transported. Additionally, by adding a fish pond or chicken coop there is a constant supply of meat and eggs.

As mentioned already, Permaculture forms an important component of a self-sufficient lifestyle. Holmgren (2002) states that Permaculture can be used to design, manage and improve efforts made to achieve an ethical and sustainable future. Holmgren (2005: 3) states that people are still fixated on the idea of European-styled, high-density cities where food is sourced from outside of the city, food that is sourced from outside of cities are more vulnerable to supply risks, such as increases in transport costs, which is beyond our control. Home gardens can supply fresh and healthy food for families and also contribute to changing the idea that diet is made of over-consumption of animal protein to that of fruit and vegetables. Home production of fruit and vegetables can combat the current obesity epidemic and can keep people healthy while growing and consuming it. Furthermore, while growing food at home and preserving seasonal surpluses, people may bypass commercial food chains which would result in cheaper food. Additionally Holmgren (2005: 4) states that by expanding the garden ecosystem to include hens or ducks, the range and value of food available at home is increased, while pests are taken care of and their bio-waste can be used as natural fertiliser for soil.

Mollison (1981: 135) states, in a discussion of Permaculture within urban areas, that designing for permaculture within larger rural sites is the same as designing for tiny urban sites. Due to the reduced growing space, the main strategy to employ is the choice of plants. The use of slow bearing low yield plants should be avoided and emphasis should be placed on trellising as they increase growing space by their larger vertical area. Modest turf roofing can also be utilised to increase growing space. Furthermore he states that an average lot size of a quarter acre is enough to produce a garden.

Clouse (2014) published an article on Cuba's urban farming revolution; it states that the country entered an economic-food crisis when it was cut off from the Soviet Union abruptly in 1989 when it relied heavily on the supply of food from it through trade. The country experienced severe food shortage and citizens were deprived of approximately one third of their daily calories. Furthermore there was a loss of access to imported animal feed, fertilisers and fuel that was the life blood of the countries agricultural system. This resulted in Cuba's green agricultural revolution.

The government responded with a prioritising of organic farming methods, production of useful and edible crops and the adoption of peasant labour. The guerrilla gardening that was present within urban areas turned into government-supported urban farming programmes (Figure 4). This has resulted in, as quoted, “what may be the world’s largest working model of a semi-sustainable agriculture (Clouse, 2014)” which produced local and affordable food supply.



Figure 4. Urban Farming in Havana, Cuba (Clouse, 2014).

The city of Havana’s infrastructure supporting food production has been woven into the fabric of the city from backyard gardens to peri-urban farms. It is estimated that more than 35 000 hectares are dedicated to urban agriculture in the city. The urban gardens produce food for animal and human consumption as well as supporting compost production, biofuels and husbandry (Figure 5).



Figure 5. An urban farmer salvages soda bottles for sowing and roof tiles for planter bed material (Clouse, 2014).

An example is mentioned of a farmer who has created a closed-loop permaculture system where vegetables are grown, organic animal waste is recycled and rainwater is harvested all on a 68 square meter rooftop (Figure 6). His rooftop supplies meat for restaurants and markets and he collects waste compost from nearby markets for harder times.



Figure 6. An urban farmer has chickens, guinea pigs and vegetable production from a 68 square meter rooftop (Clouse, 2014).

This is a good example of how urban food production has been layered over an existing city and provides a 25 year precedent of self-sufficiency and community engagement, for the rest of the world.

3.3.7 Transport

Alexander *et al* (2012: 5) state that current car culture is the source of great damage to the environment, this is compounded by the fact that it relies on a supply of oil that is available cheaply and abundantly. Bicycles can be seen as an alternate method of transport, as the majority of trips made by car are short distances. Bicycles have almost no impact on the environment and are good for health and well-being. Public transport may also be utilised to travel long distances.

3.3.8 Housing and Shelter

3.3.8.1 Approach to Housing and Shelter

Alexander (2011) explains that housing and shelter is one of life's greatest single expenses. One must think carefully about how much of their lives they are prepared to spend in seeking better housing standards. The exact standard of housing that is sufficient to meet our needs has to be carefully thought out and considered. The large houses we see in developed areas of the world today are expensive as well as resource-intensive. By comparison, we should explore alternate ways of accommodating ourselves and our families in modest and energy efficient homes. Some are exploring co-housing arrangements and green design in order to achieve low-impact development.

Thoreau (1982) suggests that if civilisation is the real advancement of the condition of man then it should be proved that man has improved his standard of living with a reduction in cost. The cost of a thing is the amount of one's life that is required to be exchanged for its acquisition. Most people do not answer the question of what exactly a house is and actually become poor while trying to acquire a house of the standard of his neighbour. By being satisfied with modest housing standards, one may save years of free time and increase the quality of one's life.

Alexander *et al* (2012: 6) mention that the decadent mansions which people in the developed world live in are extremely demanding with regard to resources, energy and cost. Rather people should choose smaller, more modest and energy efficient homes. Furthermore, the choice of location of one's home can greatly reduce the cost of a home as well as reduce commute time to and from ones workplace as mentioned already. The report also discourages purely aesthetic renovations to homes; rather one should consider Do-it-Yourself or second hand items. The idea of co-housing should also be considered, by grouping families or friends within the same house, the impact or cost of housing can be greatly reduced and promotes a sense of community. Alternative housing strategies as stated, should also be considered, these involve using shipping containers, straw bale or mud brick buildings which also reduce the financial and ecological impact of housing.

Biotecture concerns itself primarily with alternate methods of construction. This due to the fact that it is usually entirely constructed out of recycled materials such as old tires, bottles and cans which are packed with dirt and plastered with adobe. It is also described as a building which is assembled out of by-products. As explained a sustainable home is that which makes use of indigenous materials which occur locally or naturally, this is substantiated by the fact that for thousands of years houses were always constructed out of earth, rock, reeds and logs. A question is posed as to why is it that new bricks are manufactured when there are thousands of discarded tires (indigenous to all areas) which can be recycled to be efficiently used as bricks (Earthship Biotecture).

3.3.8.2 Building Design, Construction and Materials

Holmgren (2005: 3) mentions that by adopting construction methods such as rammed earth, mud bricks and recycling timber and joinery, the embodied energy of dwellings is greatly reduced while increasing the thermal mass of buildings. Additionally, Mollison (1981: 135) states that brick and masonry buildings can be shaded by ivy, which provides

good external insulation. Ivy will guard against cold wind which removes heat from buildings in cold weather; additionally, boxed-in trellises can provide a similar function. Alshammari (2013) furthers this by stating that small changes in design such as shading windows in summer and extending eaves to create shade, thus cooling the exterior walls of a building and reducing costs in cooling.

As mentioned already, biotecture is based on using indigenous and recycled building materials to construct earthships. Just as earth, logs and reeds were natural building materials of the past, the mountains of waste created by industrial civilisation, that can be found anywhere in the world, are the natural and indigenous building materials of modern society. It also means that materials have less embodied energy as the less energy that is required to utilise an existing object for building the less embodied energy it contains. Furthermore, certain characteristics should be found in materials which preserve the environment of the planet rather than contribute to its deterioration (Earthship Biotecture).

These characteristics can be seen as:

- **Indigenous:** All major components of a building should be constructed using materials which are found all over the planet, in order to make earthship construction easily accessible to anyone in any context. It should have little or no impact on the environment and require the little transportation distance. The materials should also require little or no energy in order to be utilised for construction. Consideration should also be given that these materials should be able to be utilised on a large scale as well.
- **Thermal mass:** The exterior of an earthship should be constructed materials which are dense and massive in order to store heat or cold to keep an earthship comfortable depending on its context.
- **Durability:** The exterior of an earthship should be constructed materials which are inherently durable and should not require

treatment for durability, such as the treatment required for wood, which require manufactured products to be ‘painted on’ to achieve durability.

- Low skill requirements: If the chosen material is to be truly accessible to anyone in any context, then such a material should inherently be easy to utilise and assemble. The skills required should be attainable within hours and not years and be simple enough that one may not require a specific talent to utilise. By utilising complicated materials which require high-tech equipment we are restricting the common person, we are also placing the utilisation of such a material in the realm of economics, which makes constructing a building economically unsustainable.

(Earthship Biotecture).

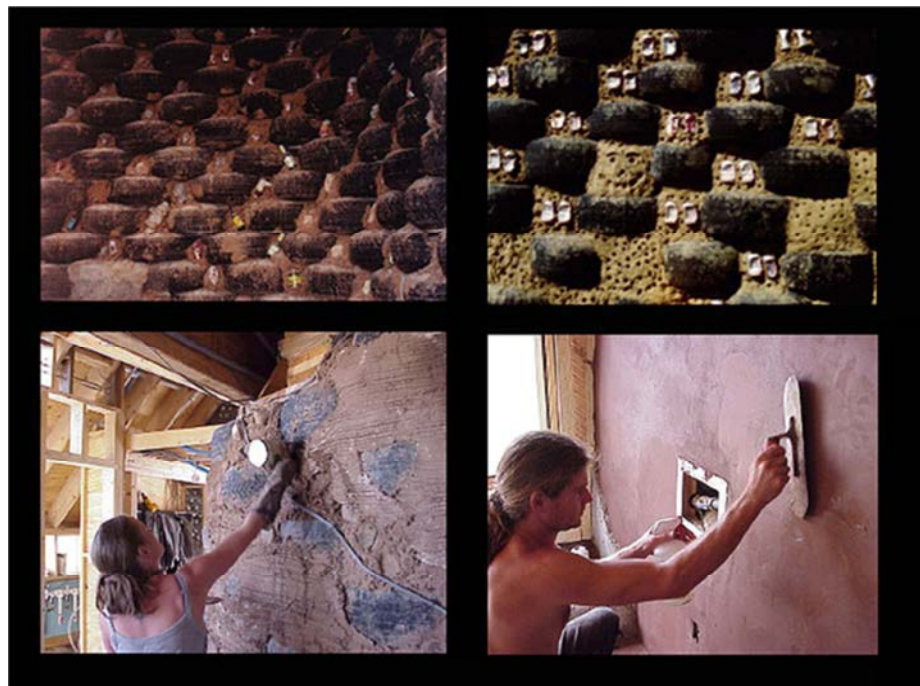


Figure 7. The process of using tires and tin cans for earthship construction (Earthship Biotecture).

These characteristics have currently lead to the predominant use of tires (Figure 7) as an exterior building material while tin cans are used to construct interior walls. These allow earthships to be constructed by anyone in any context while providing a building at a relatively low cost.

Earthship with two bufferzones

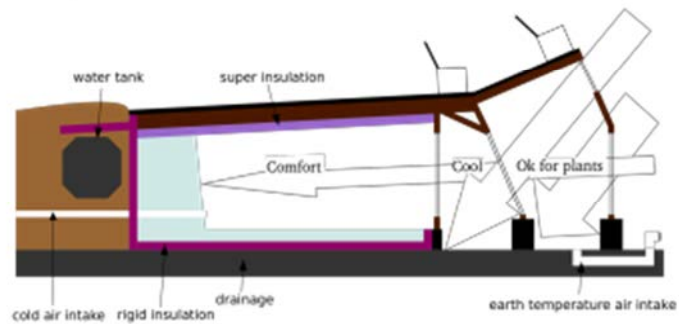


Figure 8. Sketch showing the use of thermal mass and conservatories to maximise comfort (Terranova, 2013).

Earthships in any climate are also able to maintain a constant indoor temperature of 22°C. This is due to the fact that they utilise the thermal mass of the building to release or absorb heat gradually as required (Figure 8). The thermal mass, is not affected instantly by the ambient temperatures of the environment and stay cool in summer while retaining solar heat gained in winter. This is maximised by the use of conservatories (Figure 9) which are always sun-facing and allow winter sun to penetrate into the building while shading summer sun (Earthship Biotecture).



Figure 9. Earthship conservatory functioning as a greenhouse (Terranova, 2013).

Alshammari (2013) also states that passive design can be used to heat buildings in the coldest climates at an extra cost of 15% while designing in warmer climates can be done with no cost implication. The idea of passive heating is to face solar collectors towards prevailing sunlight while incorporating thermal mass into the building which keeps it warm at night.

De Jesus (2013) states that in an eco-minimalist approach to building design, natural lighting which is emphasised, is aesthetically pleasing as well, and reduces energy costs. Additionally, the use of fewer materials and the bare essentials are encouraged. Since fewer materials are used, during construction of the building less time, equipment, energy and manpower is expended. Furthermore, quality workmanship is stressed upon and the simplified design increases the constructability of a building because of a reduction in obstacles such as errors, cost overruns and project delays.

With regard to building materials, De Jesus (2013) explains that expensive imported materials are not necessary, as locally sourced materials should be used to achieve simplicity. Maintenance and cleaning is made easy by simple surfaces and joints, thus expensive labour and cleaning is reduced on an eco-minimalist building.

Grant and Liddell (2002: 2) state that the logic that embodied energy is solely related to the transport of materials to site is flawed. Rather, more often it is the industrial processes required for certain materials are the highest contributor to embodied energy. When the overall lifespan of the building is considered, efficiency, toxicity and durability are for more critical than the energy required for the transport of materials over minor distances.

Furthermore, Grant and Liddell (2002: 3) state that turf roofs which are hailed as a component of a sustainable building are usually plastic roofs with a turf layer on top. This usually weighs more than the conventional roof and requires additional resources for the added structural support.

Grant and Liddell (2002: 3) emphasise that at the onset, the right site should be chosen, the arrangement of the building on the site should be appropriate and the topography and orientation should be exploited to maximise the value of the building and minimise loss. The building fabric should also be designed such that it can deal with extreme conditions without reliance on mechanical systems. The building materials that are selected should also be benign to humans, and the nearer they are to natural and the less processed they are mean that they are more likely to be healthier for habitation of humans. A building should also be assembled in such a way that they may be taken apart easily for maintenance or to be ultimately recycled. A simple example is stated that if screws are used instead of nails, then the recyclability of a material or building component would be greatly increased as the item would be easily and cleanly taken apart from the building. This minor change in the way we approach a building is likely to contribute more to sustainability than simply adding components such as photovoltaic cells as an afterthought.

Architect Susanka (2001), as mentioned already, has developed a design language for designing homes and living spaces that are not unnecessarily large yet provide a comfortable living space. She favours a quality over quantity approach to the architecture of housing. By a reduction of the square meterage of homes the environmental footprint of housing is reduced thereby making housing more self-sufficient for people.

Some of the key ideas discussed by her relating to design language are (Susanka, 2001):

- Framed Openings create an illusion of larger spaces, by defining one room from another just as a doorway would. Framed openings should be wider than doorways, which mean they do not obstruct views, yet they still define one area from another.

- Spatial layering creates a series of openings and surfaces which break a space into segments. Intrigue is created and a room is given the impression of being larger than it actually is.
- Visual weight can give one a greater sense of a room, particularly by using high ceilings. By using darker colours and textures one can experiment with sense of scale.

3.3.9 Clothing and Possessions

Alexander (2011: 9) maintains that the purpose of clothing has always been modesty and to keep warm. Today it seems that the primary function is display of wealth and status. Often functional and practical clothing may be obtained for a fraction of the cost of that typical of consumerist society. Dressing down would not mean sacrificing the aesthetics of clothing rather it would mean abandonment of the vain obsessions of possessions.

Thoreau (1982) further explains that the idea of dressing down can be addressed to all aspects of ownership; we may live at the fraction of the cost of our current lifestyle choices should we become more practical and functional. It is suggested that in affluent societies, more time is probably available if one may control and reduce ones materials wants. One may use free time to pursue more inspiring activities and personal development such as study etc. One may face a fate of being money-rich but time-poor. One should reassess our gains from the time we are giving up. Life on earth is seen to be a pastime and not a hardship.

Alexander *et al* (2012: 9) encourage that people should only acquire possessions that truly contribute to quality of life and to “live more with less.” Additionally, all goods that we suspect that are unjustly manufactured should be avoided. Often items which are ridiculously cheap are usually manufactured by ‘wage-slaves’ in the developing world. By buying quality goods rather than quantity, wastage can be reduced because quality items have a longer lifespan and do not need to be replaced regularly.

3.3.10 Energy, Water and Resources

Alexander *et al* (2012: 7) explain energy, primarily oil, as the ‘lifeblood of industrial civilisation’ as it fuels our current standard of lifestyle and economy. It further states that there are two primary reasons for an urgent reduction of society’s consumption of energy. One, the burning of large quantities of fossil fuel (oil, coal and gas) increases the carbon levels within the atmosphere which is the cause for climate change. Two, energy supply problems such as peak-oil mean that the supply of energy is eventually going to be harder to obtain and subsequently the cost of which is going to rise. Therefore energy should be consumed more responsibly and efficiently and a transition to renewable energy is required. The report further states that people need to educate themselves on the topics of renewable energy, peak-oil and climate change in order to make scientific-based decisions which are independent of politics. The report emphasises on the use of ‘green energy’, green energy such as wind, solar, geothermal and hydro energy should be bought from energy providers. Although the cost of green energy is higher than standard energy sources, one may offset the cost by reducing one’s consumption. It states that energy efficiency should be taken seriously, by insulating a building well, only heating or cooling rooms which are in use and using energy efficient appliances and light sources. A mind set of common-sense should be adopted, for example, wearing warm clothing instead of heating a room or keeping doors, windows and curtains closed when it is hot outside. The report emphasises the use of solar energy in the form of solar panels or a solar water heating system to supplement energy usage, which would indirectly support further research and development into the field of renewable energy. Additionally, all unnecessary electronic or petrol-filled appliances should be eliminated and their usage carefully considered.

Alexander *et al* (2012: 10) additionally provide insight into water usage. It is stated that because of climate change and population growth, the demand for water would increase. It encourages the use of water tanks, if the home food production increases then the need for water would increase, by collecting rainwater via the use of water tanks the need for municipal water would decrease or even become non-existent at most times. Although home food

production would increase the need for water, it still requires less water than industrial food production.

Lejuwaan (2012) explains that even the driest of climates can provide a substantial amount of water, therefore earthships utilise a rainwater harvesting system which can provide for a dwellings daily water supply. The rainwater is collected from the entire roof (Figure 10) of an earthship and drains into a cistern; the water is then pumped from the cistern to sinks and showers when required.



Figure 10. Earthship water catchment gutter and filter (Terranova, 2013).

Holmgren (2005: 3) furthers the argument by stating that by utilising waste wood from landscaping and gardening for water heating, space heating and cooking, urban residents become more self-sufficient while saving valuable resources from landfill sites. Additionally, by retro-fitting houses with attached greenhouses, the warmth of the sun can be used to extend seasonal produce. Holmgren also encourages the collection of rainwater through rainwater tanks, as he claims that in high rainfall areas as this is sufficient for the majority of home requirements including gardening.

Alshammari (2013) states that a classic method with regard to sourcing water is to source from a well, this has a benefit of minimal changes to lifestyle. However once a well is drilled it can require substantial amounts of power, advanced systems may reduce the power required by up to half. Sometimes

filters may be required to eliminate arsenic from contaminated water. Alshammari further states that in regions which receive substantial rainfall it would probably be more economical to collect rainwater. Rainwater is often softer (important for washing) than the hard-water sourced from wells but would require antibacterial treatment and mineralisation if used for drinking.

Alshammari (2013) also claims that the first priority in conservation of electricity is reduction of demand, by design and lifestyle change. Alshammari also emphasises on energy efficient appliances to reduce demand, without adopting mass-market gimmicks. The use of a solar roof can provide electricity without demanding lifestyle change, although they require yearly maintenance.

Alshammari further states that when solar power is not an option on cloudy days or in areas that do not receive much sunlight, then a small wind generator of 5 meters in diameter mounted to a 30 meter high tower can produce electricity for years without servicing or maintenance. The use of solar water heaters can save fuel and electricity. Utilising solar water heaters require changes in lifestyle such as bathing, doing laundry and dishes at times which are sunny. The component that greatly affects the efficiency of solar water heaters is to insulate the holding tank well, by utilising methods such as vacuum insulation.

Earthships are always designed to harvest solar and wind power by photovoltaic cells on roofs and on-site wind turbines, though as Lejuwaan (2012) explains, it would be sufficient to supply the dwelling with all the power it needs provided that the occupants adopt an attitude of frugality and not the attitude of over-consumption which is typical of first world citizens.

Grant and Liddell (2002: 3) also emphasise that society should first concentrate on reducing energy demand before trying to generate energy efficiently. They further state that super-insulation, achieving structural air-tightness and correct glazing would reduce energy demand and increase cost savings by more than any energy efficient measure.

3.3.11 Reducing Waste

Alexander *et al* (2012: 11) claim that every week one billion consumers throughout the world leave a garbage bag at the side of the road which is then

deposited into our natural environment. It is stated that society should rather reduce consumption, reuse and recycle waste. Additionally, instead of using chemicals to fertilise gardens, all organic waste from households should be composted, which would provide healthy soil to grow food. Packaging should be avoided as much as possible as it produces large amounts of waste for example by using cloth bags instead of plastic bags which cannot be used again. The report also emphasises the adoption of permaculture practices, which the future depends on. It is further stated that a grey-water system should be utilised in order to reuse water from showers, baths, washing machines and cooking. This water may then be used to flush toilets or in some cases to water the garden. Water usage may also be greatly reduced by being thoughtful about the use of water-intensive appliances such as dishwashers and washing machines.

Additionally, Holmgren (2005: 3) states that treatment of grey-water through gravel reed beds within the garden should be adopted and waterless composting toilets can be used to ensure that water is used productively. He states that one of the critical factors in the sustainability of urban living is to close the nutrient cycle from human waste to fertiliser for human food production.

Alshammari (2013) also furthers this argument by stating that the use of grey-water in flushing toilets and watering gardens can be useful as they can half the water consumption by at least half in most residential applications, however, they require a sump, pumps and additional plumbing. Additionally, the use of water for sewage disposal could be eliminated by utilising waterless urinals and composting toilets. Alshammari also states that biological treatment of sewage can be used to convert grey-water into odourless and colour-free clear water.

Lejuwaan (2012) explains the system which an earthship processes waste (Figure 11). All used grey-water from showers and sinks are utilised to water plants in the greenhouse, the plants use the water to grow as well as clean the water, the water is then utilised to flush toilets, the used grey-water is now considered as black-water and is utilised within the exterior gardens for non-edible plants. This efficient usage of water allows an earthship to be totally self-sufficient in any context.

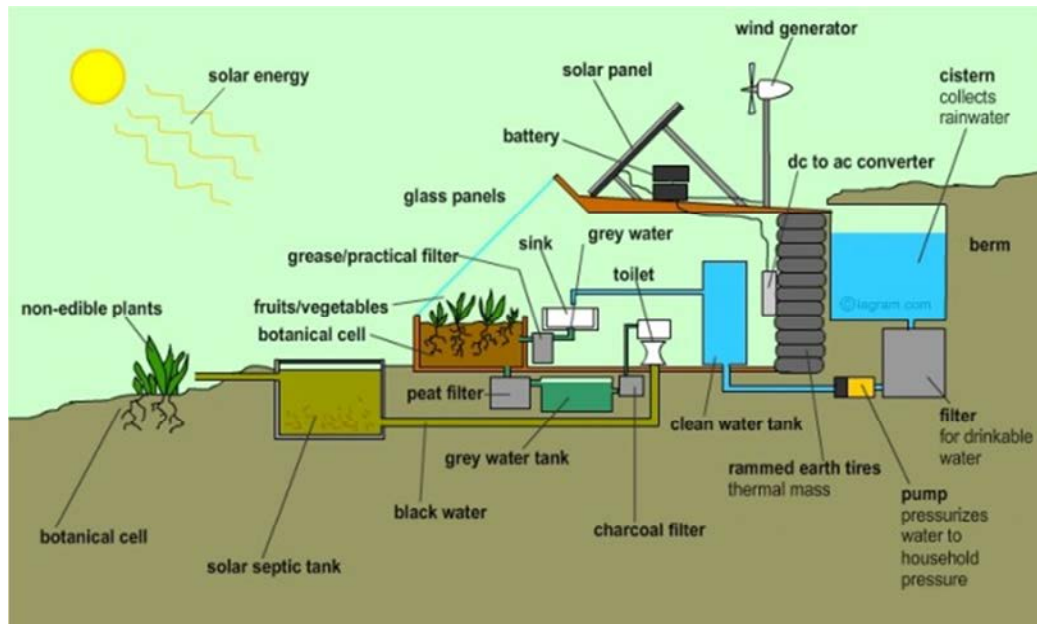


Figure 11. Diagram showing the functionality of an earthship (Martino, 2013).

With regard to reed beds and grey-water recycling, Grant and Liddell (2002: 2) state that the word ‘reed beds’ encompasses technologies that can be useful economically and ecologically when used correctly, however, due to their image as being ‘green’ they are often incorrectly specified whereas surface irrigation systems or public sewers may perform better. Grey-water recycling on the other hand can be done without by employing water efficiency measures, thus achieving similar savings while avoiding cost and maintenance. In dry climates for example, they state that direct use of irrigation could be achieved passively without the use of mechanical systems such as pumps and filters.

3.3.12 Technology

Trainer (2009) mentions that one who is living simpler should not totally denounce technology, rather one should honestly analyse its advantages and disadvantages. Often there is an illusion surrounding ‘modern improvements’ that may not always be advancement. Sometimes technology might just be pretty toys that will distract us from serious things. Technology might even come with some unwanted side-effect which may affect who we are. The television is an ingenious invention; however, it is now the biggest consumer of time in North America. Technology is often celebrated, available, affordable and fascinating; and one may easily be caught up in it while it may not always

be life-enhancing. Should technology genuinely enhance our life, we should most definitely take advantage of it.

Reasons we may be suspicious of technology:

- We have to spend time working to earn enough to afford technology, would we be better off with the free time instead?
- Technology tends to distance us from our natural environment, as humans we need the environment (Thoreau, 1982).
- Additionally it may seem that technology, besides distancing us from our natural environment, is actually destroying our natural environment.

A simpler lifestyle would not mean that technology would cease to exist. Current technologies would be preserved, and additionally, we would have more time and resources available to further expand on useful technologies. Our resources that fund unnecessary research, advertising and arms would be used to develop science, education and the arts.

Alexander *et al* (2012: 12) furthers this argument by stating that large amounts of time are being spent on social media rather than on real life activities. People could substitute the hundreds of millions of hours spent on social media for real life activities, conversation, and practical or creative activity and positive personal development. Appliances which break should not be replaced immediately, rather consideration should be given to whether one can do without it or an alternative can be found. Simplicity in technology should also be adopted, blind-faith in science can be a form of 'anti-progress'. Simpler items such as a clothes line or bicycle can be seen as more elegant than dryers or cars; Leonardo da Vinci is quoted to have said that "Simplicity is the ultimate sophistication."

Vale and Vale (2009) state rather than relying on technology which would need replacement over time, basic construction should be adopted. Furthermore, passive design and utilising non-mechanical means are more reliable and offer higher performance in practice.

3.3.13 Entertainment and Leisure

Alexander *et al* (2012: 13) suggest that people assume that free time should be spent by spending money on socialising and entertaining themselves. Socialising and Entertainment is a big business in consumer societies, with some thought, socialising and entertainment doesn't have to cost much. The purchase of food, alcohol and entertainment should be done in moderation, and purchasing of goods for entertainment should not be relied upon. Furthermore it encourages that activities such as television, which consume many hours of free time, should be replaced by positive activities such as learning a new skill. Skills such as cooking, baking, reading, painting or music, unlike passive activities such as television, these activities are an active challenge which are beneficial and can be more fulfilling. It also states that sometimes people over-schedule social engagements at the expense of relaxation and family time.

3.3.14 Community

Alexander *et al* (2012: 14) claim that a high consumption life often takes preference over community engagement. Dedication of time to acquiring wealth and consumption can have negative effects on family life, community life and can lead to an individualistic society of stressful, frantic and alienated individuals. It states that a community which shares its resources is richer, while consumption is decreased, leading and borrowing should be adopted. Additionally, sharing of skills should be adopted, by sharing skills one can become independent of the formal economy while socialising with new people and interacting with multiple generations.

Holmgren (2005: 4) states that cooperative gardening and the use of open city spaces for farming extends productive activities from a household to a community level, which increases food production and engagement within the community.

3.3.15 Utopian Sketch of a Self-Sufficient World

Trainer (2009) explains in an ideal situation, self-sufficiency has to develop on a national scale and international trade has to be reduced. Trade has to occur at a household, neighbourhood and suburban level most importantly. These should

contain small businesses which are accessible on foot and which utilise local resources and would concentrate on the local market and not export. Food may be produced locally in green areas and therefore transport, storage and packaging would be reduced. There would be a neighbourhood workshop and Permaculture could take place with self-maintaining productive plants. Animals should also be incorporated into the neighbourhood, with fish in tanks as well. Local materials such as wood for furniture and mud for bricks should be used. The environment would thus be leisure-rich and less attention would be given to entertainment. Communities and healthy environments would develop.

3.4 MATERIALISM AND CONSUMERISM WITHIN THE SOUTH AFRICAN CONTEXT

3.4.1 Introduction to Literature Concerning the South African Context

This portion of the literature review analyses the effects of materialism and consumerism within South Africa, in order to further understand the context in which this study is being conducted and to compare it to what has already been mentioned. First literature conducted amongst South African consumers is reviewed and second a review of literature concerning cultural and psychological influences of materialism and consumerism are analysed.

3.4.2 Research Conducted Amongst South African Consumers

A study was conducted to analyse the relationship between materialism, indebtedness and low-income consumers in South Africa by Glenda Jacobs of the University of Stellenbosch (Jacobs, 2010). Recent changes in consumption and credit usage are of importance to low-income consumers. Debt is increasing and spending practices are evolving with increased commercial interest within the lower-income groups of society in South Africa.

According to EmpiriQ (2011), Inglehart's Post-Materialism theory may explain the consumerist practices of South Africans. The theory, which was developed in the 1970's, is the examination of the western individual's notion of values; the first set of values, physical and economic security, being categorised as

materialist and the second set of values, that of autonomy and self-expression, being categorised as post-materialist.

With regard to the South African context, twenty years ago, in apartheid South Africa, low-income consumers were largely “rural survivalist” in nature, they were mostly black people in rural areas that practiced subsistence farming or survived off the income of family employed within urban areas. Currently these rural consumers exist but there has been a large movement of people towards semi-urban townships which has produced many low-income households. Estimates show that these low-income households are about three quarters of the South African population (Jacobs, 2010: 3).

Jacobs’s research suggests that the collective mind-set adopted by low-income consumers makes them view themselves within the context of others by making decisions based on a purchase giving them a sense of belonging. Therefore peers, role-models and family influence the consumption practices of an individual rather than their own specific needs. The research further shows that the lower-income bracket spending practices accounts for about 14% of the current South African GDP, which means that even though their income may be low they have an enormous buying power, resulting in large commercial opportunities within the low-income bracket (Jacobs, 2010: 21).

Due to the increased commercial interest within the low-income bracket, the desire to consume, as well as the range services and goods available, has increased. This is compounded by improved access to credit even though it has an impact on the resultant debt-burden (Jacobs, 2010: 24).

The current economic climate has increased the level of consumers adopting credit as unemployment is at 24%. Low-income consumers are often employed informally and this results in inconsistent income within the lower-income bracket. The result is that these consumers incur debt of necessity and the long-term negative financial implications of short-term debt are ignored due to unforeseen expenses incurred. Short-term loans create the illusion of overcoming financial situations by allowing an extension of monthly income (Jacobs, 2010: 24).

A study conducted at the University of Stellenbosch Business School sought an understanding of debt patterns and materialism amongst low-income consumers with the database of HomeChoice (Pty) Ltd was utilised as a sample for the study (Jacobs & Smit, 2011: 2). The database of 160 000 consumers was seen as a resource to study the habits of low-income consumers and the propensity of incurring debt for the purpose of consumption. HomeChoice was also chosen due to the fact that it sells home décor and furniture products, which due to their non-essential nature are likely to be influenced by materialism rather than necessity while providing the option of purchase by credit. The nine item scale saw materialism defined as “centrality of acquisition”, “the pursuit of happiness” and the “image of success”. The questionnaire (Figure 12) received 217 responses with the maximum income level of respondents being R7 000 per month.

Item	Dimension	Description
2	Centrality	I like spending money on many different things
4	Centrality	Buying things gives me a lot of pleasure
7	Centrality	I like a lot of luxury in my life
3	Happiness	My life would be better if I owned many of the things I don't have
5	Happiness	I'd be happier if I could afford to buy more things
8	Happiness	It bothers me that I can't afford to buy all the things I like
1	Success	I admire people who own expensive homes, cars and clothes.
6	Success	I like to own things that impress people
9	Success	Some of the most important achievements in life include acquiring material possessions

Figure 12. Materialism Questionnaire (Jacobs & Smit, 2011: 2).

The scale of materialism was analysed first (Figures 12 & 13), with a score of 3 being neutral and a total score of over 27 being considered as a high level of materialism.

Item	Question	Dimension	Average score	Rank
1	I admire people who own expensive homes, cars and clothes	Success	3,06	7
2	I like spending money on many different things	Centrality	3,53	4
3	My life would be better if I owned many of the things I don't have	Happiness	3,47	5
4	Buying things gives me a lot of pleasure	Centrality	3,75	2
5	I'd be happier if I could afford to buy more things	Happiness	3,94	1
6	I like to own things that impress people	Success	2,47	9
7	I like a lot of luxury in my life	Centrality	3,12	6
8	It bothers me that I can't afford to buy all the things I like	Happiness	3,62	3
9	Some of the most important achievements in life include acquiring material possessions	Success	2,97	8
Total materialism score			29,93	

Figure 13. Average Materialism Scores (Jacobs & Smit, 2011: 3).

An analyses of the results showed that the sampled consumers reflected a fairly high level of materialism, with emphasis on happiness and centrality. The results showed that the feeling of happiness was a more determining factor than the image of success attributed to purchasing an item (Jacobs & Smit, 2011: 3).

Age Group	N	Average
Between 22 and 24	10	27,50
Between 25 and 34	69	31,70
Between 35 and 49	91	30,53
Over 50	47	26,68

Figure 14. Comparison by age group (Jacobs & Smit, 2011: 4).

Furthermore, a comparison of age groups (Figure 14) shows that there is a distinction in levels of materialism, the over 50 age group was significantly less materialistic than that of the 25-34 age group. Therefore there seems to be a larger tendencies of younger consumers towards materialism than their over 50 counterparts (Jacobs & Smit, 2011: 4).

The conclusions drawn (Jacobs & Smit, 2011: 5) show that the level of indebtedness had little relation to materialism; rather they were influenced primarily by demographics such as age, income and gender.

3.4.3 Low –Income Consumer Behaviour in South Africa

Jacobs (2010: 22) attempted to answer the question of the distribution of spending of low-income consumers. The table which follows (Figure 15) shows this as well as its comparison to other countries, however the behaviours of South Africans is of concern to this study.

HOUSEHOLD EXPENDITURE BY SECTOR				
Sector	South Africa	Brazil	Russia	India
Food	43.0	30.4	41.7	70.5
Housing	11.0	5.2	24.0	2.4
Water	1.3	0.9	0.7	0.1
Energy	6.4	6.7	4.8	11.8
Household goods	11.2	14.3	9.7	1.7
Health	1.4	6.6	6.8	2.9
Transportation	5.6	10.7	2.7	2.1
ICT	1.8	3.0	1.0	0.6
Education	2.2	1.3	0.9	1.2
Other	16.1	20.9	7.7	6.7
	100.0	100.0	100.0	100.0

Figure 15. Distribution of Household Expenditure of South Africans (Jacobs, 2010: 22).

We can conclude that most of the household expenditure is distributed amongst food, housing and household goods, food being a major factor, which accounts for almost half of the household expenditure. Also a significant amount is spent on ‘other’ goods besides the necessities mentioned above when compared to other countries.

Alexander *et al* (2012: 21) stated that almost all if not most of one’s food could be sourced locally at low cost and almost no energy cost from home gardens, community gardens and small farms even within the urban environment, by employing the means of permaculture etc. already discussed. It is further stated (Alexander *et al*, 2012: 43) as a conclusion that we could enjoy a comfortable lifestyle within urban areas at 10% of the current cost, footprint area and energy cost if a simplified lifestyle is adopted.

3.4.4 Current South African Youth Culture

The practice of Ubokhotane has developed and has been recognised. It is a Zulu word which can be translated formally as “to lick one another” (Nxedlana, 2012). It is now used to describe popular sub-culture and its activities. The concept of Ubkhotane originated around 2006/2007 in Johannesburg, South Africa, it was developed by an exhibitionist-Pantsula faction who hung around public areas showing off their material possessions. Others subsequently came along and changed the traditional Pantsula dress code and invented new dance moves, this developed into a culture of bragging that now define Ubokhotane.

Ukukhothana is now a way of engaging in battle, with a culture based predominantly on the system of fashion. Clothing, alcohol food, dance and language are used as a means of distinction in battles to bragging about monetary worth. These gatherings are attended by many young people who meet at public places which are out of the public’s view.

Extreme behaviour such as burning a pair of designer shoes or cash is used to distinguish themselves, the reward being fame and popularity (Sangweni, 2012). Furthermore, the izikhothane seem to be teenagers, who cannot pay their own bills, parents have to foot the bill while their child burns a R1 500 pair of shoes in a performance (Sangweni, 2012).

In Comins’s (2013) article on the South African youth, she quoted proceedings at the 2013 Future Speaks Youth Conference held in Durban, she explained that the youth have degenerated the concept of Ubuntu and upliftment of the poor, held by the former generation which used their youth in the struggle for democracy, in place of opulence and materialism. Commins (2013) further explained that cultures of opulence such as izikhothane have developed, with no consideration for the method of acquisition of wealth.

3.4.5 Conclusions on the South African Context

It appears from the literature reviewed that materialist tendencies are greatly influenced by demographics such as age, gender and income. This is greatly so

within the low-income bracket and the youth, especially within the pre-earning bracket.

Further studies of the cultural and psychological influences which affect the youth prove that this is a problem within this particular age group. This is important because the mid-set developed at an early age is likely to influence the youth in the future when they are responsible for other more important aspects of life such as family and household. Architecture can then be used as a tool to change this condition.

3.5 CHAPTER CONCLUSIONS

3.5.1 Design Framework

The concepts and theories mentioned above form a framework for the design of a working model for developing urban self-sufficiency. The ideas presented in the form of secondary research material, are broad and cover most of the macro and micro aspects of these concepts which relate to architecture. The authors have studied and researched their respective ideas in great detail which provide an invaluable tool in the design process of the working model.

Most of the ideas presented, appeal for an approach of reason and common sense, with simplicity as the core. Some ideas may come across as utopian, when considered from the perspective of Durban's context, though they provide a goal to which architecture would lay the foundation to achieve. Although unfamiliar to most of the society within our context, most of the ideas are practical and achievable and can be adopted easily. The current needs of Durban's context justify and pave the way for such ideas to be adopted.

3.5.2 A Proposed Building Typology, Function and Context

Contextually, the problems seem to be prevalent more so within the low-income bracket as well as the youth, and as mentioned the pre-earning bracket. This research has uncovered an appropriate target group for the architectural design of the proposed working model. This is appropriate because architecture can be used as a tool to challenge the problems of youth and under-skilled individuals

mentioned earlier in their life in order to prepare them before they are overtaken by responsibilities other than their immediate self, such as household and families.

A proposal can be made for a youth development centre in Durban's inner-city. Firstly, the youth have been identified above as a target party, secondly, skills development and Further Education and Training (FET) can be used as a draw card to attract underprivileged youth, who have just completed their secondary education and seek further education or those who have not, who seek employment and earning capabilities (identified above within the low-income pre-earning bracket). These youth would temporarily reside within the centre in order to gain skills to allow them to attain employment or earning capabilities in a way that would encourage anti-consumerist and anti-materialist values within their lives. This would subsequently improve the quality of their lives and aid in health and well-being as suggested by the research mentioned thus far. Furthermore, Durban's inner city has been selected as a context for this working model as there it contains low-income earners and is an appropriate urban environment.

The following chapter will investigate precedents of existing buildings that have applied the theories and concepts which have been reviewed, chosen based on the information uncovered and the target party identified within this chapter.

CHAPTER 4: PRECEDENT STUDIES

4.1 INTRODUCTION

This chapter aims to review, investigate and analyse existing buildings and projects that incorporate and have been designed around the concepts and theories already mentioned in the literature review.

By analysing the concepts and theories that form a framework of the design of these buildings, the practical application of these theories and concepts can be understood. Conclusions are made on success and failures of these concepts and theories in their application and their subsequent applicability to the South African context.

These precedent studies are therefore important in providing a framework in the architectural design of the proposed working model of this research project.

4.2 EXPERIMENTING WITH SIMPLE LIVING IN AN URBAN CONTEXT: Living in a Shed

4.2.1 Project Background

Alexander (2010) mentions that his journey towards this experiment started when he was busy with his doctoral study in Law based on the assumption that “...money and resources are extremely important to human beings *up to a point* - the threshold point – but beyond that point, which evidence suggests is surprisingly moderate, the pursuit of more wealth insidiously detracts from what makes life meaningful and degrades the health and integrity of our living planet. This normative position highlights the importance of having a concept of economic sufficiency and of knowing how much is *enough* (Alexander, 2010: 4)”. This is in opposition to the conventional view that progress is achieved by an increase in growth in GDP. In order to be persuasive, he set about to proving why getting richer would not actually translate into well-being in an affluent society and that lowering income and consumption would increase the quality of one’s life.

Alexander (2010) set about researching what personal measures could be undertaken to oppose consumerism and capitalism and whether these measures would prove successful on the whole and how best to achieve this within the culture and environment he was opposing. This resulted in his personal experiment in simple living which was conducted in Australia, in trying to achieve simple living within urban Melbourne. The experiment was conducted by occupying a small self-constructed shed, for over two years, on the property which he then resided. This precedent study aims to analyse this experiment to further inform this research document.

4.2.2 Justification as a Precedent Study

This study is greatly justified because the experiment conducted aims to prove the same theories of minimalism, simple living and permaculture as this research document. By studying the methods used and the findings of this experiment conducted it would greatly aid in developing this research document. Furthermore, unlike some of the other precedent studies which are to

follow, this experiment has been conducted within an urban environment, in a society which is similar to that of urban South Africa. Alexander is also in his youth, being 28 years of age with no dependants at the time of the study, this aspect is important because according to Jacobs & Smit (2011: 4), already mentioned above, the age group of consumers of 24 - 34 years proved to be the most materialistic compared to their older counterparts within the South African context. Therefore, comparisons can be made between Alexander and South African youth.

4.2.3 Site and Context

As mentioned already, the shed was constructed on a property located in urban Melbourne, which consisted of a five person share-house which Alexander (2010) resided in. He then proceeded to negotiate with his house-mates to allow him to construct a shed in the backyard of the property, while still sharing a portion of the costs of rent and utility bills.

4.2.4 Project Objectives

The main objective of this study as mentioned by Alexander (2010) was to ascertain which measures could be undertaken to provide an alternative to the prevailing norms of consumerism and capitalism and to ascertain it's the successes and failures thereof. He also wished to ascertain whether the collective adoption of those measures could provide a significant impact on the whole. Since his doctoral thesis at the time adopted a stance of anti-consumerism he wished to not only provide theoretical evidence but evidence based on a practical study conducted within the same urban environment of which he was critical of.

4.2.5 Analysis of the Study Conducted

4.2.5.1 Detailed Description of the Study

Alexander (2010) mentions that the shed was constructed using recycled materials over a period of six days with no prior knowledge of construction methods with the spirit of sustainability and frugality as the

only motivation. It is worth mentioning that the shed was constructed by borrowing tools as well as well as borrowed manpower (Figure 16).

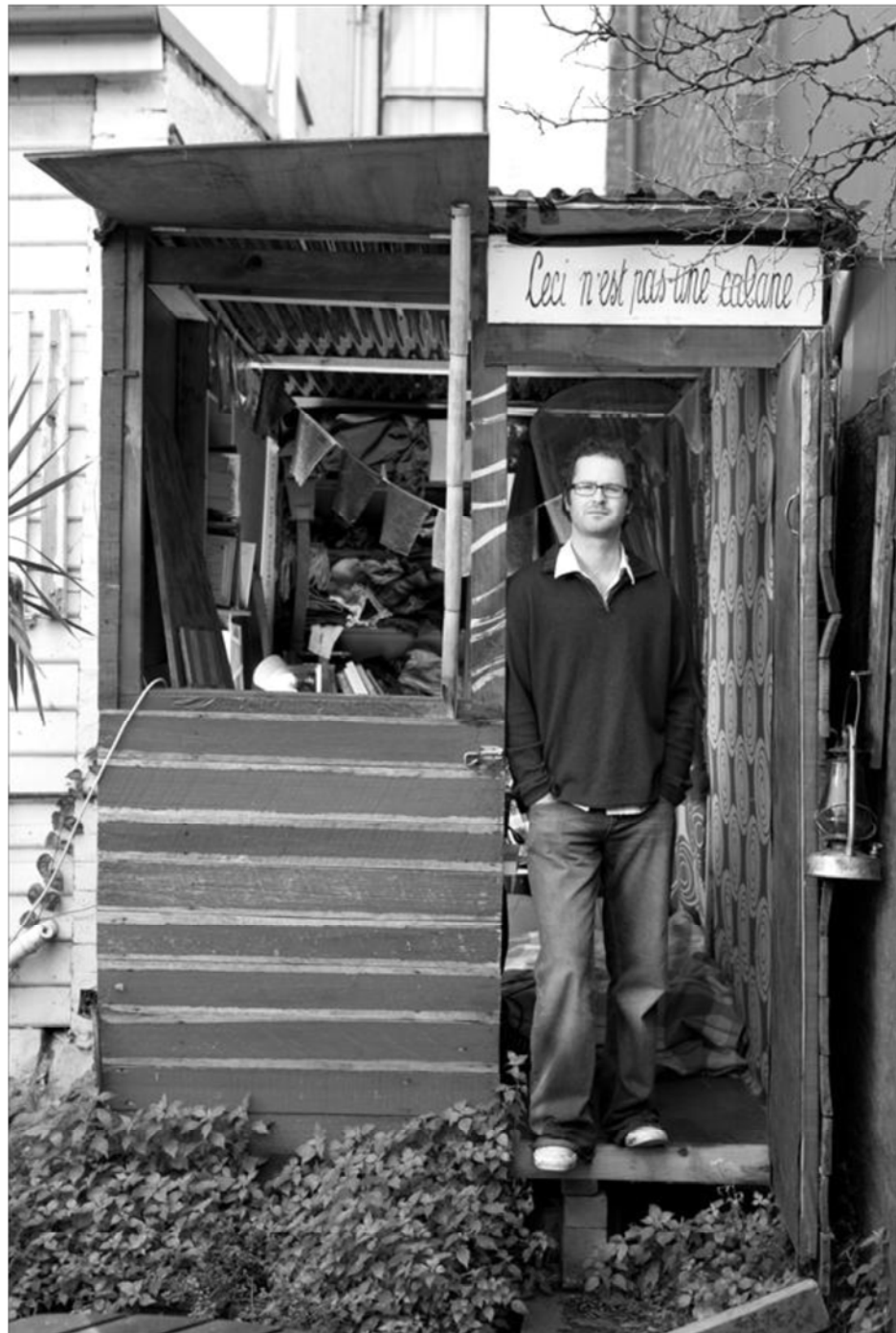


Figure 16. Exterior of the shed (Alexander, 2002: 8).

Most of Alexander's food was sourced using permaculture techniques by growing organically in his own 1.5x10m garden; additionally four chickens provided two to three eggs per day. The chickens also proved a good source of manure. Rainwater was also collected via a rainwater

tank due to water restrictions. Alexander adopted a mostly vegetarian diet due to the thought of personally shooting a cow in order to source meat seeming unappealing to him. As stated by him the effects of a mostly self-sufficient vegetarian diet have had positive health benefits.



Figure 17. Interior of the shed (Alexander, 2002: 9).

Furthermore, Alexander shared the kitchen and bathroom of the main house as the shed only consisted of his personal living space (Figure 17).

He also made the choice of purchasing renewable energy from his supplier at an increased cost which he offset by reducing consumption; this was due to the fact that he could not afford to outlay a large sum of money to purchase a wind turbine or solar panels. Consumption was greatly reduced by not utilising a heater; instead he opted to wear extra clothing.

Supermarket visits were minimised even though they were convenient, as they promoted toxic practices within the agri-business. This is proof that a consumerist lifestyle may be avoided by adopting a simple lifestyle and affording an individual a level of self-sufficiency (Alexander, 2010).

4.2.5.2 Results of the Study

Alexander (2010) concludes after two years of living in the shed, that it has been “the richest and most fulfilling (Alexander, 2010: 10)” years of his life, though he cannot imagine the shed as a permanent residence due to commitments to a relationship and the thought of starting a family. However he claims that the time spent living in the shed is not merely about the shed; rather it is a manifestation of his quest to live a simpler life within an urban context.

He has learnt that housing can be considered as one of life’s biggest expenses and therefore there exists a potential to save the most amount of money in its attainment. When the day comes where he may have to leave the shed in order to continue with the following stages of his life, he will be nevertheless prepared to adopt a more modest standard of living compared to the social norms. To him, the fact that a shed that took six days to build can function well in enough to provide adequate shelter pales in front of the reality of the social norms where people are prepared to work for twenty to thirty years in order to purchase a home. He has learnt that a modest dwelling can allow one to live wealthier than the wealthiest now live, and that an expensive house does not equate a happy or meaningful life.

The time spent gardening and sourcing his food has proved therapeutic while the practice of living a largely vegetarian diet has proved to be a personal challenge of self-discipline while providing an improvement to health and well-being. Although he has been able to largely avoid supermarkets, he has found that avoiding them in totality is challenging. He concludes that the time spent living in the shed is not a template of living simply, rather it is a process of thought or a training of one's expectations, an exercise in discipline.

4.2.6 Conclusions

The experiment proves firstly that a self-sufficient lifestyle can be sustained to some extent within an urban environment, more so the youth, who exhibit the most tendencies towards materialism and consumerism, are the most capable of achieving a self-sufficient lifestyle due to the fact that they have the least dependents. Furthermore the low-income consumers also exhibit the most tendencies towards materialism and consumerism, and the experiment proves that living a simple and self-sufficient lifestyle can be cost effective.

This experiment proves that the practical application of the theories of minimalism, voluntary simplified living and permaculture can be used as a means to oppose consumerism and achieve sustain a self-sufficient lifestyle within an urban environment. This precedent study therefore will positively inform the working model in the form of the proposed building typology of this research document.

4.3 AUTONOMOUS BUILDING: Hockerton Housing Project

Typology: **Self-Sufficient/Autonomous Co-housing Development**

Architects: **Prof Brenda Vale and Dr Robert Vale**

Location: **Rural Hockerton, Nottinghamshire, United Kingdom**

Site Area: **10 1171m²**

Building Area: **570m²**

Year of Completion: **1998**



Figure 18. View of the Hockerton Housing Development (Alasdair Morrison and Partners).

4.3.1 Project Background

The project is a group of five earth-sheltered, ecologically sensitive houses (Figure 18) which are situated in the village of Hockerton. The project was designed by autonomous building architects Brenda and Robert Vale and is one of the first autonomous, zero-energy residential projects in the United Kingdom.

The project aimed to have minimal impact on the environment as possible and to consume minimal power from the local grid supply while maximising the use of the sun to directly heat the building. The project is self-built by the residents who are committed to living an environmentally sensitive lifestyle and residents

could contribute to the construction of their own home according to their skills and expertise.

4.3.2 Justification as a Precedent Study

The building is important because it is one of the first instances where people have attempted to create a building which can be used to facilitate and aid in their commitment to living a lifestyle which is environmentally sensitive. Furthermore it is a proof to others of the possibilities and issues faced when designing and living within an autonomous and self-sufficient building. The sole objective of this building was to realise and sustain a self-sufficient lifestyle with the aid of architecture. The development also provides a model for the practice of growing food through permaculture techniques.

4.3.3 Site and Context

The development is situated in a rural village of Hockerton, Southwell, Nottinghamshire in the United Kingdom. The site is exposed to a cold climate and sunlight from the south, with the site being previously used for agricultural purposes.



Figure 19. View of site within rural context (EBC).

The large 10ha site (Figure 19) slopes slightly to the south west and its size has allowed for occupants to live a largely self-sufficient lifestyle with the aid of cultivation of crops, rearing of animals, water supply and waste disposal.

4.3.4 Project Objectives

Due to the prevalent cold climate of the area and the need for buildings in the area to adopt means to shelter occupants from the cold the development aimed to achieve this while reducing the use of artificial space heating to zero. The development also aimed to reduce CO₂ emissions of the development to zero as well. The development also aimed to offset all construction energy requirements and CO₂ emissions.

Furthermore, after being inspired by architects Robert and Brenda Vale's autonomous house at Southwell, the development aimed to be as autonomous as possible. As with their own house, the architects aimed to design the development to be autonomous with regard to energy, water and waste treatment. The development also aimed to utilise renewable energy sources to sustain its energy requirements.

The development was also designed to prove to be cost competitive to the current conventional housing standard in the short term, while proving to save cost within the buildings life in the long term. This was also aimed to be achieved by utilising easily transferred construction methods and easily sourced and environmentally sensitive construction materials. The occupant should also have full control of the buildings infrastructure and services while minimising maintenance in the long run.

An auxiliary aim was to also enhance the biodiversity of the site and surrounding landscape. These objectives were all aimed to be achieved without loss of comfort and modern day amenities.

"The Hockerton Housing Project aims to be an inspirational centre and act as regional catalyst for sustainable action, offering improved facilities and more extensive activities for a wide range of interest groups." (www.bbc.co.uk)

4.3.5 Project Description

4.3.5.1 Overview

The development consists of five earth-sheltered (to the north away from the sun), single storey, self-sufficient dwellings. The earth-shelter

towards the rear of the building slopes easily with the natural ground slope. For ease of construction, a module of 3.2m in width was repeated through all five 19m long x 6m deep individual houses. The front south-facing side (sun facing side) of the building has a conservatory running the entire length which catches the sun (Figure 20). Most of the rooms have 3m high windows to fill the interior with natural light through the conservatory.



Figure 20. Front of building showing conservatory, private garden and photovoltaic array on the roof (Alasdair Morrison and Partners).

Residents live a holistic lifestyle which is in harmony with the surrounding environment, where all their ecological implications of living are accounted for, which makes this development one of the most energy efficient residential developments in Europe.

The dwellings are earth-sheltered, utilise passive solar heating and make no use of any active space heating systems. All of the energy needs of the building are supplied by the wind turbine and the photovoltaic array with waste disposal and water supply being provided on-site. These have allowed the development to be largely autonomous and self-sufficient of the existing local utility supply grid.

The development also provides tours for visitors and support for further development into ‘eco-community building’. As a result, a learning and resource centre has been constructed by the project members which contain exhibitions and learning facilities in order to aid in research and development.

4.3.5.2 Food, Lifestyle and Community

The development encourages a holistic and sustainable lifestyle which is environmentally sensitive through co-housing. Co-housing is aimed at the sharing of facilities to efficiently manage and use resources. The design of the development has purposefully built-in opportunities for interaction via social and physical activities. Furthermore, at the onset, the development was self-constructed by the residents.



Figure 21. Garden and ‘Oasis’ (Alasdair Morrison and Partners).

The greenhouse and surrounding landscape allows for the production of organic fruit and vegetables utilising permaculture techniques, which provides for about two thirds of their needs and a form of sustainable agriculture. Additional food is purchased collectively and collective growing of food reduces the need for excess tools. The use of organic

food production eliminates the use of fertilisers and pesticides and the resultant pollution of the environment thereof. The gardens are located between the buildings conservatory and the lake which creates an oasis, while the sounds of wildlife dominate over that of the local road (Figure 21).



Figure 22. Residents engaged in fish farming using Permaculture techniques (Hockerton Housing Project).

Furthermore there is an apiary which supplies over 300lbs of honey per year. Lakes provide a means for fish farming, providing occasional fish for meals (Figure 22). The large site also allows for the production of meat and eggs through rearing of sheep and chickens. The small flock of sheep provide organic meat and allows for sheep ‘mowing’ which is a passive way of controlling grass. The site provides seasonal, healthy and a fresh supply of food which avoids the unnecessary energy consumption, packaging, transportation and consumerist based consumption which contributes to an environmentally responsible way of living.

By residents collectively growing food, a social and learning atmosphere is created with people socialising and learning new skills from one

another (Figure 23). Each adult resident is committed to providing at least 300 hours per year for community activities, food production and maintenance of the land and existing energy and water systems.



Figure 23. Cooperative growing of fresh fruit and vegetables on-site using permaculture techniques (Hockerton Housing Project).

Health and well-being is promoted by the strong sense of community and support within the co-housing styled development, the result of which is skills and friendship development. The commitment of residents to providing 300 hours a year towards food production and maintenance promotes physical activity, this also means that mental stimulation is achieved because each resident has a responsibility and all are accountable for their actions.

The development does not only provide housing, to reduce unsustainable travel out of the development, it provides on-site employment opportunities. The cooperative business offers guidelines and consultancy to other groups wanting to develop sustainable lifestyles. The cooperative offers workshops such as woodwork, basket making, music and other artisanal and creative skills development workshops.

Alternatively to reduce CO₂ emissions due to transportation, an electric car was purchased for communal use by residents for necessary travel (Figure 24), and each dwelling unit is restricted to owning a single car at the development.



Figure 24. Communal electric car (Hockerton Housing Project).

4.3.5.3 Building Construction, Design and Planning

The development has maximised the use of benign, organic and recycled materials in its construction. Furthermore, the dwellings have been constructed to be of a high thermal mass, this makes it efficient in sheltering the occupants from the cold climate. The building is constructed such that the concrete floor slab is 300mm thick with the roof (which is earth sheltered) being a beam and block roof. The exterior skin of the building is two skins of concrete block-work filled with concrete between to form a 500mm thick wall, while the interior walls are 200mm thick concrete block cross walls. The exposed exterior envelope of the building is made of clay bricks which are fired from reused waste methane gas (Figure 25).

A 200mm thick sub-slab was used to simplify the construction of the superstructure and a polyethylene waterproof membrane was laid on the roof binding slab. The exterior walls slab and roof was super-insulated

with 300mm of CFC free polystyrene and the roof is earth-sheltered with 400mm of topsoil which blends into the existing natural ground slope. None of the slabs, insulation and waterproofing membranes contain holes for services (Figure 25).

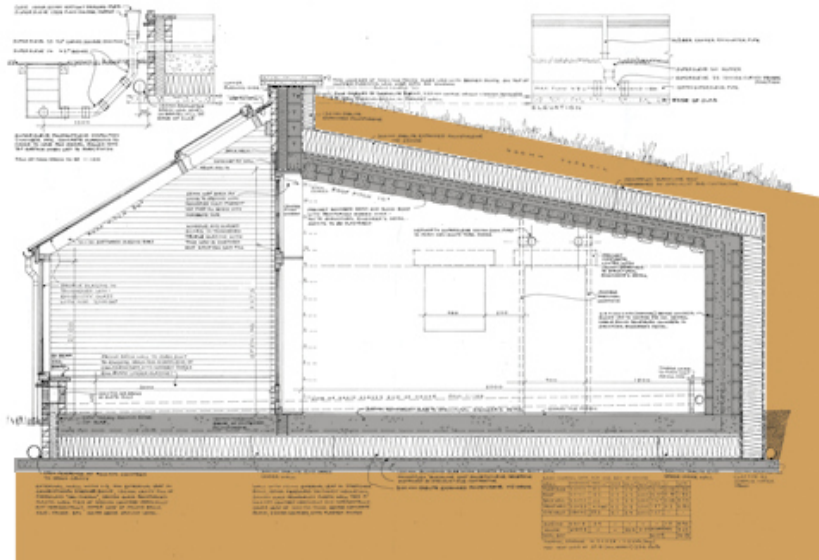


Figure 25. Technical section showing earth sheltering and building envelope (Hockerton Housing Project).

All the main doors and windows open into the conservatory (which is double glazed with low-e glass) and are all triple glazed with low-e glass that is argon filled. This means that heat transfer can take place passively from the conservatory to the house by opening windows if necessary (Figure 26).

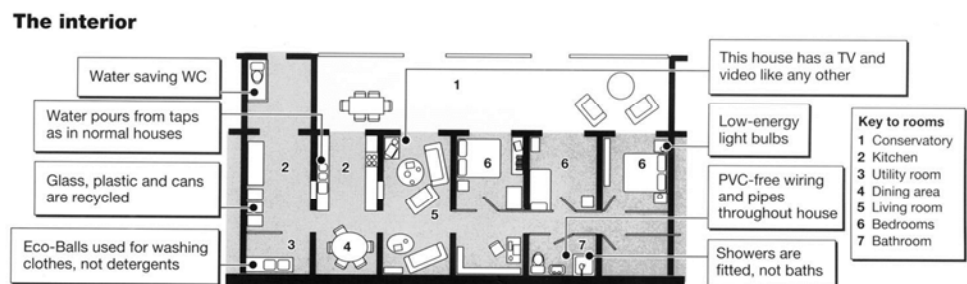


Figure 26. Typical floor plan of single unit (Hockerton Housing Project).

4.2.5.4 Sustainability, Energy, Waste Disposal and Technical Aspects

Ventilation of the building is achieved by opening windows on the exterior walls and doors. The building also utilises a mechanical

ventilation heat recovery (MVHR) system that actively supplies fresh air to the rooms and extracts air from the kitchen and bathroom (Figure 27).

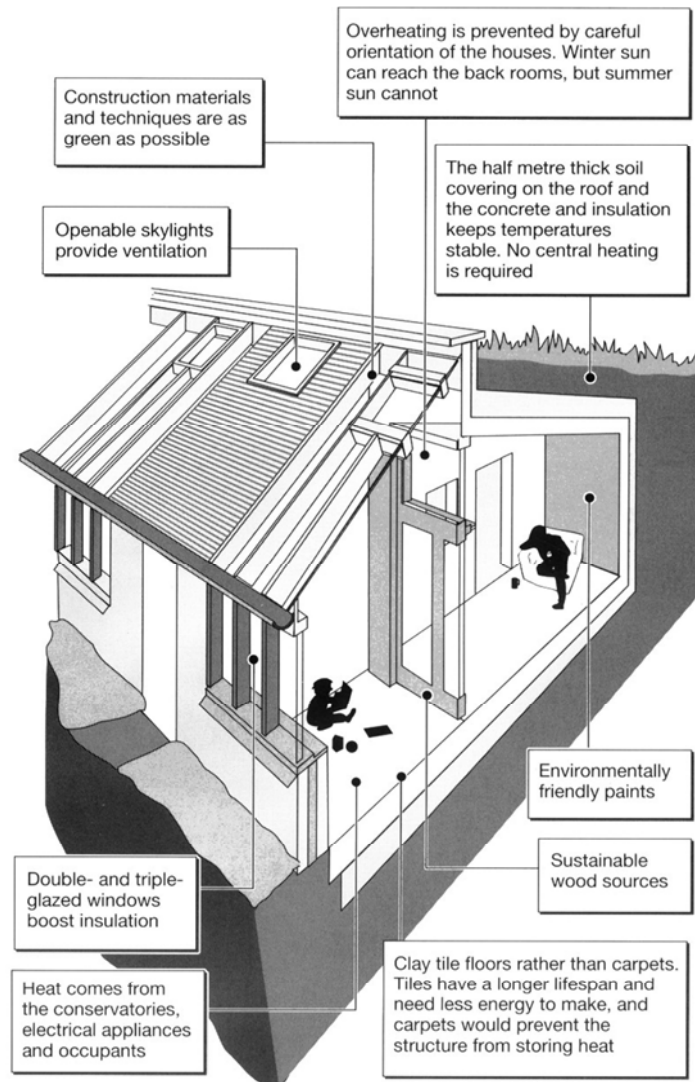


Figure 27. 3D Section showing technical aspects (Hockerton Housing Project).

All water heating is done by utilising an air-to-water heat pump which stores water in a super-insulated 1 500l plastic tank situated in the utility room. The system draws passive-solar heated air from the conservatory with the result that the system needs only a third of the energy required compared to a conventional system.



Figure 28. View of conservatory (Alasdair Morrison and Partners).

All space heating is achieved by passive solar gain and body heat from occupants which is stored and contained within the building because of the super-insulated envelope and its high thermal mass. The design of the south-facing elevation (sun facing side) allows winter sun to penetrate into the deepest parts of the building with the aid of 3m high windows looking into the conservatory, while open-able skylights allow excess heat to escape in the summer (Figure 28). Furthermore, the placement of deciduous trees shade the building in summer with their leaves and do not block sunlight in winter because they lose their leaves. This design maximises on sunlight when it is most needed and reduces solar gain when it makes the building uncomfortable.

The use of low energy light bulbs, laptops and energy-efficient appliances make efficient use of energy. All appliances are switched off and do not remain on standby while dryers are done away with because clothes and dishes are dried passively on racks in the conservatory.



Figure 29. Photovoltaic array on roof (Alasdair Morrison and Partners).

All the energy requirements of the house are taken care of by a 5kW wind turbine situated on-site and a 7.65kW photovoltaic array situated on the roof (Figure 29).

Rainwater is collected from the sloped roof and then filtered using a UV system before being stored on-site for drinking purposes. All the sewage is treated using a reed bed system which breaks down the waste and is filtered and finally deposited into a nearby pond which meets the EU standards for bathing.

A monitoring of the energy consumption during the first year of occupancy proved that the development consumes 25% of the annual consumption of conventional new houses within the United Kingdom while the development only consumes 10% of the annual consumption of the United Kingdom's current building stock.

4.3.6 Conclusions

The Hockerton development manages to remain sustainable due to its energy self-sufficiency; this allows it to reduce its carbon footprint to a large extent. Critically speaking the development should not have been built on a greenfield

site, rather it should have been built on a brownfield site. On the contrary, even though the site has not had any development previously, the agricultural uses of the site could have consisted of a high carbon footprint had pesticides and other practices which are insensitive to the environment been used. Nevertheless, the entire development is still low impact and its design has attracted newer species to the site.

The size of the site and the range of activities that take place give us an indication of the space required to maintain such activities. This is of importance due to the fact that in urban areas this might pose a problem.

From an eco-minimalists perspective, the use of passive solar heating is commendable as this has been achieved within a highly cold climate. Energy efficient measures taken are also commendable along with the collection of rainwater which is proven to cost £100 per year in total. On the contrary, the use of wind turbines, photovoltaic cells and water treatment systems are subject to criticism as time would tell their success when keeping maintenance and failures in mind. The sewage treatment system has also proved to be useful as it has the potential to handle 50-100 people.

The practice of permaculture in the form of organic farming and rearing of small animals and fish are also noteworthy. Permaculture has allowed the development a largely self-sufficient food supply while aiding in health and well-being. This has also aided in lowering the carbon footprint of the building and a reduction of 'food miles'.

The potential of replication of this development exists due to a number of reasons. Even though the dwellings consisted of additional design elements which would not be found in a conventional dwelling, the cost did not prove excessively more than that of the conventional dwelling. This is largely due to the reduction of labour cost with the residents opting to self-build the development. This could prove a cost problem for others but the tenants of minimalism and simple living support the practice of self-building one's home.

Although minor aspects of the design of the development are yet to be proven in the long-term; the development achieves a high level of autonomy and self-

sufficiency at the onset. It must be noted that this has only been achieved in a rural area; however it is not hard to envision many of the aspects of the design of the building itself being replicated within an urban environment.

In conclusion the development has aided in the residents achieving a holistic, self-sufficient, autonomous and simple lifestyle without compromising on comfort and well-being.

4.4 CHAPTER CONCLUSIONS

This chapter has investigated the application of the theoretical framework within the design of the precedent studies.

The study of Alexander (2010) reveals the extent to which a simplified lifestyle may be adopted and the subsequent challenges and benefits that may arise while adopting a simplified lifestyle at the level of an individual, while the study of the Hockerton (1998) housing development reveals the challenges and benefits, and the subsequent solutions, which may arise out of adopting this lifestyle on a larger and more permanent scale.

This has revealed information which informs the proposed architectural intervention. The information gained is now used to inform appropriate case studies, investigated within the next chapter, which aid in the understanding of these ideas within a South African context.

CHAPTER 5: CASE STUDIES

5.1 INTRODUCTION

This chapter aims to review, investigate and analyse existing local case studies of buildings and projects to further expand the analysis conducted in the previous chapter within the South African context.

By analysing the concepts and theories that form a framework of the design of these buildings and projects within the local context, the practical application of these theories and concepts, their subsequent viability within the South African context can be understood.

Each responsible person was asked to complete a questionnaire (Appendix I) which analysed their particular undertaking of urban self-sufficient living in order to fully investigate and understand the background, underpinning ideas, process and future projection of their project this is combined with general discussion and notes taken.

Conclusions are made on success and failures of these buildings/ projects and their contribution to designing an architectural working model within the local context as well.

5.2 AUTONOMOUS, SELF-SUFFICIENT RETROFICATION FOR LIVING WITHIN A SUBURBAN CONTEXT: A Study of the Omar Residence

Typology: **Self-Sufficient/Autonomous Co-housing Development**

Location: **Suburban Isipingo, Durban, South Africa**

Year of Completion: **Work in progress**

5.2.1 Project Background



Figure 30. Street view of original property (Google Earth, 2013).

The project is the efforts of businessman Ismail Omar in achieving self-sufficiency within his urban residence. The residence is one of six units, occupied by immediate families (Figure 30), which are situated within the residential area of Isipingo Beach situated on the outskirts of Durban. Omar's efforts range from permaculture practices to harvesting water and energy in order to achieve autonomy from the local supply. Currently his undertakings have mostly been with regard to his own residence at the property, however some have benefitted all that reside at the property.

5.2.2 Justification as a Precedent Study

The study is justified firstly because Omar is a relatively average individual who has had no previous exposure or experience with these techniques. He is a self-taught middle-class individual who resides in conventional urban setting and is surrounded by the conventional way of life which is adopted by his family and community. Additionally, he is most likely the only individual to adopt these practices or lifestyle within his immediate community, which makes his journey into self-sufficiency of interest to this study. This project has also been chosen because it is a retrofit, and by investigating this project we may understand the failures and inadequacies of conventional architecture in providing a base to introduce urban self-sufficient living so that it may inform the design of the proposed working model.

5.2.3 Site and Context

The project which is situated within the residential area of Isipingo Beach Durban is surrounded by individuals of all income levels. The site is situated directly opposite the ocean which results in substantially harsher weather than other houses within the area (Figure 31).



Figure 31. Site context (Google Earth, 2013).

5.2.4 Project Objectives

Omar aims to achieve total self-sufficiency and autonomy as a result of his undertakings. He aims to lead a wholesome, healthy and comfortable life within his current residence while being totally independent of local supply.

5.2.5 Project Description



Figure 32. Supply switch and battery store (Author, 2014).

Omar's first undertaking of retrofication was to harness solar power within his own house. He has set up a photovoltaic array on his roof, which gathers solar power which is then stored within four batteries. The stored power can then be used to supply all the household energy requirements for a minimum of 6 hours. Furthermore he has installed a switch which allows him to easily alternate between solar and local supply (Figure 32).

He further utilises rainwater harvesting to supply his water, he has achieved this by installing four water tanks on the first floor. He utilises a pump to achieve the required pressure as the tanks are not situated high enough. The tank then supplies potable water to the entire property with the ability to easily switch to local supply (Figure 33).



Figure 33. Rainwater harvesting collection tanks (Author, 2014).

Omar is also in the process of installing a solar water heater on the roof as well, it consists of a recycled satellite dish which has been covered by mirrored tiles and concentrates the sun's rays onto a copper pipe through which cold water flows, the hot water is then stored in an insulated tank (Figure 34).



Figure 34. Solar water heater covered in mirrored tiles with adjustable arm (Author, 2014).

Omar's permaculture practices involve planting 'heirloom seeds' of edible fruit and vegetables within planting spaces, for a reliable food supply. Heirloom seeds are collected and planted as opposed to the current conventional 'genetically modified (GM)' seeds sold, which forms part of permaculture

practices. These provide natural and healthy foods for the consumption of the entire complex as opposed to the ill effects of GM foods. Furthermore, he manufactures compost from kitchen waste to fertilise his plants (Figure 35).



Figure 35. Edible fruit and vegetables grown on site (Author, 2014).

Omar also supplements his food with the production of honey. Two hives are situated on a roof and supply up to 20kgs of honey per year per hive. The honey is then consumed by the entire complex and bee's wax is used to make organic beauty products for his family (Figure 36).



Figure 36. Hives situated on a roof (Author, 2014).

Furthermore, Omar slaughters his own animals at home which provide a supply of meat all year round for his family. Additionally, he has pursued many other projects such as animal skin tanning, archery and bow-making, edible oil-production (through a self-constructed seed and nut press), log-building construction techniques, knife sharpening, canine assisted defence training and self-defence training.

5.2.6 Analysis and Discussion

The following ideas and thoughts were collected based on a questionnaire (Appendix I), which was answered by Omar, and further discussions.

Omar explains that he is motivated to be self-sufficient because he does not want to be dependent on an outside source to meet his basic needs. Outsourcing ones basic living needs is unreliable and can mean that sometimes one is put into a compromising position. He prefers to be self-sufficient and in control over his situation and needs. He views sustainability as a by-product of his primary motivation of self-sufficient living. Self-sufficient living means that one primarily has a responsibility to provide for one's family, if one cannot provide for one's family then it is unlikely that one may develop a responsibility for future generations. He explains that if people live a simple and responsible lifestyle which is devoid of wastage and extravagance then it would automatically mean that the future generations would have an abundance of resources in the future; this mind-set does not require one to actively promote sustainability as a responsible lifestyle should be expected of all individuals.

One of the most challenging aspects of Omar's projects has been the perceptions and attitude of his community. The prevalence of ignorance and narrow-mindedness of his community often leads them to question his actions and undertakings. He maintains that the rights of neighbours should always be upheld when undertaking any project within an urban area. This has often resulted in him going out of his way to entertain the grievances of his neighbours even though he had a legal and moral right not to do so. His bee hives had to be moved to a more discreet location after months of being functional, but when his neighbours expressed concern when they noticed him harvesting honey he opted to move it in order to please them. He has also

received uncertainty by his immediate family which resides with him on the property, when in the process of transitioning to solar power, he was often told that it was a futile endeavour because of the availability of a local supply, these concerns were put to rest when the local supply failed and all the residents flocked to his own house which remained totally unaffected, he has since received more support.

He further explains that in the process of many of his projects he was confronted with a lack of knowledge within the field, this led him to contact many different people within different fields in order to gain the required knowledge on the particular subject. It is not merely the fact that there is a lack of knowledge; it is more that there is a lack of total understanding and knowledge regarding the practices of self-sufficiency on the whole. Furthermore the context of a suburban residence means that there was a lack of workable space to pursue his undertakings, which meant that he has often had to resort to creative solutions, such as positioning of rainwater tanks on ledges etc. He also finds lack of time challenging due to work and other responsibilities, though he states that this has not been a deterrent as one has to make time for this type of lifestyle, often sacrificing other conventionally practiced methods of entertainment and leisure and obtaining it in alternate ways by his chosen lifestyle.

Omar defines success as a total lifestyle of self-sufficiency, when he attains a total sense of security over all of his resources then he would consider himself successful, he therefore maintains that the journey to self-sufficiency is slow and challenging especially with regard to his current context and situation.

Omar emphasises that the current standards of architecture do not allow for a self-sufficient lifestyle. Aspects of building design such as orientation and adequate space for utilities required for self-sufficient living should be given more preference when designing buildings, rather than the preference given to aesthetics and extravagant facades which is presently the norm.

Omar explains that his journey is only made possible by diversifying his skills; he often takes time to learn new skills in order not to be dependent on others. Although untrained in any artisan skills, he has so far obtained many additional

skills by watching, learning and practice. He emphasises that in order to be self-sufficient an individual should obtain a diverse skillset.

By choosing a self-sufficient lifestyle, Omar has obtained a healthier and wholesome lifestyle for him and his family, he has achieved peace of mind that he has gained more control of his resources and can provide effectively for his family. Along with this the cost of living has also dropped, by sourcing resources such as electricity and water his cost of providing basic necessities to his family has declined, which results in financial freedom.

The lifestyle has also resulted in Omar being a more responsible consumer, by putting effort to source his resources he and his family have adopted a culture of re-using and recycling, therefore there is less wastage in his life. He explains that by one sourcing one's own needs one attributes more value and appreciation to what one owns. This aspect has been one of the most fulfilling on his journey to self-sufficiency.

Omar sees the progression of self-sufficiency through the promotion and education of this lifestyle to others. By doing this more people would understand that this is a superior way of living and it would become more accessible and acceptable within society. He also aims to contribute to streamlining the current available knowledge through his work.

5.2.7 Conclusions

Omar's motivation to adopt a self-sufficient lifestyle highlights an important point that if one is to be environmentally sensitive then this would only occur if one is responsible to his immediate family, environment and community in the present situation. It is important because it reinforces the literature investigated, which promote a minimalist or simplified lifestyle to be adopted by all. It also provides insight on the mind-set of current society, that some people may not be primarily motivated by sustainability, rather they are motivated by a common sense or practical approach which affects their current situation. This can be used to inform the approach of the proposed architectural intervention.

The challenges faced by Omar within his immediate community also highlight the mind-set of current society; it seems that some people are automatically

uncertain about aspects of a self-sufficient lifestyle that go against the current norms and practices which they are exposed to, a solution to this can be seen within Omar's experiences, where his family only accepted the benefits of solar power when their local power source was cut, that people are more open to new ideas once they witness the practical benefits of it. The lack of first-hand knowledge is also apparent in that he could not find anyone that could provide total knowledge in order to assist in the completion of his project. This highlights the fact that within the local context further promotion of a self-sufficient lifestyle is required by people who have gained experience within the field. The fact that he finds that working on these projects, to achieve a self-sufficient lifestyle, forms part of his leisure underscores the benefits of this lifestyle and that it promotes positive activities in order to live a fulfilling and wholesome life.

Omar's disappointment in the current standard of architecture in developing a self-sufficient lifestyle within urban areas is important because it highlights the need for architectural intervention within this field and the role of designers in promoting this lifestyle. Architecture needs to change its focus from providing buildings which are extravagant, and often impractical, in nature to buildings which are practical.

The role of skill acquisition is also underscored by Omar's experiences, it highlights the need for skills development within society and the effort required. Omar was willing to learn and acquire new skills; other individuals who are not equally motivated as he is may find the skill-gap a deterrent to living a self-sufficient lifestyle. His acquired skillset (through his pursuits) prove that he has successfully adopted a holistic mind-set of self-sufficiency and subsequently has adopted it as a lifestyle.

The benefits that Omar has gained by adopting this lifestyle are proof of the practicality and applicability of the theories of minimalism and a simplified lifestyle which has been investigated within the literature review (Trainer, 2009) and the utilisation of these theories in developing the proposed architectural intervention. The fact that it has decreased the impact of consumerism and materialism within his life prove that the research problem may find a solution

within this research. This provides insight to the role of architecture in developing urban self-sufficient living.

5.3 BIOTECHTURE AND PERMACULTURE WITHIN AN URBAN CONTEXT: A Study of the Edwards Residence

Typology: **Self-Sufficient/Permaculture/Simple Living Residence**

Location: **Central Durban, South Africa**

Architect: **Paul Mikula**

Site Area: **1 600m²**

Year of Completion: **Work in progress**

5.3.1 Project Background

The project was conceived by Horticulturist Frank Edwards, who has some experience in town planning, architecture and construction, ten years ago after being motivated at the birth of his grandson. He came to the conclusion that sustainability was the only means by which we may provide and secure resources for the coming generations.

The project is distributed between his current residence, neighbouring public park and plant nursery business premises. He has experimented with a range of undertakings which revolve around permaculture, biotechture, simple living and sustainability and the subsequent promotion of these ideas.

The ideas and experiments conducted consist of guerrilla gardens, permaculture practices, wind turbines, solar water heating, vermicomposting (earthworm composting), solar cooking, hemp construction, grey-water treatment, rainwater harvesting, open pollinated seed production, biodiversity, zero-waste (through waste reduction, recycling and reusing) and the subsequent promotion and education of these concepts.

5.3.2 Justification as a Precedent Study

The study is justified primarily because these concepts have been realised within an urban environment as well as on a residential and commercial scale. It has been realised and conceived within a society of consumerism and materialism. Furthermore, notable success has been achieved in realising these ideas and its

promotion as ‘common sense sustainability and way of life’. It is therefore a model example of self-sufficient living at an urban, residential and commercial level.

5.3.3 Site and Context

All the projects are situated within the context of central Durban, within a residential setting. The guerrilla garden is situated next door to the residence within a public park and has now been approved by the council. The projects are in full access to the public and encourage public participation and education (Figure 37).



Figure 37. Context of House Edwards and guerrilla gardening initiative (Google Earth, 2013).

5.3.4 Project Objectives

The primary objective as stated by Edwards is to promote and educate sustainability. This has been achieved by making the project easily accessible for view by the public. Information boards and signs accompany each undertaking and provide useful information on each subject.

Furthermore Edwards aims to create a sustainable, resource abundant and environmentally sensitive world for future generations by implementing, promoting, expanding and educating all the aspects of this project already mentioned.

5.3.5 Project Description

5.3.5.1 Overview



Figure 38. Photograph of plan of house and neighbouring park (Author, 2014).

The project is divided into three groupings, the guerrilla garden in the public park (Figure 38), the Edwards residence and the plant nursery business.

The guerrilla garden was started in 2009 by Edwards in the next door public park (Figure 39). He proceeded with illegal planting using permaculture techniques. He was approached to stop the same day, and also received approval the same afternoon.



Figure 39. Street view of public park before permaculture intervention (Google Earth, 2013).



Figure 40. Street view of the 5 year guerrilla garden and educational signage (Author, 2014).

The existing grass has now been replaced with a permaculture ‘food forest’ which provides a variety of edible organic fruit and vegetables to the public free of charge (Figure 40). The public may walk between the raised planter beds and take whatever they please while the food forest is gravity fed with grey water from Edwards’ own property.

Edwards’ own house next door functions as a residence and workplace, and exhibits many of his experiments. The property consists of the house, two cottages and a large garden, the garden is modelled as a permaculture food forest, with chickens, bees and grey water treatment ponds.

The plant nursery which functions as Edwards' business is situated in another area a few kilometres away. The project elements situated at the nursery function mainly as educational tools for the community, these involve a wind turbine, solar water heating and hemp construction. For this reason this study would concentrate on the residence and guerrilla garden due to the fact that is realistic, in the sense that it is being utilised practically.

5.3.5.2 Food, Lifestyle and Community



Figure 41. Bananas harvested from the guerrilla garden, available to the public (Author, 2014).

Edwards' is able to source fresh organic fruit, vegetables and eggs from the food forest (Figure 41). He utilises 'chicken tractors' which involves periodically moving a chicken enclosure along a planting bed in order to achieve good soil; additionally he has free range chickens as well. He also has an apiary which houses honey bees on-site, which produces fresh honey.

Edwards lives a simple lifestyle which is anti-consumerist and anti-materialist in nature. He prefers to live a wholesome fulfilling lifestyle, which is filled with productive activities that contribute to sustainability and the community. He also dedicates his time to furthering sustainability in the community by engaging in additional public projects. He chooses a simpler lifestyle, and to engage in simpler activities, over one that is work-intensive.

There is an overwhelming sense of community which can be found at Edwards' residence and the neighbouring park. The property houses Edwards' son, a few tenants and friends, all of whom are constantly involved in the many activities and projects. While conducting this study, it was noted that Edwards received many visitors and friends, including a guest from Germany, who contribute to his activities on a micro and macro scale all in the spirit of community.

5.3.5.3 Building Construction, Design and Planning

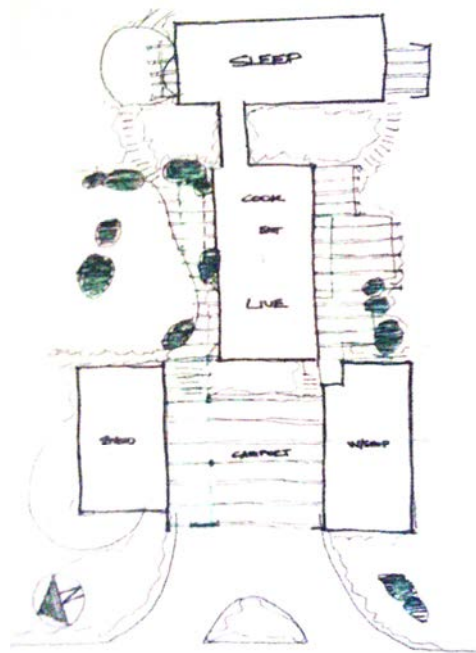


Figure 42. Sketch plan of house (Author, 2014).

His current residence at Julia road consists of conventional self-constructed house designed by Durban architect Paul Mikula. The main house was not designed to be pretentious or to compete with the house next door, rather it is simple and practical and its aesthetic is derived from its ability to merge with the surrounding environment (Figures 42 & 43).



Figure 43. Exterior of house showing relationship with garden (Author, 2014).

The garden was designed along with the house, and the house allows a free flow of living between the garden and the inside of the house, an integral part of each other, inspired by Durban's ideal climate. The exterior is covered in 'splatter' cement coloured plaster which requires no maintenance and successfully blends naturally into the surrounding environment.



Figure 44. Interior of house (Author, 2014).

The interior of the house (Figure 44) is bagged, the floor is covered with natural looking quarry tiles and the ceiling is supported by gum poles. The house was designed to look as natural as possible, without competing with the surrounding landscape, liveable and workable as

well as practical and easy to maintain. These objectives were all achieved while allowing the building to look aesthetically appealing, although this objective was secondary in nature to the project.

Along with the main building there is an earthship on site which is often occupied by guests. Following the concept of an earthship, it was constructed with materials which were sourced directly from the surrounding site (Figure 45), the earthship consists of walls made of a combination of old tires sourced from down the road, reused tin cans and glass bottles and filled and plastered with adobe from the site. A portion of the wall allows natural light to filter in using glass bottles which function as glass bricks. The windows and fittings are all reused and recycled materials with an exception of the sink, taps and bathtub (Figure 46). The floor consists of a gum pole structure on which recycled timber slats are used for flooring. The roof of the earthship is constructed using gum poles. The earthship is a good example of self-sufficiency as it is constructed at very low cost with materials sourced directly from the surroundings. It is also successful as it performs well enough to be utilised by guests and proves to be a good alternative to the conventional house without compromising on comfort.



Figure 45. Picture taken showing the construction of the earthship (Author, 2014).



Figure 46. Earthship bathroom containing recycled materials (Author, 2014).

5.3.5.4 Sustainability, Resources, Waste Disposal and Technical Aspects

Edwards explains his own guideline to sustainability which he calls 'Relative Sustainability Factor (RSF)', he calculates it as:

$$\textit{Weight (of item)} \times \textit{Distance (to source)} + \textit{Cost} = \textit{RSF}$$

This formula, although self-conceived, provides a guideline to the Relative Sustainability of an item and subsequently the impact of utilising it.



Figure 47. Rainwater harvesting from gutter into collection tank (Author, 2014).

Edwards mentions that water is used primarily in permaculture to build soil life, if one can collect, store and utilise water effectively then healthy soil is built, the abundance of crops is then incidental to the effective water management. The main source of water is from water harvesting off the roof, the water is collected by storing run-off from gutters in a water tank (Figure 47). The water is then mechanically pumped to a higher level where it undergoes filtration for use within the main house (Figure 48).



Figure 48. Rainwater filtration system (Author, 2014).

Although the filtration system is powered by the local grid supply, it is still possible for it to be powered using photovoltaic cells, which would be done in the future. The tenants on site have declined the use of the harvested water over personal concerns, although there are no disadvantages found with using it. The grey water from the site flows into a grey water treatment pond which utilises plant life to filter the water for use within the garden (Figure 49).



Figure 49. Grey water treatment pond (Author, 2014).

The main house uses the conventional local sewage disposal system while the earthship is equipped with its own earthworm composting toilet, the waste is waterless and is composted and then utilised on-site for permaculture (Figure 50).



Figure 50. Vermicomposting (earthworms) outdoor toilet (Author, 2014).

5.3.6 Analysis and Discussion

The following ideas and thoughts were collected based on a questionnaire (Appendix I), which was answered by Edwards, and further discussions.

Edwards has faced many challenges in the past ten years to which he has overcome. Firstly, people have been largely narrow-minded towards his undertakings; some of his neighbours have not been receptive to his guerrilla garden and food forest, although they are free to partake in its produce. The pond which was set up was punctured, and Edwards has largely ignored these activities. Secondly he has faced ignorance to sustainability and permaculture; he has dealt with this by accompanying all his undertakings with information boards and graphics which can be freely read by the public (Figure 51). Lastly corruption and money has been a problem, he has overcome this by being totally self-funded and activism.

Through all these challenges Edwards feels that he has had relative success in all his undertakings, he has thoroughly enjoyed the process thus far, and is willing to continue his work.



Figure 51. Information boards available for educating the public (Author, 2014).

Edwards feels that architecture, and more specifically biotecture has allowed him to construct a totally self-sufficient building in terms of construction, materials and cost. According to him, the earthship he has constructed can be

built with an RSF of zero, which proves that this type of building is totally sustainable. Furthermore he believes that it is imperative that architecture and buildings recognise their climate and that buildings, should be designed to integrate with their own micro-climate just as his house been designed to achieve.

Edwards, who has developed skills in many trades, firmly believes in anti-specification of skills, and that it is imperative that people should adopt an attitude of 'jack of all trades' without restricting themselves to certain skills only, rather people should diversify their skills in order to become more self-sufficient in order to pursue sustainability.

The implementation of this way of life has created a joyous, fun-filled, fulfilling and holistic life for Edwards. It has also allowed him to achieve a healthier lifestyle, made possible by an abundance of healthy food and physical activity. Being surrounded by introducing biodiversity within his surroundings he can live a beautiful and stress free lifestyle which allows him to work for pleasure rather than a job that is stressful and undesirable. All these aspects have contributed to an increase in quality of life.

Furthermore, the sustainable mind-set which he has adopted has allowed him to be more self-sufficient because he re-uses repairs and recycles wherever possible. The adoption of permaculture has allowed him an abundance of resources which cannot be rivalled by purchased goods; he states that he can't even consume a supermarket purchased egg due to the quality of eggs produced by him which he has now become accustomed to.

Edwards is has now dedicated his life to sustainability and contributing to resource abundance for future generations, and continues to further his work, he claims to enjoy the pursuit of sustainability and rather than the pursuit of material possessions wealth which is the current norm of society. He continues in his efforts of activism and wishes to further his ideas of permaculture to the public in the form of guerrilla gardens.

5.3.7 Conclusions

Edwards' motivation through the birth of his grandson is commendable, it represents an environmental responsibility for future generations, and this should be the primary motivation for people to adopt a sustainable environmentally sensitive lifestyle, overcoming the conventional ideology to consume in the present while future generations would have to account for later. Indeed the current generation now has to deal with the effects of climate change due to the lifestyle of the generation that preceded it. His efforts to educate and motivate those who are ignorant to sustainability are productive and prove his dedication to the field.

The relevant success that he has achieved is only overshadowed by the absolute potential of what is possible, as he explains that he has so far only adopted a 60% effort which can be seen in his endeavours. Most of his projects have started off as experimental and although great potential exists, have sadly remained experimental, for example, waste disposal could be taken further by eliminating the conventional system totally from his main house and the harvesting of energy through photovoltaic cells and solar water heating, which remain as displays at his business premises, could also be added to the main house. This deprives the house of being a totally autonomous and self-sufficient building, which is the purpose of this study. It is nevertheless important to note that Edwards plans to further his efforts through further public intervention which would only allow these undertakings to achieve full potential.

The role that architecture has played in his undertakings through biotecture i.e. the earthship, proves that it is possible for a building to be self-sufficient and autonomous within an urban context without compromising on comfort. It serves as a working model to educate and motivate society and more so architects to adopt similar practices in future buildings as a means to be totally autonomous and self-sufficient. His main house is nevertheless wholly successful in the fact that it harvests the full potential of the climate through its design of integrating with nature and the surrounding environment. This further confirms the ideas mentioned by the official Earthship Biotecture Institute presented within the literature review.

Edwards' ethos of skills diversity provides insight to the fact that society has proceeded too far into skills specialisation. It is imperative that if one is to become totally self-sufficient, one should not have to rely on the skills of others who are outside ones micro-context; rather, as mentioned already (Trainer, 2009), skills should be concentrated within an individual or within ones micro-context.

The relative improvements to quality of life experienced by Edwards have proved true to the research already mentioned (Trainer, 2009). This proves that a lifestyle of simplicity, self-sufficiency and relative autonomy is a worthy alternative to the conventional lifestyle of consumerism and materialism (Trainer, 2009) presently adopted by society. By promoting this alternate lifestyle within urban areas through architectural intervention we may achieve the hypothesis of this research project.

5.4 CHAPTER CONCLUSIONS

The following is an analysis and conclusion of both case studies conducted and the subsequent ideas that would inform the proposed architectural intervention.

In comparison, it is important to note that there is a fundamental difference between both the individuals interviewed responsible for the case studies. Omar is an apt representation of the common man who has undertaken a journey to reach self-sufficiency. Being a businessman he has had no previous experience within the field and has had to acquire new skills and knowledge. On a micro scale he is surrounded by individuals who are ignorant to a self-sufficient lifestyle and its aspects. On the contrary Edwards, being a horticulturist by profession, has studied town planning and building construction from the beginning, he is further surrounded by friends and family who support and aid his lifestyle. Omar seems to have faced more challenges from his situation than Edwards, therefore through the study of Omar we may understand the problems faced while through Edwards we may understand the ideal situation. It is therefore necessary that the proposed architectural intervention be designed to accommodate the common man such as him.

It is of great interest to this investigation to note the differences in motivation between the two case studies as both individuals form are examples of different parts of society. On the one hand, Edwards is motivated to provide a resource abundant environment for the future generation, alternately, Omar is motivated to ultimately be totally self-sufficient in terms of resources, with abundance for the future generations being a by-product. One views self-sufficiency as a means to an ultimate goal of sustainability while one views self-sufficiency as the ultimate goal. This provides insight on the various views of self-sufficiency that exist within our society and the means by which it can be developed. This project however views self-sufficiency as a goal, through which the effects of consumerism and materialism may be alleviated.

It can be understood in both cases that there is a lack of understanding within society regarding this type of lifestyle; both report that this has presented a formidable challenge to their respective projects. It appears that only by further

education and demonstration can society appreciate the value of this lifestyle. Furthermore, both individuals emphasise on the importance of diversifying ones skills in order to achieve a self-sufficient lifestyle. It is therefore appropriate that the proposed architectural intervention aims to educate and equip lower-income youth with the necessary skills and knowledge required to develop an urban self-sufficient lifestyle.

In both cases we may gain further insight on the role of architecture in developing self-sufficient living. In the study of Omar's residence we understand the shortcomings of conventional architecture in providing an adequate platform to develop self-sufficient living, while the study of Edwards' residence reveals the success that can be achieved when designing a building with the correct orientation, relation to the environment and site conditions.

By studying the aspects of the lifestyles adopted by both Omar and Edwards we can understand the importance of living a minimalist or simplified lifestyle as an alternative to consumerism. It is also important to note that both case studies were chosen based on the fact that they encompassed the practical application of self-sufficiency and not the mind-set of simplicity, anti-consumerism and anti-materialism. It was discovered through investigation that these theories formed the foundation and motivation to the adoption of a self-sufficient lifestyle. Therefore these case studies further strengthen the importance of this research document in the adoption of the theories of minimalism and voluntary simplicity as a theoretical and conceptual framework for the proposed architectural intervention to develop urban self-sufficient living.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter summarises the findings of this research document, it outlines the conclusions, while keeping the hypothesis in mind, and compares it to the aims stated at the onset of this research project. The conclusions made are presented with recommendations.

6.2 CONCLUSIONS

In order to provide conclusions to the study of the role of architecture in developing urban self-sufficient living, it is relevant that the hypothesis of this research document is kept in mind while proposing a youth development centre for Durban's inner-city.

“By researching what the role of architecture is in developing urban self-sufficient living, we can encourage an alternate lifestyle to consumerism and develop urban self-sufficiency. There will be a reduction of the environmental footprint of living in urban areas, a sustainable and self-reliant community and an improvement in the quality of life.”

These conclusions are realised by comparing the research of secondary sources mentioned in the literature review and precedent studies to the results of the case studies conducted, by doing this insight would be provided on the reliability and practicality of the secondary research and its subsequent adoption by the proposed architectural intervention to develop urban self-sufficient living.

6.2.1 Minimalism and Voluntary Simplicity

It is apparent that the desire for this lifestyle within the South African context is overshadowed by the prevalence of the phenomena of consumerism and materialism within society, more so within the low-income bracket and the youth, as concluded by the literature review. It is apparent that there is a need to

educate and promote this lifestyle as an alternative to consumerism and materialism.

There is however a movement within society by certain individuals to adopt this lifestyle. It is important to note that the motivation for these individuals vary, the common person is more likely to be motivated by the control and security of basic resources that this lifestyle allows while there is also a part of the community who are motivated to guarantee a sustainable future for the next generation, as concluded within the case studies.

It can be concluded that it is indeed possible that this lifestyle may be sustained with urban areas if the appropriate changes are made to mind-set and architectural design. It seems that architectural design has provided an inadequate platform to develop a self-sufficient lifestyle and has the potential to provide solutions to the problems faced.

It is apparent that the effects of consumerism and materialism have had significant negative effects on the South African context and that there is a lack of artisan skills on behalf of the general public.

6.2.2 Autonomous Buildings

It can be concluded that autonomous buildings have had a major role in developing self-sufficient living within the South African context. The success of autonomous building practices in affording the security and control of one's own resources has been unfounded within the case studies. Furthermore it has proved to reduce the cost of living and consumerism. However in order to adopt autonomous building practices, specialised skills are required, which substantiate the need for skills development and selective adopting of the aspects of autonomous buildings. It is therefore imperative that the proposed architectural intervention incorporate the use of the design philosophies of autonomous buildings.

6.2.3 Biotope and Earthships

The value of biotope can be seen by the fact that it is emphasised that earthships utilised waste material for construction. As emphasised, biotope's

utilisation of simple construction techniques is valuable to the South African context because they require no previous specific knowledge or talent, this is important due to the lack of artisan skills and its availability to the common man. As mentioned already the proposed architectural intervention is to target youth and low-income earners, these individuals are least likely to possess specialised skills or knowledge. The methods of construction, although different from the conventional methods, have proved to provide practical and useable buildings within the South African climate.

6.2.4 Permaculture

Permaculture has proved to play a major role in achieving self-sufficiency with regards to food. It provides a solution by which one may attain one's own sustainable supply of food. Furthermore, the 'common-sense' approach of permaculture has proved to make efficient use of space and resources, which would be imperative within urban areas. Permaculture also promotes a healthier and sustainable lifestyle through an abundance of fresh, cheap, organic and healthy food which is free of pesticides and harmful fertilisers; this aids in reducing the effect of consumerism with low-income earners.

6.2.5 Eco-Minimalism

Eco-minimalism has provided a common-sense guideline as to the adoption of sustainable building practices. The concept is important because it places emphasis on passive design, and there seems to be shortfall the current conventional architecture with regard to passive design. The approach of eco-minimalism also promotes simplicity in design and the avoidance of complication, this aspect is beneficial because simplified design would be more accessible to the general public, especially those who are unskilled and low-income earners.

6.2.6 The Small House Movement

The design guidelines of the small house movement aid in designing buildings with a smaller footprint without compromising comfort. This is important when considering that the proposed architectural model is to be within urban areas, which are constrained by space.

6.3 RECOMMENDATIONS

The following are recommendations made, based on the conclusions reached, while conducting this study.

A proposal is made for a youth development centre in Durban's inner-city. The centre is to adopt all the following ideas mentioned, within its design. The centre is to provide a facility for the promotion and practice of self-sufficient living within urban areas via further education, training and skills development for boarding youth who seek employment, with attention given to those within the low income bracket and disadvantaged individuals. Along with learning the practical aspects of self-sufficiency, the centre is to provide a means to develop a mind-set of self-sufficiency. By being educated with skills of self-sufficiency and living within a self-sufficient facility, it is hoped that these low-income youth are able to develop self-sufficiency while residing within an urban context.

It is imperative that a minimalist and simplified lifestyle is utilised as a means to developing self-sufficiency as an alternative to materialism and consumerism. The promotion of these values and concerns, which have been uncovered within this research document, should be implemented and taught within the proposed facility.

One of the solutions to consumerism and materialism lies in the adoption of autonomous building practices, as well as the development of these skills, within the proposed facility and those that attend it. Autonomous building design and education would guarantee self-sufficiency with regard to resources such as water, energy and comfort. The building should also be biotecturally designed by implementing the design philosophies of earthships. This would guarantee the sustainability and an environmentally sensitive building; furthermore it would also provide assurance that a self-sufficient lifestyle is accessible to the common man and would reduce the requirement for skills specification.

Permaculture practices should also be implemented within the proposed facility. This would allow self-sufficiency with regard to food supply and would

encourage a healthy lifestyle at low-cost while making efficient use of space and resources. It would also be used to practically educate and equip those that attend the facility with the required skills.

The adoption of eco-minimalism is to provide a guideline, to the proposed facility, which is simplified, easily attainable and would allow easy understanding of those that attend it due to its disapproval of complicated design. Additionally, the small house movement is to provide a guideline to the efficient and sustainable use of space and ensuring a reduced environmental footprint.

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APPENDIX I: QUESTIONNAIRE

Question 1

Explain your project/undertaking, your motivation, and the key ideas which have motivated it.

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Question 2

What are the challenges that you have faced in your particular undertaking of urban self-sufficient living, and how did you overcome them?

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Question 3

What successes have you achieved in your particular undertaking of urban self-sufficient living?

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Question 4

What has been the role of architecture in your particular undertaking of urban self-sufficient living?

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Question 5

What skills have proved useful or necessary in your particular undertaking of urban self-sufficient living?

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Question 6

What are the benefits/improvements to quality of life have resulted from your particular undertaking?

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Question 7

Has your particular undertaking of urban self-sufficient living decreased the impacts of consumerism and materialism in your life?

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Question 8

How do you see your project developing further at a personal level and at the level of society?

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