

University of KwaZulu-Natal



Investigating the feasibility of the use of Moladi construction technology to assist in-situ upgrading in Informal settlements within the eThekweni Metropolitan area.

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Declaration

I hereby declare that this research report is my own work. It is submitted for the partial fulfilment of the Degree of Master of Housing at the University of KwaZulu-Natal, Durban. It has not been previously submitted for this purpose, or for any other degree or examination at any other university.

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Abstract

The existing South African housing backlog confronting the residents is daunting. With the current investigations displaying that the backlog is not depleting or not reaching levels anticipated by the democratic government, the stakeholders of low-income housing sector are facing an immense challenge. Most houses constructed after 1994 utilised conventional brick and mortar construction, with alternative construction methods of housing only taking up an insignificant portion in the total housing supply.

The purpose of this study is to investigate the feasibility of Moladi construction technology as a valid alternative to the traditional low-cost housing model, in terms of delivery time, quality and total cost. Social acceptance is also analysed as a parameter that affects the success of Moladi construction model. This parameter represents the basis that indicates the feasibility of a new method implementation.

Hence, the study dealt with the potential impacts of implementing an alternative construction technology for in-situ upgrading projects, and in particular for the case study of Piesang River and Namibia Stop 8 settlements in Inanda, under the eThekweni Municipality jurisdiction. The main purpose of this study is to assess the level of willingness of low-income residents to use alternative construction technologies instead of the conventional ones, with the aim of reducing time and cost delivery, while not compromising the overall quality. Moreover, this research seeks to estimate the role of community participation in planning and implementation phases of housing projects. The study applied a comparative research design by means of case studies and is based on qualitative research methods.

The findings indicate that the use of alternative construction can be considered a satisfactory solution to low-income groups, more so in the informal settlements due to cost, speed of construction and quality production. Thus, the proposed recommendations suggest that the city administration should be given more attention to the use of less costly alternative materials and technologies without affecting the quality of construction. Finally, the government policy intervention, in conformity with the introduction of new construction technology that could be managed by the beneficiaries themselves, should get serious attention. Allowing for a sense of ownership for these housing projects from the beneficiaries.

The findings of the research point out that using Moladi as an option to assist or replace the conventional brick and mortar built housing will be feasible due its ability to reduce cost, time while not compromising quality.

Keywords: Alternative construction technology, low-income, informal settlements. In-situ Upgrading

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List of Abbreviations

ACT	Alternative Construction Technology
CCMT	Community Construction Management Team
CCT	Conventional Construction Technology
DUT	Durban University of Technology
FEDUP	Federation of the Urban Poor
HDA	Housing Development Agency
IDP	Integrated Development Plan
IRDP	Integrated Residential Development Programme
MCT	Moladi Construction Technology
MUT	Mangosuthu University of Technology
NGO	Non-Governmental Organization
NDP	National Development Plan
NHF	National Housing Forum
NHBRC	National Home Builders' Registration Council
NS8	Namibia Stop 8
PHP	People's Housing Process
RDP	Reconstruction and Development Programme
SABS	South African Bureau of Standards
SANS	South African National Standards
SDI	Slum Dwellers International
UISP	Upgrading Informal Settlements Programme

Chapter One (1) Introduction

1.1 Introduction

Twenty-two years after gaining democracy, the South African government is still facing a struggle in providing satisfactory low-cost housing as espoused in the numerous policies of housing, since the first democratic elections in 1994 (Charlton & Kihato, 2006). Some of the most noticeable weaknesses of the housing policy is that there is not a clear linkage between the existing focus in government on the role of housing to poverty alleviation, and the ability of the policy to deliver on these objectives (Charlton & Kihato, 2006: 259). This has in turn resulted in housing backlogs and poor quality of low cost houses.

Section 26 of the Constitution of South Africa states that all South Africans should have the basic right of access to *adequate housing*.¹ This responsibility of housing the people of South Africa falls to the state (Currie & De Waal, 2005), which is empowered to utilize all legislative and economic resources, at its disposal, in order to achieve this right to housing, in all forms. Although the state has mobilized, resources and labor, after 1994, to achieve these objectives many challenges remain in the facilitation and provision of adequate subsidized and social housing (Khaki, 2009).

The backlog of cost effective and high quality housing units continues to grow at a rapid pace. Although the proportion of poor households living in formal dwellings increased from 47% in 1994 to 66% in 2012 (Affordable Housing Development South Africa, 2012), the population also expanded from 40.6 million to 51.8 million from the year 1996 to the end of 2011 (Statistics South Africa, 2016). The Department of Human Settlements reported that figures from the SA Institute of Race Relations (IRR) place the 2016 SA's housing backlog at 2.1 million units, noticeably more than the projected shortage of 1.5 million houses in 1994. (South African Department of Performance Monitoring and Evaluation, 2016). This, in reality, was a slight decrease from the reported 2.4 million in 2007 (Sisulu, 2007), yet a significant increase over the

¹ Adequate housing not interpreted narrowly, but rather seen as the right to live somewhere in security, peace and dignity. This also encapsulate the following: 1) Security of tenure; 2) Housing, land and property restitution; 3) Equal and non-discriminatory access to adequate housing; 4) Participation in housing-related decision-making at the national and community levels.

1.8 million units reported in 2001, and the 1.5 million units reported in 1996 (Sapa-AFP, 2006). EThekweni metro, on its own, has an approximate housing backlog of 400 000 units as of June 2014 (EThekweni Government Provincial Treasury, 2014), in comparison to the estimated 1.5 million units of South Africa as a whole, simple making it one of the largest housing backlogs in South Africa. Therefore, households have no choice but to settle in informal dwellings/settlements (commonly referred to as *shacks*) to meet their housing needs (Huchzemeyer, et al. 2006).

Haselau (2014) states that “*the state capability needs to be increased to support co-production modes of housing delivery and settlement making between ordinary citizens, community organisations, cooperatives, the private construction sector and the banks*”. Government wants to remove the housing backlog by 2030 setting a target of building 200,000 housing units a year (Haselau, 2014).

Like any urbanised society, eThekweni Metropolitan is facing serious challenges in the provision of adequate housing for its citizens. There is an acute shortage of housing units relative to the demands, leaving her citizens with no option rather than, for them, to turn to informal settlements to provide for their basic need of housing (Tshikotshi, 2010). Furthermore, there is an increasing realisation that the current methods used to tackle the convoluted challenge of informal settlements in South Africa have been ineffective (Misselhorn, 2008). In the face of the increasing pressure and community dissatisfaction with the inability of government (along with the municipalities) to provide basic infrastructure and housing to the urban poor households, it is important that there are well-informed decisions in the respect of addressing the issue of informal settlements along with the delivery of in-situ upgrade to tackle the constantly growing low-income housing backlog (Cairncross et al., 1990).

The Constitution of the Republic of South Africa (1996) states the government should take reasonable legislative and other measures in ensuring that everyone enjoys a right to adequate housing, social security and appropriate assistance. Since 1994, South African government has created about 3.6 million housing opportunities, mainly benefitting the urban-based poor. In the process, formalisation of informal settlements is still a nagging issue, due to the lack of appropriate building technology that will ensure the delivery of adequate housing. The challenge of providing adequately viable settlements is mounting enormous concern by day, as the municipalities

struggle to produce what they have promised and still do to their people repeatedly in the aim of *“providing a better life for all”*. The government is facing enormous pressure to meet new responsibilities with a greater accountability and the inclusion of community participation in settlement planning while current governance structures cannot adequately ensure effective delivery of basic services (UNDP, 2013). According to Ntema (2011) the National Housing Policy specifies that in order to get the housing subsidy the beneficiary should demonstrate some involvement, either in the form of monetary savings or labour (planning or construction depending on their strong skills and qualities). This should stimulate the creation of a culture of responsibility and saving for housing amongst the citizens faced with the plight of housing. In fact, the government has introduced the People's Housing Process, originally coined by the Slum Dwellers International (SDI), through the promise to fund households who are willing to participate in building their own housing. The PHP (People's Housing Process) approach to housing provision was approved in 1998 as a self-help (or self-built) housing scheme inspired by the work of the homeless people's federation and saving and housing schemes from around the globe. The PHP has been a feature of the National policy; nevertheless, many provinces resisted it in favour of private sector delivery (Khan and Thring, 2003).

In July 2008, the adoption of Enhanced People's Housing Process (EPHP) started and rolled out in April 2009, to replace the previous PHP programme. This new policy was the result of long and difficult negotiations between the National Department of Housing and a group of NGOs including Planact, DAG, the Built Environment Support Group (BESG), Afesis-corplan, Urban Services Group, Utshani Fund and Federation of the Urban Poor (FEDUP). These NGOs, through numerous attempts, objected to the narrow definition of the PHP as *“self- build”* housing involving contributions of *“sweat equity”* as opposed to the use of contractors. They believed it should be defined as the fundamentally concern a collective, *“community-based process of decision-making that would seek to address housing in the context of other social needs and community priorities.”*

The new policy adopted a broader definition of PHP in which beneficiaries actively participate in decision-making over the housing process and housing product. To empower beneficiaries, create partnerships, mobilise and retain “social capital”, build “housing citizenship”, encourage beneficiaries who are aware of their rights and

responsibilities, promote local economic development, foster stable communities. Through the building of houses that are better suited to the needs of individual households, involving women and youth more directly, and create settlements which are more responsive to the needs of the community. Now, provided some assisted help, people can choose alternative construction methods to build dwellings that are characterised by good quality and design, that reflect individual needs and taste, and from which they can work (Currie & De Waal, 2005).

This, in turn, has necessitated the introduction of innovative and alternative construction and policies aimed at advancing the use of methods (with the involvement of community members) able to speed up housing delivery in the informal settlements of South Africa through the informal settlement upgrade programme (in-situ) (Sisulu, 2007). Haselau (2013) reinforces that there are alternative construction methods that take less time and cost for building low-cost housing and that the lack of awareness regarding alternative construction methods represents a significant barrier to its implementation. Hence, this study aims to investigate the barriers that prevent the use of alternative construction technology (ACT) such as the Moladi construction model, in the upgrade of informal settlements to improve the delivery of housing.

Moladi technology involves easy to use plastic panels interconnected to make a plastic structure/formwork of any length and height for the different walls of a building to allow for the pouring of in-situ concrete. The method seeks to deliver housing cheaper, faster and easier without the necessity of skilled workforce to do the construction of the actual structures but people within communities willing see change in their communities without negotiating the quality of the end product (Moladi, 2008: online). The reinforcing, pipes, electrical installation, door- and window openings cast before the pouring of the concrete into the wall formwork. It takes approximately four hours to set up the plastic mould and about two hours to fill it with a special blend of concrete. This is an overnight process where the walls are left to dry overnight and the formwork then removed on the walls setting to the shape. The formwork can be set up to 50 times to construct more houses and can then be recycled then after (De Lange, 2008: 35).

During her first term as Housing Minister (before the ministry changed the name to the now 'Human Settlements ministry') Lindiwe Sisulu, reported in the 2008 in parliament,

that: *“In order to tackle the building material issue, the department needed to undertake an investigation in respect of the use of alternative building technologies which would meet all the essential standards for quality, norms and standards of the NHBRC” found in SANS 10400*” (Ndaba, 2008: online). The Application of the National Building Regulations SANS 10400 contains prescriptive rules for any form of construction deemed to satisfy the National Building Regulations. The application of these rules is not fixed; hence, the owner of the house is permitted to utilise any means to satisfy the requests of the National Building Regulations. Minister of Human Settlements Tokyo Sexwale later reinforced the sentiments shared by Lindiwe Sisulu, after taking over from her during his stint as the minister. He also stated in September 2010 that of the 1.5 million houses constructed since 1994, only 17 000 units were built utilizing alternative forms of construction and alternative solutions are necessary to help conventional building technology to meet the backlogs (Sexwale, September 2010). Then in 2013, in her second term as the Minister of the Human Settlements, Lindiwe Sisulu stated, *“their approach to human settlements service delivery was directly in line with the National Development Plan, or NDP. The impact of the global climate change, particularly on the poor, acknowledges that through the outcome of optimal and sustainable use of resources, and the Department was proactively enforcing the use of alternative building materials in projects such as the 1951-unit built in Delft 3 and 5 project in Cape Town in the Western Cape* (Madikizela, 2013). However, to date, this only accounts for 0.68% of all constructed houses in the formal housing supply and it clearly indicates that alternative technologies and building methods are not contributing significantly to the national housing infrastructure supply.

In the *20 Year Review: South Africa 1994 to 2014 report*, the government acknowledges that: *“the state competence has to be bettered to support co-production modes of housing delivery and settlement making between ordinary citizens, community organisations, cooperatives, the private construction sector and the banks”* (Merckel and JUDY, 2012). Through this, a reinforcement by the Government promised to try within their confines to eliminate the backlog by 2030 setting a goal of constructing 200,000 units of housing a year (Sapa, 2013).

1.2 Problem Statement

Tonkin states that there are numerous challenges that impede a reduction in the housing backlog (Tonkin, 2008):

- 1) The shortage of reasonably priced, well-placed land prevents communities to integrated settlements;
- 2) Funding from government is slow in responding to the needs, as well as under-spending of allocated budgets due to non-capacity;
- 3) Subsidies allocated for housing projects face the challenge of the ever increasing inflation, hampering the project completion;
- 4) The lack of capacity and material resource shortages, that leads sometimes to delays in project implementation;
- 5) The nominal or lack of community involvement and choice in decisions of slums upgrading;
- 6) The withdrawal of large construction groups, after the announcement in 2002 that local authorities will handle the development of low-income housing projects.

There is a need to assess alternative building technologies that will help delivering low cost houses that is both affordable and constructed within the shortest possible time with the involvement of the communities through their participation in the planning and construction phases of the housing project. Furthermore, it is evident that there is potential for the use of Moladi building technology for in-situ upgrading of informal settlements. The technique perceived to have the potential of reducing the cost of construction in comparison to the conventional building technology of brick and mortar house and in turn accelerates the production of housing stock to trying and tackle the challenges of backlog faced in the country (Coetzer, 2010).

Furthermore, the lack of participation of communities in planning and construction of their houses has exposed numerous challenges encapsulating the lack of empowerment but, in turn, the absence of gratitude and having a no sense of ownership of the houses received by the beneficiaries (Ndinda & Uzodike, 2008). Houses delivered by the government tend to deprive communities from having a choice on what materials used in the construction, resulting in the lack of innovation in the form of alternative ways of construction that beneficiaries embrace. In turn, these houses have easily been dilapidated or sold by the beneficiaries due to their desertification of the product delivered to them by the municipality. At the same time,

people disregard the value of the house, as they have worked not put in any effort into their houses, either during the decision making of design or the construction, hence there is no sense of ownership and keep them in a good condition. This could be linked with the poor consultation and engagement with the beneficiaries during planning and construction of houses. Subsequent to this, people still sell their houses and return to informal settlements (Kabajuni, 2009). Kabajuni (2009) emphasised that the participation of people in housing projects is said to improve value of them sharing their concerns so that what is handed over to them as an end product meets their visions. Such expectations could include the location of their houses and even the design of the house.

Also Riley (1999) states that construction, skills gained by the community members involved in the housing projects are able to empower them to facilitate and to stimulate holistic development processes by enabling beneficiaries to eliminate dependency and to improve their quality of life through gaining employment or creating employment by establishing small-scale construction enterprises. These very same skills which are gained can be for housing incremental use, in the extension of their houses in the future, successively cutting cost of construction. Rogerson (2000) further points out that the construction sector can play a meaningful role in addressing the current unemployment crisis in South Africa.

Therefore, the essential difficulties confronting housing are money related, political and societal issues. Because of the numerous effective reaches influencing the delivery of housing, one can conclude that here is no single certain way to address all issues directly.

It has proven beneficial that research of other alternative building techniques be considered to address these challenges facing the output of low-income housing to tackle the ever-growing housing deficit (Van Noppen, 2012). There are inadequate standard housing units and those produced, through public or private intervention, reach only a limited few of those on the long waiting list for housing and only the few fortunate enough to afford them end up benefitting from the housing projects. The issue is more about the targets of housing production not being met mainly due to land and construction costs. Costs, in fact, are higher than that assumed, and most dwellings units designed for the lower income groups are going to those with much

higher incomes (Van Noppen, 2012). Lastly, the rigorous policies that not open to innovative ways of tackling the issue of housing. Therefore, this study aims to investigate how feasible it would be to use Moladi Construction Technology (MCT) as a new alternative to bridge the housing backlog. It will highlight whether participation of communities in the upgrade process stands to improve the delivery system of housing in these particular projects while building some sense of ownership by the involvement of the housing beneficiaries in all the phases of the construction of the houses.

1.2 Justification of the study

There are numerous reasons that force people to move to the cities, with the most common one being the search for better and stable income to sustain their livelihood. There is no doubt that the challenge facing South Africa, and the continent as whole, is really hard, but the most important question is whether conventional building methods are able to cope with the ever increasing demand for quality housing. The ever changing technology advancement it is far reaching that the government sees it fit to move away from the brick and mortar method of construction which uses expensive materials requires skilled professionals, which are most cases expensive to when rendering their services. With the demand and requirement which is presently facing the South African government, it is highly unexpected that it will resolve the housing crisis in our age with a technique developed for the requirements of society 3473 years ago (Botes, 2013).

Dating back on the characteristics of the two settlements chosen as case studies, namely Piesang River and Namibia Stop 8 (NS8), it is evident that informal settlements in Inanda have been a site of extensive strife since the mid-1980s. Piesang River is one of Durban's oldest settlements, while NS8 is a new settlement; both transformed from informal to formal settlement through the in-situ upgrade programme with the assistance of FEDUP (SDI, 2013). The continuous influx of people in the area further strains the government in terms of housing provision and due to unemployment; the area is awash with social ills. Secondly, the groundwork they have already done in taking the initiative and having involved the community in the in-situ upgrade. Lastly,

the little exploration on other ways to tackle the housing backlog. It is for the above-mentioned reasons that Piesang River and Namibia Stop 8 are useful case studies in identifying the key challenges and opportunities of involving the community in the construction of their own housing, as well as testing the social acceptance of new technologies and methods of dealing with the housing backlog. The success of this study will help policy makers to better understand and have a *situational analysis* of alternative construction in informal settlements.

1.4 Research Questions and Objectives of study

1.4.1 Research Questions

To what extent the Moladi construction technology, applied in informal settlement upgrading, can enhance the construction and delivery process in South Africa?

1.4.2 Sub-questions

- a) What are the differences between the conventional and Moladi construction technology that would make it a better option over the conventional way of building?
- b) What are the pros and cons of the conventional construction in comparison to that of the Moladi building model?
- c) Why is there a need for the introduction of Moladi building technology to the upgrade of informal settlement (in-situ upgrade)?
- d) In what way, will the use of Moladi building technology improve the delivery of housing in informal settlements to tackle the housing backlog?

1.4.3 Objectives of study

The main aim of this study is to investigate whether it is feasible to use Moladi building technology in the in-situ upgrading of informal settlements, over the commonly used conventional construction methods. If feasible, this alternative building technology could be used to fast-track the construction of housing in informal settlements, in turn tackling the challenges of the backlog of adequate housing in the EThekweni metropolitan area.

The primary objectives of the study are summarised as follows:

- a) Understanding the existing housing condition in EThekweni metro and defining the housing challenges faced concerning the delivery;
- b) Examining the international and local use of Moladi in low-income housing and coming up with a result that meets the requirements of stakeholders, implementers of the project and regulations while addressing the challenge of housing backlog;
- c) Determining whether the Moladi building technology will be socially acceptable by means of community participation;
- d) To determine the role of community members in the selection of construction materials and technology used in the in-situ upgrading process.
- e) To determine whether there is any community participation in the construction phase of the in-situ upgrading projects.

1.4.4 Hypothesis

Using the Moladi building technology in the upgrading of informal settlements, is possible to reduce, significantly, time and cost of construction, in turn tackling the housing backlog for low-income housing in South Africa.

1.5 Definition of key concepts

1.5.1 Informal Settlements

According to UN-habitat (2003) informal settlements are operationally defined as residential areas which have been developed without legal claims to the land and/or permission from the concerned authorities to build. As a result of their illegal or semi-legal status, infrastructure and services are usually inadequate, and as suggested by Mguni (2011), the physical characteristics of informal settlements consist of infrastructure that is below the '*adequate housing*' levels. Informal settlements do not have network and social infrastructures which include water supply, sanitation, electricity, roads, storm water drainage, schools, health care centres and market places to name a few. Although informal settlements vary in magnitude and other appearances in different counties, most commonly informal settlements share the lack of unswerving basic services such as the supply of clean water, electricity, timely law enforcement and proper services (UN-Habitat 2007).

Nevertheless, Roy (2011) advocates that it is a progressive understanding that informal settlements are spaces of habitation, livelihood, self-organization and politics.

This notion shifts away from the pathology of Informal settlements that need to be fixed and sees their immense potential in terms of dynamic places of living for those that cannot afford the formal route of acquiring housing. Informal settlements aids for the upward mobility of rural households and, through the access to urban jobs, allows the urban poor to move out of poverty. These settlements grant the households an entry point into city and allows for them to participate in the economies where migrants can acquire valuable information, job contact and skills to grant the access to employment. Over time, a lot of them can gain new skills/expertise and enhance their chances of outwards and upwards to better housing conditions in superior neighbourhoods (Glaeser, 2011). These reception areas (informal settlements) also assist the households to reduce their costs of living, more specifically for those with low paying, entry-level jobs. Most informal settlements are cleverly well placed in relation to employment and job opportunities, as this plays a vital part in cutting down the transport costs (Huchzermeyer, 2002).

Informal settlements, at times, defined as *substandard*, referring to the poor living conditions (sometimes with high environmental risk) and deprivation. Urban substandard settlements offer housing to urban poor. (Sutherland *et al.*, 2016).

Furthermore, *informal* settlements are often located on prime land (Hassan, 2012) and better located than new housing developments built to accommodate inhabitants in cases of relocated. Also conceived as active housing agents, as they source locations for new housing developments (Huchzermeyer, 2002). On the other hand, informal settlements may be located on hazardous land but offer other benefits to the informal dwellers, and offer immediate response to housing needs in urban areas of developing countries. The location of these settlements is critical for the socio-economic activities of inhabitants (Abbott, 2003).

Informal settlements tend to be related to failed policies, corruption, poor governance, inappropriate land markets, finance systems and regulations and a lack of political will to address housing Menshawy *et al.* (2011) and El-Batran & Arandel (1998). Others have blamed informal settlements on inadequate institutional capacities, and escalating poverty (Majale, 2008). Despite all the efforts to reduce its growth, the number of informal settlements is still constantly increasing. Therefore, addressing the informal urbanization challenge represents a key strategy that benefits not only the

urban poor, but also the city as a whole, towards sustainable and self-reliant communities (Khalifa, 2015).

Staff (1993), also notes that an informal settlement is a compact settlement that comprise of communities that have built their own houses within the confines of traditional or formal land tenure. Staff further emphasizes that these types of settlements are common in Third World countries and are the urban poor's solution to housing shortages.

However, Srivinas (2005) notes that the definition of informal settlements can vary from country to country, based on its legal and planning framework. For the purpose of this study, informal settlements refer to residential units constructed in “planned” and “unplanned” areas, which do not have formal planning approval. In essence, they are settlements that are characterised by inadequate housing, social services and infrastructure (Todaro, 1994).

1.5.2 Informal Settlement upgrade (in-situ)

Conventional informal settlement ('in-situ') upgrading entails the re-development of an informal settlement in a comprehensive and relatively complete fashion in respect of housing, tenure and infrastructural services. Secure the full range of project fundamentals have to first before such upgrading can be successfully achieved, while Huchzemeyer (2006) defines informal settlements upgrading as the process of improving the living conditions of informal settlement households either on the same land which they occupy namely, 'in-situ' or on a green field site.

Informal settlement interventions by governments, throughout history, have been evolving with housing policy. In South Africa, interventions by the democratic government, since 1994, have involved different upgrading strategies. These, ranging from the *Roll-over upgrading*, which involves the removal of residents from their informal settlement shelter into temporary accommodation called transit camps. Secondly, *Partial relocation*, which involves the upgrading of dense informal settlements, where some removal is necessary to make way for access and services. Lastly, the so-called *in-situ upgrading*, which aims to reduce the interruption of social and economic networks by decreasing the number of households relocated to another site or elsewhere on the site (Del Mistro, et al., 2009).

Tshikotshi (2009), also states that there are three conditions involved in the informal settlements upgrading that are acknowledged of namely: “*the property rights, the property values and physical attributes of the underlying assets, and their impact on each other*”. Furthermore, according to Cities Alliance cited in Ziblim (2012: 4) informal settlements upgrading is defined as a process whereby the former in urban environments is incrementally upgraded, formalized, and incorporated in the urban fabric. Therefore, upgrading does not only focus on the legal aspects, but seeks to improve the living conditions and services.

1.5.3 Community Participation

Borck and Pettit (2007) stated that community participation varies according to the different approaches reflecting the point of view of those involved in the operation and their socio-economic background. Community participation, from the government perspective, can be both a potential threat to the established power and a means of presenting a popular approach to the problem of the poor. From the implementation agencies point of view, community participation may be a way of making a project acceptable to the local population, as it will be cheaper and smoother to implement. From the residents point of view it means a role in the development of their environment where they can choose the improvement option, and reduce the project costs. The World Bank definition of community participation has three dimensions; the first being the contribution in decision-making about what should be done and how, for all those affected, the second is mass involvement to the development effort and the third is sharing the benefits of the programme (White, 2011). Community participation stems from self-help upgrading linked to planning processes on grassroots level where the power of decision is left to the local populations on the future of their own settlement (Lizarralde and Massyn, 2008).

The existing housing framework support the active community participation as a paramount tool in project life cycle of in-situ upgrading programs (DoHS, 2004).

Community participation is a concept that is becoming very popular; however, in reality, is very difficult to translate into practice. In practice, according to Jordhus-Lier and de Wet (2013) community participation often becomes “*formal, legalized, and politicized*”. Furthermore, it is common that in upgrading projects most options and plans are precisely defined by officials, and residents are merely “*informed*” (not engaged) at a later stage during implementation phases (Piper, 2012).

1.5.4 Community participation in the in-situ upgrading

The involvement of informal settlement communities, with the aim of giving them a voice, at every phase of the policy process and implementation, forms an elementary principle of the Upgrading of Informal Settlements Programme (UISP) (Revised Housing Code, 2009). Although community participation has become a highly talked about term, it is still unclear to most, due to the way the concept is being practiced, within the realm of public sector governance. In as much as this concept can be perceived to be effective and closely related to empowering the historically marginalized communities and therefore ensuring long-term their development by merely bring them together to achieve their dream of housing (Viratkapan & Perera, 2006).

Huchzermeyer (2006) also notes that community participation in the implementation of the UISP signifies a different characteristic scenario, where participation condensed to nothing more than an administrative facade. In reality, implementation has shown to be a basic top-down approach with minimal regard for participatory processes. Hence, there is a need for a revaluation of the whole concept that move away from the upgrading, which has plans that are already pre-designed by various experts, leaving little room for the community participation and influence (JordhusLier and de Wet, 2013).

1.5.5 Low income groups

Low-income groups in urban areas commonly referred to as the urban poor. According to Yeboah (2005), the term low-income used synonymously with the poor in both academic and practitioner circles, such as the United Nations and national governments. Furthermore, it is noted that the lack of distinction between poverty and low income is, however, predicated on the assumption that, it is the most convenient even though not the best way to measure poverty.

The low-income housing sector comprises the lower end of the housing market in South Africa. The current definition of such housing extends to all homeowners earning zero income to a level of up to R18 000 per month (FinMark Trust, 2009). This housing sector is further divided into two tiers, namely the subsidy-housing sector

(lower tier) and the 2“gap market” (upper tier). The purpose of subsidies and financing for these two sectors are two-fold: first, to provide a system of capital wealth creation that will enable a “trickle-down” of resources for people in the lower tier, and secondly to enable the upper tier to enter into the commercial market (Thring & Kahn, 2003). This goal avoids the utilisation of subsidies *ad infinitum*, but its success is also highly-dependant on the growth of the economy, and thus the growth of the commercial housing market.

The “*gap market is defined as the range of homeowners with an income level of between R3 500 and R15 000*” (Department of Human Settlements, November 2011).

This category came to be known as the gap market after 1994, due to the ineligibility of beneficiaries to receive a subsidy similar to the homeowners that fall into the sub-R3 500 category, but also unable to access the commercial housing market due to high entry-level of income required for financing.

1.5.6 Conventional Construction technology of Housing

Conventional Construction technology (CCT) defined as components of the building that utilize materials such as cement, concrete products, and other metallic building components and methods are casted on site through the process of timber or plywood formwork installation and steel reinforcement. Thus, provisioning of housing is relatively capital intensive because expends money to skilled labours, raw materials, transportation and result to slow speed of construction. These conventional construction materials and technologies are so expensive and sometimes scarce materials that they are by and large beyond the affordability of the common people and so cannot be employed for mass housing. This mode mainly serves for the middle and upper income groups of the urban population. They are often averse to lending to the poor, and generally lack sufficient client orientation and outreach into poorer especially in developing countries. This mainly achieved through the private market (UN-HABITAT, 2006).

Conventionally built houses consist of concrete bricks layered and mortared to form walls. The conventional method of concrete masonry construction falls into this category, although autoclaved aerated concrete bricks are also used. The

² Gap market is defined as the range of homeowners with an income level of between R3 500 and R15 000 .

conventional method for building low-cost houses refers to a traditional 40m² brick and mortar structure, with two bedrooms, a kitchen/living space and a bathroom. This type of house is the most commonly used in the subsidy housing supply, and needs to comply with all the necessary requirements as set out by the NHBRC (Zeiber & Zeinor, 2012).

The top structure is built on a suitable foundation dependant on soil conditions. Load-bearing and external walls are constructed with 140mm hollow concrete blocks, and the interior walls with 90mm masonry bricks. The NHBRC requires a plastered finish on the external wall to provide sufficient waterproofing, while the inside walls are required to be bag-washed if not painted. The roof consists of treated wood rafters, built onto the external walls. A galvanised roofing sheet or roofing tiles are then fastened to the rafters with screws that can support the calculated windloads (Zeiber & Zeinor, 2012).

1.5.7 Alternative construction technology

In this study alternative construction technology (ACT) is defined as the housing construction technique that moves away from the use of conventional construction technology CCT with the intention of minimizing the use of costly methods as well as time of construction without compromising or affecting the quality of construction. Therefore, cost effective, fast construction and quality shelter production provide for low-income groups (UN- Habitat, 2006).

While NHBRC has extensively that elaborated that “*alternative construction technology*” is “*Innovative housing techniques refer to any deviation from traditional construction methods that are not specified within the limitations of SANS 10400 - it does not necessarily have to be a material that has never been used before*” (NHBRC, 2013). This definition extends to all residential building systems that don’t utilise the standardised method of masonry stacking units. Thus, it encompasses innumerable available products in the international and local market.

Alternative is not only hinged on the type of material, but also the approaches used to construct and deliverd the houses, through the involvement of the people who benefit for the housing projects to have an influence on the end product. The households and community members are in charge of their upgrading process; they know best their housing plight, challenges and what need to be prioritized. As they are in charge of

the design processes, households can influence the dwelling design to best serve their household needs/dynamics making them more functional. This can apply to both the ordering of spaces in the neighborhood and the implementation processes (Belford, 2013).

1.9 Structure of the dissertation

Chapter 1 – Introduction

This chapter serves as an introduction to the research study. It outlines the problem statement as determined through the literature review, as well as a research statement outlining a solution. A summary of the contents of each chapter ends the introduction.

Chapter 2 – Methodology

Chapter 2 will discuss the underlying qualitative research approach that was used in the study. The research methodology as well as the dissertation objectives are defined. There is a focus on the historical and geographical background of the Piesang River project on how the settlement came to its existence. The main research instruments are also investigated. Finally, the limitations and ethical considerations of the study are given and the chapter ends with a conclusion.

Chapter 3 – Literature Review

Chapter 3 contains the literature review that documents the background of housing in South Africa, as well as the use of Moladi construction technology, which can prove to be feasible in accelerating housing delivery.

Chapter 4 – Case Study

Chapter 4 discusses the case studies that were used in this research and how they came about. Case studies of Namibia Stop 8 and Piesang River are used to provide a clear understanding of the research phenomenon.

Chapter 5: Research findings and data analysis

Chapter 5 analyses the data collected. Data collected was analysed and presented according to the different themes that were explored.

Chapter 6: Summary of findings, conclusion and recommendations

This last chapter will present the summary of the research findings, conclusions drawn from the findings and further makes the recommendations for further research. Recommendations are based on the lessons learnt.

Chapter 2

Chapter Two (2) Methodology

2.1 Introduction

The chapter talks about the methods used by the researcher to conduct the study. It consists of the objectives of the research, the applied research design and approach, instruments, reliability of the research, limitations thereof and the ethical aspect of performing a feasibility study. The population, sampling frame and sampling units used in conducting the study as well as to described them. Sources of data, data analysis and interpretation, and data presentation tools are explained to detail in the chapter.

2.2 Research Aim and Objectives

The research investigation is concerned with the use of an Alternative Construction Technology as a potential solution to upgrade informal settlements, with the participation of community members to address the primary challenges facing the low income housing backlog in South Africa, particularly in the case of informal settlements. The effect of using other previously explored alternative construction technologies, such modular, Intermodal Steel Building and premade housing Units over those commonly used and referred to as “conventional” construction is compared and explored, and as well as presents the use of Moladi in relation to its feasibility for future use in low income with more focus on informal settlements in-situ upgrade housing projects.

2.3 Research Design

The present study is based on a comparative type research to investigate and address the ‘indicated specific objectives and research questions. Comparative research design was selected because the data obtained through survey method using questionnaires, interviews and observation that emanated from the nature of the study objectives were required in comparing the data collected about CCT and ACT in line with the cost, speed and quality production as it was by using frequency, percentages and describing qualitatively by words.

2.4 Research data collection approach

Normally in research, there are two types of approaches to deal with the collection of the data, quantitative and qualitative. Creswell (2012) states that quantitative and qualitative methodologies should not be considered as rigid, distinct classifications, perfect inverses, or separations. Rather they speak to distinctive closures on a varied field. The table below illustrates these differences.

CRITERIA	QUALITATIVE RESEARCH	QUANTITATIVE RESEARCH
Purpose	To understand & interpret interactions	To test hypotheses, look at cause& effect, & make predictions
Group studied	Smaller & not randomly selected	Larger & randomly selected
Variables	Study of the whole, not variables	Specific variables studied
Types of Data Collected	Words, images , or objects	Numbers and statistics
Form of Data Collected	Open-ended responses, interviews, participant observations, field notes & reflections	Precise measurements using structured & validated data collection instruments
Type of Data Analysis	Identify patterns, features & themes.	Identify statistical relationships
Objectivity and Subjectivity	Subjectivity is expected	Objectivity is critical
Role of Researcher	Researcher & their biases may be known to the researcher	Researcher & their biases are not known to participants in the study
Results	Particular or specialized findings that is less generalizable	Generalizable findings that can be applied to other populations
Scientific Method	Exploratory or bottom up: the researcher generates a new hypothesis and theory from the data collected	Confirmatory or top-down: the researcher tests the hypothesis and theory with data
View of Human Behavior	Dynamic, situational, social & personal	Regular & predictable
Most Common Research Objectives	Explore, discover, & construct.	Describe; explain & predict
Focus	Wide angle lens, examines the breadth & depth of phenomena	Narrow- angle lens, tests a specific hypotheses
Nature of Observation	Study behavior in a natural environment	Study behavior under controlled conditions, isolate causal effects
Nature of Reality	Multiple realities, subjective	Single reality, objective
Final Report	Narrative report with contextual description & direct quotations from research participants	Statistical report with correlations, comparisons of means, & statistical significance of findings

Table 1: Quantitative vs. Qualitative research source (Johnston et al, 2006)

The study adopts a qualitative methodology as it seeks to explain the relationship of one variable with another variable through qualitative elements. The qualitative approach lets the researcher assess or examine the experience of people in detail through exhaustive interviews or focus group discussions (Hennink, Hutter & Bailey, 2011 in Langford, 2012: 111-112). Moreover, another author expresses that one preferred standpoint of subjective strategies in exploratory research is the utilization of open ended questions and probing, giving the respondents the chance to react in their own words as opposed to driving them to browse settled reactions, as quantitative techniques do. Another favorable position of qualitative methods/techniques is that they permit the researcher the adaptability to probe initial participants' reactions and responses (Mack et al, 2011).

This research also explores and evaluate the feasibility and benefits that would be brought by the use of Moladi building technology in comparison to the conventional methods in the construction of houses in informal settlement upgrading, in particular with the participation of the community members in the construction process. Moreover, the research study employs the appropriate tools to investigate the housing programme responsible for the realisation of benefits stated in programme's objectives and in policy. A qualitative methodology applies a large variety of data techniques that were used in this research study (Robinson, 2000; Crang, 2002). Furthermore, the research study was conducted using a number of *primary* and *secondary* data. Primary data being the data the researchers are collecting information for the specific purposes of their study. In principle, the questions the researchers pose to the respondents are tailored to prompt the data that will be substantial for the study in question. Researchers collect the data themselves, using surveys, interviews and direct observations, While, secondary is data that has been interpreted and recorded by other people or researchers related to the study (Williams, 2006).

2.4.1 Primary sources

The primary data for this research gathered through semi-structured interviews, focus groups interviews and questionnaires. The key informants included the group savings members from the community who had already benefitted from the first phases of the housing projects and those who were yet to benefit from the next phases of the housing project (this would help the researcher to test for feasibility and social acceptance of the alternative technology's use for the next phases).

2.4.1.1 Sample size and procedure

The two case studies analyzed to support this research are namely Piesang River and Namibia Stop 8 collectively have eight saving schemes made up of 30 members on an average per saving scheme. The interview respondents were from a sample size selected through a **snowballing sampling procedure**. Snowballing sampling isolates cases of interest from people who know people who can offer relevant data, which can aid the researcher to attain the study's mapped objectives (Patton, 1990). This style of sampling made it easy to pick out the relevant information that was useful for this study because the researcher had limited information on the particular houses built through the community participation initiative, implemented by FEDUP savings group through the PHP approach. Not only did it help to find out the aforementioned, but helped the researcher get to test the **societal parameter** of the possible use of alternative construction methods in their upcoming projects, as these were the people who were hands on the projects and took the vital decisions in what methods and materials are used in these upgrades. Henceforth, the key informants identified by the researcher even went to the extent of referring and suggesting other possible informant who played a role in the planning and construction of their houses.

All the interviews conducted with the FEDUP savings group were through focus groups as this allowed the researcher to get all their opinions at the same time. Marczak & Sewel (1991) cited in Butler, (2002) states that, a focus group could be defined as a "group of interacting individuals having some common interest or characteristics, brought together by a moderator, who uses the group and its interaction as a way to gain information about a specific or focused issue". Discussions with the focus groups assisted in this research to both cut down on time and get precise information related to the study. This proved to be an advantage while conducting interviews through focus group discussion, as it helped other respondents recall about certain issues while others were speaking and sharing about an issue related to the question in discussion. This, in turn, allowed for the response of all questions fully.

Moreover, an action research approach was applied in this study. Members of the selected community were invited to come and share with the researcher through a highly interactive process of co-production. In practice, the researcher went to the extent of asking the respondent to draw some of their dream houses to get a sense of what the community really aspired to.

Further information came from various housing project facilitators who were involved in the project, selected through **purposive sampling** (Khuma, 2008). The study focused on how the community members took part in the planning and construction of the houses in Piesang River and NS8 to evaluate if their exploration of using other methods used in the project were welcomed by the community members. For this reason, the purposive sampling procedure was useful because the study purposefully targeted those that were involved in the planning and construction of the complete phase of the project. According to Teddlie & Tashakkori (2009), purposive sampling is a data collection technique that helps in selecting a number of key informants to respond to the research question but yield the most information about a particular phenomenon. The interviews with uTshani Fund facilitators were based on purposive sampling strategy because the researcher already knew the respondents who would furnish information pertinent to the aim of the research. This research used semi-structured interviews following a list of thematic questions on a specific context and theme related to each particular key informant. In addition, the researcher used a camera and voice recorder to capture visual and voice data respectively with the consent of the respondents.

2.4.1.1.1 Key informants

- **FEDUP savings group:** A set of open-ended and closed-ended structured interview questions was prepared and asked during focus group interviews. The questions were asked in sequence and read out to the respondents. Open-ended structured interview questions allowed the respondent to give as much information as they could. This approach also enabled the researcher to probe specific answers and repeated where the respondent did not understand the question. Leedy (1986) as cited by Govender (1997) and Salane (2000) argues that interviews allow the researcher to extract the information that is required. The personal interviews are said to enable the researcher to probe responses and make follow up questions on the responses given. The questions covered issues related to the benefit of savings, affordability and the quality of houses, reasons for joining the group savings club.
- **Community construction management team (CCMT):** the main team of people that oversee implementation of the housing projects from drawing plans (which are formalised by qualified architects and engineers) to the construction

process, which is contracted out to community members. The construction team consists of five members who each have a specific task: the technical officer requests specific items and provides quality control, the book keeper sources the best and cheapest materials, the store keeper controls the inflow and outflow of stock, the loan and savings officer looks after the community's finances, and the project manager oversees the whole process. And, unlike in the private and public building sector, most of the construction team's members. The CCMT members were interviewed using a focus group interview to allow all the members to air their experience with the community participation and their personal view of how the community would receive the alternative technology. The interview questions comprised of both open and closed-end questions. Open-ended questions are those questions that look for clarity, "approaches and steps embraced to ensure community involvement. On the other hand, closed ended questions are those questions that seek facts that do not require" clarity.

- Municipality officials from the informal settlement Unit (eThekweni Municipality)
- **Residents from Piesang River and Namibia Stop 8:** the residents of these two settlements have either been involved one or another in the construction of their houses in the first phases of the informal upgrade. Hence, these are the vital stakeholders of the projects, as there are the people who benefit the houses on completion of the housing project, secondly they are the ones who determine what construction technique is utilised to build the housing which they will live in.

2.4.1.1.2 Societal Parameter

"A Moladi home will be termed satisfactory to the norms of living to society if it be similar or at the standard of that a conventional (brick and mortar) house".

The social parameter refers to the *sustainability*, based on the receptiveness and tolerability of the Moladi construction technology, as a favourable building method over the conventional one by the beneficiaries of the housing projects. In the social context, its use was important to express these changes, identify factors that bring these changes and explore future patterns that help to provide solutions. To measure and find out the acceptance, a broad expressive investigation was performed in some

informal settlements in the eThekweni Metropolitan area, namely in Piesang River, and NS8. The designed investigation studied the beneficiaries' negative and positive views that surround the use of alternative construction technologies and materials, and tried to find out if marketed properly, if there would be any shift of perception that can eventually cement the improvement of the societal view of non-traditional housing.

2.4.1.2 Secondary Sources of Data

Secondary data defined as data that is available already from other authors and researchers. It has already been collected for other purposes beyond one's specific research, such data is easily accessible and inexpensive (Dickey, 2012). The research has included the use of secondary data sources such as books, government documents, dissertations, journal articles, newspaper articles as well as online material. The secondary data used in the research mainly focuses on books, journals, government papers, policies and thesis. The reason being such a wide variety of data will offer a broad array of information on the research in question; the fact that to be able to justify or understand the phenomena being studied the researcher cannot go about on their own knowledge, as this will pose a challenge of limitation of information (Seidler 1974). To understand the phenomena in context there needed to be studies of similar cases, which have explored the subject matter studied prior used to get a greater understanding of the topic.

2.5 Research techniques

In this study different types of research techniques were used to assess and describe the benefit of Moladi building technology over that of the conventional building technology because to cost, speed and quality and also the main factors that affect the application of MCT. These are questionnaires, interviews Document analysis, and observation.

2.6 Data Collection

Primary data collection involved the use of various tools ranging from interviews, semi-structured surveys, and tape recording to obtain information from the respondents. Interviews were held with 3key informants as illustrated on the graph below. Consent was obtained before the start of all the interviews to use the tape

³ Key informants selected purposely based on their knowledge, expertise and experience into the issue being investigated.

recorder of the interview session with the community members, savings groups and residents. The use of a questionnaire allows a larger population used for information as well as focus groups to gathering purposes. Preceding the arrangements made to meet with these individuals. Questionnaires were given to the participants from both settlements in their homes and everyone was required to respond to the questions being asked in a survey and then and those with the focus group, were asked during group saving and community meetings. There mixture of closed as well as open-ended questions varying with what the information was required from the respondent. The community members who benefited from the first phases of the housing project asked to provide comprehensive knowledge of the construction options and processes that were used to come complete the housing projects, social problems in the area, their causes and what they feel can be the solution to the problem. The various community networks were established and their influence on the social stability of the area.

2.6.1 Survey

The survey was made up of three sections, to try and better understand whether the respondents knew of how what they recognised as being a socially aspectale house. The first part aimed to obtain the uninformed opinion of the participants regarding preference between the two survey cases, with no information pertaining to the technical performance of the two types of houses, thus providing an uninformed opinion. The second part of the survey provided the participants with various real-world technical information e.g. the durability, cost, construction time, etc. regarding the two cases. Therefore, the preferences between the houses were examined once more, but the participant was then presented with more accurate information in order to obtain an informed opinion. The third and final part of the survey determined whether the participant was willing to accept the Moladi solution, if some aspects of the conventional solution were present to help them to be more receptive the option. This provided an informed, investigated opinion from the respondents as the conclusion to the survey. Therefore, the dependant variables that are studied in the survey are:

- 1) The inhabitant's housing preferences;
- 2) What the respondents' social feeling are with brick and mortar houses;
- 3) What the respondents' social feelings are with Moladi houses.

2.7 Data Analysis

Data analysis is the process of evaluating data. It evaluates the impact or importance of data. Different segments formed to provide different themes for the data was acquired (Schoenbach, 2014). For data analysis purposes, the use of thematic data analysis made easy, for the researcher, to understand the collected data. Thematic data analysis method proved to be ideal for this research study. It allowed the researcher to do a categorisation of different themes and ideas within the data. Furthermore, the different themes and ideas have been analysed and described in detail providing flexibility to the research study as different aspects emerged from this data analysis (Braun and Clarke, 2006).

The raw data collected from the interviews conducted with Municipality officials that were involved in the upgrade of the informal settlements in Piesang, as well as the raw data collected from the household survey conducted with households who have benefitted from the upgraded housing presented to them to validate the study accurately through its analysis. Qualitative researchers aim to gather an in-depth understanding of human behaviour and the reasons that govern human behaviour (Creswell, 2003). Research approach adopted enabled the researcher to appropriate data and the informants had a chance to respond to problems they face in informal settlements.

2.7.1 Thematic Analysis

Phase 1: Familiarising With the Data

The researcher aimed to translate information, read and re-read the information, note down beginning thoughts to connect them with the current information.

Phase 2: Generating Initial Codes

To generate initial codes, the researcher coded interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code. The exercise involved the creation and application of codes to data being analysed: an interview transcript, field notes, observations, etc. to produce a record of the things that have been noticed (Kelle, 1995). Once the record has been produced, focused attention was paid to that record to identify relevant themes emerging from there.

Phase 3: Searching for Themes

This stage included examining the codes into potential theme, assembling all information significant to every potential theme. Themes are distinguished by "uniting parts or pieces of thoughts or encounters, which frequently are pointless when seen alone" (Leininger, 1985: 60). The thought is to build up these topics and to work out how they identify with each other inside the information. The most critical topics that address the research question were chosen from all the potential subjects. Using literature review as a basis for structuring my analysis, this research used the following themes: Housing cost, construction time, social acceptance of alternative technology, community participation and housing typology.

Themes that emerged from the informants were pieced together to form a comprehensive picture of how they perceive, describe, clarify and elaborate on what thoughts they perceive about the use of alternative technology in the construction of their. Even in cases where they express different ideas on its use the coherence of these ideas only materialised when they were pieced together to make an argument.

Phase 4: Defining and Naming Themes

The researcher defined and named themes as an on-going analysis to refine the specifics of each theme, and generating clear definitions and names for each theme.

Phase 6: Producing the Report

This phase was the final opportunity for analysis where compelling extract examples and their analysis was done while relating back the analysis to the research question. Therefrom, the researcher built a valid argument for choosing themes that allowed him to make inferences from information gathered from the interview. The analysis at this stage required the researcher to examine data collected to make some sense out of each.

2.8 Limitations of the Study

Except for the time and financial constraints, the researcher faced a couple of challenges that somewhat posed as a limitation that could adversely affect the study's undertaking. These respectively were the difficulty to parallel ACT and CCT due to the lack of use of alternative construction technology in Piesang River in Inanda.

Secondly, the lack of human resource and research laboratory, inadequate adaptable and innovative construction technology application for in-situ housing upgrade in informal settlements of Piesang River and Namibia Stop 8, and lack of efficient relevant and recent information related to the study, respondents' inadequate knowledge towards the interview, questioners associated with ACTs.

2.9 Conclusion

This chapter seeks to discuss the research statement that regulates the fundamental theme which the study tries to address, namely to see if Moladi can offer an “improved” way out to the current challenges confronting the backlog of low-income housing in the country. Hence, the study focused on the low cost housing project in the informal settlements of Piesang River in comparison with the case of Namibia Stop 8 to validate the feasibility of the alternative technology. To evaluate the feasibility of use the Moladi construction technology for the adaptation of cost efficient, time manageable, quality and environmentally friend housing. Secondly, to see what impact community participation has on the delivery of housing projects. A qualitative research approach was used to draw and assess the themes. In this study, unrestricted methods played a vital role to reaching to a results. The population, sampling frame, sampling units and techniques were presented in this chapter to show the exact sample used in the study. The chapter also described sources of data, ways of data analysis and interpretation and presentation tools used by the researcher. Sampling methods also enhanced the legitimacy of the study. Data analysis is discussed in Chapter 5.

Chapter 3

Chapter Three (3) Literature Review

3.1. Introduction

The forever growing backlog of low-income housing, suitably located and of an acceptable standard, normally termed of good quality housing in South Africa has become a cause for concern. In as much as there has been an addition of 5.6 million houses, amounting close to 50% percent of formal housing since South Africa's first democratic elections in 1994, with an estimated backlog in 2016 currently standing at 2.1 million housing units significantly more than the estimated deficit of 1.5 million houses in 1994 (Khaki, 2009). Although there is significant progress in the delivery of housing particularly low-income housing, for many complex reasons this backlog is resisting to decline. This is despite the fact that the rate of housing delivery remains unparalleled internationally and in South Africa, due to the actions of the state and other role-players in the built environment (Rust, 2006).

This chapter deals with a theoretical and empirical basis of the impacts of the housing challenges presently confronted by millions of South African households, as well as a review of a possible solution in the form of Alternative Construction Technology (ACT) that allows for the involvement/participation of the communities during the planning and construction phases. The impacts of the application of alternative construction technology to speed up construction, produce a finished product of high quality, also minimize the cost of construction are reviewed. In addition, empirical basis of the use of alternative building and construction technology (ACT) reviewed in comparison to that of different countries and how ACT for provision of low-income housing units' works in their case, which may help reduce the backlog.

The first section of the literature review aims to analyze extensively the South African current housing situation. To get a better picture of this situation, there is therefore a need to touch on the history of housing delivery in the country, from the pre-colonial times to that of the present day, understanding the complications and challenges that have dealt the housing crisis in the country. This will help painting a clear picture of the backdrop to, and rationalization of the housing policies that were legislated after the democratic government took reign in 1994. The resulting challenges and housing backlog also discussed from the viewpoints of informal settlements and the upgrade

of them to try getting the settlements formalized. A comparison of several implemented and proposed alternative construction solutions along with how communities can be included into the housing projects, with a summarized problem definition concluding the first section.

In second section, one of the possible aforementioned alternative construction methods/solutions from the first section explored further. The use of Moladi construction technology for low-cost homes, commonly referred to as form molded housing (Moladi housing), was specifically mentioned. This section traces how the moladi construction technology came about and what influenced the birth of form mold housing architecture. A summary of the varied uses of moladi follows, with specific emphasis on residential building. The pros and cons of using moladi construction technology for housing purposes, especially for low-income housing, are also given and a discussion on the feasibility of an alternative low-cost housing solution ends the chapter.

3.2 Theoretical framework

3.2.1 The enabling approach

The “Enabling Approach”, developed in 1988 as part of the Global Strategy for Shelter (GSS) to the Year 2000, advocated an “*enabling strategy*” that shifted the role of governments from provider to “facilitator”. Governments were to play a role of working to remove obstacles and constraints that hindered the access to housing and land, such as fixed housing finance structures and unsuitable planning regulations, while people’s onus was to finance and build their own housing. “Enabling Housing Markets to Work” (1993) a World Bank’s Policy Paper, was largely along the lines of the GSS, hope the markets would deliver at the same time the equity and efficiency goal. GSS places much importance on the capacity building for enhanced management of the urban area, reform of institutional norms (more so in the public sector), and "local ownership" relating to the policy. NGOs were to have a key role along with other influential civil society groups in the housing process. It makes note of the vital role the government plays, in not only making the "enabling institutional environment", to assist with the actions of the non-governmental actors, but indeed to also provide investments and facilities which the private and other non-governmental sectors cannot adequately provide - such as trunk and other important infrastructure. The GSS also accorded a fundamental role to the private sector in shelter delivery; based on a

sectoral approach that aimed to introduce innovations in building technology, new construction methods and affordable building materials (UN-HABITAT 1997).

The enabling approach as was defined initially by United Nations Centre for Human Settlements (UNCHS) (1987) differed from that which the World Bank (1993) advocated in its policy paper. In the UNCHS' initial formulation of enablement, the emphasis was on the key role of the community and on the need to enable the community to 'help themselves,' as well as on action at the local level. The World Bank version of enablement hardly mentioned communities, conceptualizing society rather as constituted by 'consumers' and 'producers,' and focusing on seven instruments which were mainly related to economic aspects, and which overlapped with only a couple aspects of the UNCHS approach.

At present, participatory or community-driven *in situ* informal settlements upgrading is recognized as the best practice. Based on the recognition of the key role the poor play in improving their own living conditions, participation in decision-making viewed as a right and an instrument in achieving greater effectiveness in the implementation of public policies (UN-HABITAT 2003). Recent successful upgrading cases based on community participation involve the poor in formulation, financing and implementation of upgrading programs and formally recognize the use of alternative technologies in the construction of housing. As UN-Habitat states, the inclusion of “those traditionally responsible for providing informal housing”, i.e. informal sector landlords, land owners and the investing middle class, are essential in order to encourage investment in low-income housing, maximize security of tenure, and minimize financial exploitation of the urban poor. Government's role thereby is to initiate the upgrading process, to maintain financial accountability and adherence to quality norm, through moderation bodies such as the likes of NHBRC of South Africa (UN-Habitat 2003a: 189). Generally, the key to a more sustainable approach lies in the right design of the community's responsibility and participation in the upgrading process as this can generate “ownership” that is increasingly recognized as prerequisite for sustainable urban development projects (UN-HABITAT 2003a).

This conception of the enabling strategy, however, has been subject to much debate and criticism for its over-concentration on the private markets and exclusion of alternative/complementary modes of housing provision from serious policy

consideration to enabling for the use of alternative construction methods. Tendler (2006) also points out that in order to guarantee success of enabling approach, promoting policies such as decentralization, privatization, and deregulation, demand-driven development is necessary allowing for beneficiaries to have a say in what construction method they prefer, rather than being forced to accept that of the conventional methods. While, Turner (1976) advances that one of the biggest obstacles in achieving user control over the housing process was the problem of unrealistic building standards. Turner recommended deregulation to support the decentralization of housing production.

Smit (1997) asserts that the responsibilities and role of the State should be restricted to the formulation of the policies of what has to be delivered, legislative framework enabling for the delivery of the highlighted elements in the policy and co-ordination of all housing activities. He adds that there has to be monitoring of the housing resources spent by the State for accountability and see to it that it gets value for money. The State should only be involved in the installation of bulk infrastructure. Mc Gurie (1981) cites the fact that the provision of housing is left solely to the market.

3.2.2 Acceptance theory

Louho, Kalliojaand and Oittinen (2006) state that acceptance is about how people agree to take and adopt some new technology for use. User acceptance of new technology is further described as the noticeable readiness within a group to employ new technology to achieve a goal previously with a different method (Dillon 2001). Hence, acceptance can be viewed as a function of user involvement in technology use. Acceptance can be further described as the critical factor in determining the success or failure of any technology and acceptance has been conceptualized as an outcome variable in a psychological process that users go through in making decisions about technology (Dillon and Morris 1996). Shi (2005) states that most studies in relation to the satisfaction acceptances of the consumers towards a new construction technology are based on the housing needs, wants, values, norms, preferences, satisfaction and acceptability. Hence, from the current literature it emerges that are three most important social aspects namely housing needs, preference and norms, which determine the social acceptancy of the implementation of new construction technology.

Housing Preferences: The preferences of the recipients of the house aims for specific elements in a house, and are normally very shifted and tend to change after some time. It is reliant on a large number of perspectives, which can be partitioned into households' financial profile, socio-statistic profile and what value they hold for housing (Shi, 2005).

Housing needs: According to Simons (1987) Maslow's framework, which is largely represented as a triangular hierarchy of levels, hypothesizes that the requirements of individuals can be partitioned into a few unique layers of significance. This chain of command of necessities was produced by Abraham Maslow in 1943 in his mission to qualify the hypothesis of human motivation. Despite the fact that his study has been superseded by advanced Connection Hypothesis in sociological and mental research (which just considers the way which people relate to each other over a periods), it is centred on the idea that still demonstrates legitimate for the meaning of fundamental human housing needs and provision.

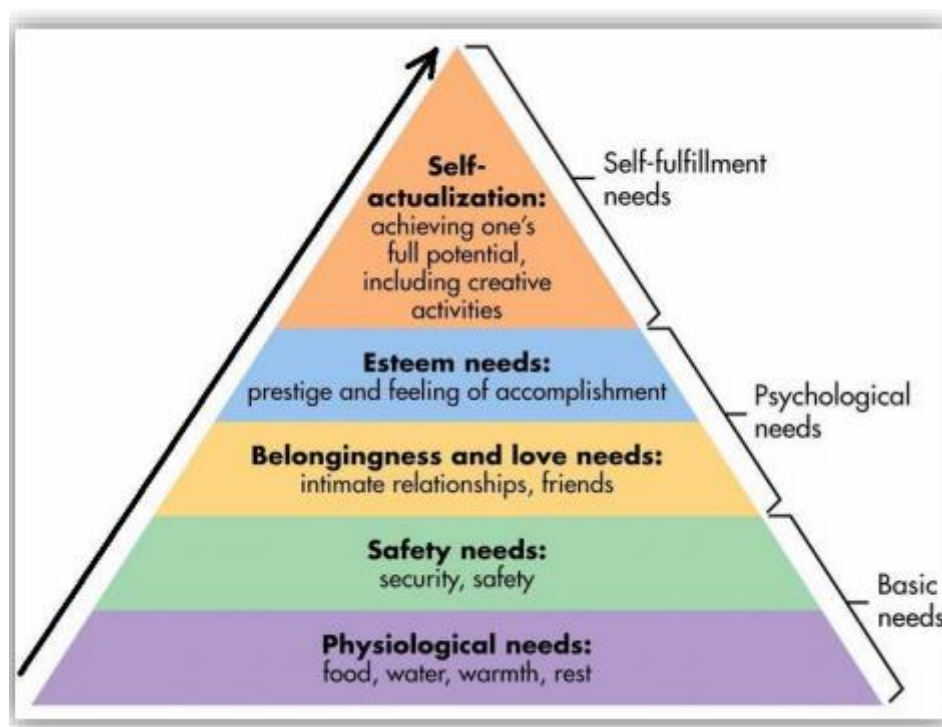


Figure 3.2 Maslow's hierarchy of needs (McLeod, 2016)

As per the definition as set out by Maslow, the requirements of people can be partitioned into five unique layers (fig 3.1), with every layer coming first before alternate layers. Alluding to Figure1 the graph above, the primary level relates to essential physiological needs, which are the minimal positioned level in the chain of importance.

From here, every single other level begin, up to the fifth level. In the event that a level's need has not been met to then the upper levels' impact is immaterial; subsequently, every level must be satisfied to advance to the following. In spite of the fact that this progression was produced to incorporate the entire of human needs, it can be contracted down to a definition that exclusively delivers needs specifically identified with housing. Hence, this basically supports that for any new technology to be accepted and be termed suitable it has to first meet a certain level of acceptance the lower level (Merriam-Webster Inc., 1994).

Housing norms: Despite the fact that a house may satisfy the requirements of the owner, it doesn't really imply that it will be satisfactory to him/her. This is because of the social desire that is available in every individual. To comprehend these complicated features of housing, particularly as it identifies with government sponsored minimal effort lodging in South Africa and as it relates to subsidized low-cost housing by the government in South Africa, it is necessary to investigate the extent of housing norms in all humans.

As depicted by Morris et al. (1986), that the housing standards of individuals are based on social beliefs, weighted on by the precendency of what other have grown believe is a standard norm for it to be acceptable. Therefore, a housing unit has to adhere to specific guidelines and desires set by the community, or section of that group. This suggests that if a household does not consent to these standards, a deficit will exist. Thus, it will allow for the family to spur the on deficit, so as to remove the dissatisfaction of not meeting the norms. (Morris and Winter, 1978).

3.2.2.1 Negative Perception of Alternative Housing Construction Solutions

Even though several alternative housing designs have been proposed, tested and built as showcase examples by a variety of organisations in South Africa, the uptake of these solutions have not developed to implementation on a massive, nationwide scale. The insignificant 0.68% share that make up the total of low-cost alternative housing projects in South Africa illustrates this situation (Sexwale, 2010). Negative perceptions that prospective homeowners have about new building materials and technologies contribute to this sector's exclusion, and community input has shown this to be a widespread problem (Department of Human Settlements, 2010). Thus, the underestimation of the complex relationship between society and housing in the

alternative low-cost housing sector is evident. The proposed test designs in this thesis are subject to the “*Alternative Construction Technology*” name (ACT) due to the use moulds through the Moladi construction technology. This objection stems from the sociological view of a traditional “home”. From the general viewpoint of the beneficiaries, a traditional home consists of a brick and mortar top structure with adequate living space, kitchen, ablution facilities and bedrooms, together with a back- and front yard. The solidity provided by modern brick structures contributes to inhabitants feeling safe and comfortable inside their homes, as opposed to the perceived lower quality of ACT systems (which make use of thin steel framing to shape the structure, plastic moulds, concrete poured into the mould, or polystyrene coated with thin plaster to name a few examples) .

The household will then have a choice to either adjust its conditions (by changing the housing) or to adapt to the conditions (by changing the household) to remove this deficit. By incorporating the housing norms of a household, Morris and Winter (1973) then developed a new type of housing suitability approach, known as the Housing Adjustment Model .

3.2.3 Housing Adjustment Theory

The theory of housing adjustment behaviour is a framework aimed at getting accustomed to the method by which households pursue to maintain to find an equilibrium, the things that cause disequilibrium, and the consequences of existing in a state of disequilibrium. In this sense, equilibrium refers to a state in which the household’s current housing is in accordance with the norms of both society and the household itself, and it fits the needs of the household. Housing norms include space, tenure and structure type, quality, expenditure and neighbourhood. When one or more of these norms is not met by the household’s current housing, the household experiences a housing deficit. Hence there needs to be some sense of equilibrium met when bringing in and trying to introduce the use of alternative construction technology (Morris and Winter, 1978).

3.2.4 Collaborative planning theory

Collaborative planning followed the realization that people were not saying much about planning for their community development. The collaborative planning theory was meant to encourage previously silent groups, including the poor, women, and the

disabled, to come to the centre of community development and say what they think could help them (Giddens, 1985). Collaborative planning downplayed the central expert role of the planner and instead adopted a people-centred approach where people could drive their development process and decide as a collective (Healey, 1998). Participants in collaborative planning theory are encouraged to find ways of practically achieving their planning desires and to question what is put before them rather than simply agreeing with everything.

According to Ntema (2011) the National Housing Policy specifies that all housing subsidies offered should be met with a contribution from the recipient either in the form of funds or labour, to encourage a culture of responsibility and saving for housing. The government introduced the People's Housing Process and promise to fund households who are willing to participate in building their own house. People can now, with assisted help, choose alternative construction methods to build dwellings that are of a good quality, of a design that reflects individual needs and taste, and from which they can work.

One of the advantages of collaborative planning is that participants are able to interact with the planners; their indigenous knowledge is not simply taken for granted, which means there is a mutual learning process where knowledge passes from the expert to the local people and from the people to the expert (Tewdwr-Jones, 1997). Secondly, collaborative planning empowers people because they become part of the planning process in that they are able to question and reason throughout the process of planning (Tewdwr-Jones, 1997). Thirdly, collaborative planning adopts a more open style of practices in such a way as to open communication between the expert and the stakeholders (Tewdwr-Jones, 1997). Moreover, with collaborative planning participants are able to collaborate and change the existing conditions into what they think could best suit all of them. For the purpose of this dissertation, collaborative planning theory highlight participants' concerns such as the relationship of professionals, municipality and community members from Piesang River and NS8 as they engage in collaborative work.

3.2.5 Integration and Coordination Approach

Smit (1998, 77) stated that *"in order to improve people's lives in a meaningful way and be able to cope with the complexities of informality, it is essential that informal*

settlement upgrading policies and programmes are integrated...” Smit (1998) further cites examples of successful integrated approaches to informal settlement upgrading from India and Kenya. Integration, as a concept, is often used broadly but in this thesis it will be used specifically as a tool of bringing together different sectors, policies or programmes in informal settlement upgrading. Mabin and Smit (1997) as cited by Pieterse (2003) define integration approach as coordination and integration of sectorial investments in cities to ensure that, among other things, design and spatial planning come together and reinforce social development.

3.3 Conceptual framework

3.3.1 The need of alternative building technology in low-income housing project

The growing population of urban habitant in the world has unavoidably results in a very severe rise in the demand for housing. The gap between demand and supply creates a very complex problem, driving the housing sector towards less efficient and more-expensive solutions and new city dwellers towards informal independent construction of dwellings in informal settlement (Rust, 2006). The building sectors are the primary consumer of resources and energy in the modern environment. Therefore, it is of great importance to develop technologies to deal and reduce adverse environmental effects, while reducing time and cost of production without compromising quality of the house. The need for consideration of the potential and performance of innovative ideas to try to curb these challenges, find the paramount solution, a consistent set of yardsticks need to be developed with the consideration of sustainability in mind. Additionally, the evaluation of sustainable building technologies and solutions entails the development of comparison schemes and benchmarks that will highlight the challenges and opportunities of technology (Saler, et.al. 2012).

The importance of alternative building approaches in support of sustainable low-cost housing development, in light of the ever-increasing costs of traditional building materials and the high expectations of those demanding free housing. Alternative and innovative building methods are said to be more economically effective building materials and construction methods should be sought to tackle the ever growing South African housing backlog. Intermediate Technology Development Group (ITDG) aimed

to improve poor people's shelter conditions in rural areas through the use of appropriate building technologies. has learned that improving urban poor people's housing (physical capital) through the use of alternative building materials in urban areas involves not a review of the standards and regulatory frameworks, but also building human capital through skills upgrading, strengthening community based groups and empowering local communities (social and political capital) and facilitating access to credit (financial capital).

3.3.2 Understanding the use of alternative building technology

Incremental housing is a concept that is currently at the centre of the South African housing policy, more so in the draft the proposed new Human settlements policy draft that seeks to address all the nagging issues. Incremental development of housing insures that the residents, over time, will gradually expand initial basic dwellings into more adequate homes, which can satisfy their needs (CSIR, 1997), while Goethert (2010) refers it to an informal building and expansion way of construction "*the pay-as-you-go process*" which is often the de facto growth pattern, particularly in low-income neighbourhoods. The concept of incremental growth belongs in the broader concept of incremental type of housing. Incremental housing normally takes three usual formats, namely site and service schemes, core housing schemes and lastly, informal settlement upgrading. The three typical format of self-help need beneficiaries with the communities to make financial contribution towards their housing improvements to satisfy their housing needs. The inclusion of community members in the construction phases of the housing project will allow for the transfer of skills, which will help them as beneficiaries to realise the incremental aspect over a period.

The objectives of incremental approach are to include labour intensive methods, which in turn create jobs as emphasized in community participation. Furthermore, the incremental approach promotes participation of communities, maximizes job creation through backward and forward linkages, improves economic linkages by purchasing building materials and after housing improvements through internal investment, promotes skills transfer promote capacity building. Lastly, it promotes an ascending mobility done by involving communities in the initial stages of the housing projects than "top down" approach and gives the beneficiaries a sense of pride and ownership about

the final product realized at the, because of the community's involvement (Parnell, 1999).

Through incremental mode of housing delivery, the government plays an enabling role of ensuring that the conditions are conducive for the delivery of housing. The government plays a supportive role in housing delivery to enable communities on continuous basis to improve their housing circumstances (Boonyabancha, 2011). In essence, beneficiaries are being called to make an active contribution to help themselves by improving their housing incrementally towards an ultimate goal with assistance from the government in the form of an initial subsidy and ongoing support (Boonyabancha, 2011).

Incremental housing approach solely hinged on individual households and communities taking the responsibility to continue improving their housing as a best position to take (Dewar, 1993), training beneficiaries causing improvements such as low incomes.

3.3.3 Conventional Modes of Housing Construction

Conventional building ways commonly referred to as building which are constructed using materials ranging from cement, cement concrete products, and additional metallic building constituents and methods are assembled on site through the process of timber or plywood formwork installation, steel reinforcement and cast in situ. Therefore, housing provision is highly demanding and capital intensive because it uses up a lot of money on skilled labours which could be managed if communities and beneficiaries were involved in the construction of the houses, raw materials, transportation and that by and large result to slow completion of houses. Conventional construction materials and technologies are expensive and sometimes battle with the challenge the ever increasing material prices, while the subsidies remain unchanged, they are also beyond the reach and affordability of many people who find it hard to even make ends meet for day to day basic needs and so cannot be employed for mass housing. This mode mainly serves for the middle and upper income groups of the urban population. They are often averse to lending to the poor, and generally lack sufficient client orientation and outreach into poorer especially in developing countries. This is mainly achieved through the private market (UN-HABITAT. 2006).

3.3.4 Alternative Construction Technologies

There are numerous challenges that have resulted in a non-effective housing delivery in South Africa. The Human Settlements Department has undertaken to address these challenges in the future, with the goal of speeding up the delivery of small houses for people living in informal settlements through innovative methods. However, the bulk of South Africa's housing units are built using conventional construction techniques to provide a durable, 40m² brick and mortar home. This is in unembellished contrast with other countries, where the use of alternative building technologies provides a stream of innovative solutions for the built environment, and make up a large segment of the affordable housing sector (Slawik, et al., 2010).

As stated by the Housing Minister Lindiwe Sisulu in her parliament speech in 2008 reported that *"In order to tackle the building material issue, the department was undertaking investigations in respect of the use of alternative building technologies which will meet all the requisite standards for quality, norms and standards"* (Ndaba, 2008: online).

Research, development and dissemination of low cost building materials and technologies (dubbed 'appropriate technology', or 'alternative technology') world over is characterized by involvement of many organizations, including international, national and non-governmental organizations. The common objective has been the lowering of construction costs, especially concerning housing to make it affordable to a majority of people who are predominantly in the low income group. The prospective beneficiaries of the 'appropriate technology' are perpetually those people that are predominantly from economically weaker sections of society. They have a limited capacity to afford houses constructed with conventional building materials and technologies, hence due to incapacity, are always reliant on the government to afford the opportunity to a starter house. Angel (2000) also puts it, wherever appropriate technology has started taking root, four main attitudes are identifiable: Rejection of the concept, acceptance of the idea in principle, active involvement in knowledge, mobilization and experimentation, and willingness to apply the concept as a normal part of business administration and community activity (SheltNet, 2014). Along with the aforementioned, there is still political issues that need to be dealt with to allow for the full rollout and use of alternative technology in the construction of low-income housing.

Providing the backing structures and infrastructure for the distribution of low-cost building technology for housing has been a duty of a numerous role players in form of government agencies (central and local), Non-governmental Organizations (NGOs), Research and Development Institutes and Community Organizations. There is, however, lack of interaction and partnership framework, within which these organizations can co-operate (Goodman, 2005) They have largely tended to work independently and hence mistakes made and lessons learnt have not been shared without necessarily going through the bitter lessons of experience. Thus, political will and support from both central government, as well as local authorities, for the dissemination of low cost building materials and technologies is essential. This includes enactment of enabling legislation to remove any planning and building regulations that may hinder the use of the alternative building materials and technologies.

Likewise, it is key for effective implementation of the alternative technology to bring forth the involvement and active participation of the community members 'Target Groups'. Through the concept of 'Self-help', by way of production and use of alternative technologies, low income individuals and households have been important showcases for the technology (Muturi, 1993).

Shortage of urgent demand of affordable housing, environmental concern due to the extensive exploitation of natural resources, shortage of fund and skilled work force are some of the challenges that have led to the research and probe the use of alternative construction technologies and methods as an option to replace or assist the conventional ways of constructing. Hence, there has been considerable loggerheads in most developed countries, in realizing that the use of ACTs matched with CCTs owed to save the scarcity of construction materials and natural resources. This in turn will also save as a solution to the shortage of skilled labour and inevitably reduce the cost of construction, with the main drive being solely based on providing affordable, quality houses within short period of time for the low income groups (Deepa, 2006). Alternative construction technology can be a source of creating job opportunities for unemployed or underemployed skilled and unskilled workers living in poverty. They can also have multiplier effects by creating income-earning opportunities for those involved the housing project, depending on aspects concentrated on during the

construction. In addition, cost comparisons of houses using these alternative materials and technologies suggest that they have the potential to enable a 30-50 per cent reduction in building costs (UN-HABITAT. 2006).

According to Lategan (2012) there has been little implementation of alternative materials and technologies in the low-income, mixed income and subsidised housing sectors. According to the Human Settlements Review, (2010:266) 2.9 million housing units were delivered for South African low-income earners between 1994 and 2009 .

Studies conducted during this period indicated that only 17.000 of these units were constructed using alternative building materials or innovative systems. This constitutes only 0.06% of the total number of units built. Low-income residential development can be significantly improved by considering alternative building material options (Balleriono, 2002). Up to 60% of total housing delivery costs can be attributed to engineering design and construction materials, clearly justifying the investigation and implementation of more effective alternatives for the sake of improving the use of financial resources (Balleriono, 2002).

The use of alternative building materials could excel the building process substantially. A 40m² house may be built in four to seven days, using alternative materials, compared to the average thirty-day period required to build a unit of the same size using conventional brick and mortar construction (Human Settlements Review, 2010). Given the backlogs experienced in South African housing development and the urgency related to supplying homes for the disadvantaged, time savings can be of substantial benefit.

However, numerous issues in regards to the utilization of alternative technology as substitutes for more conventional methodologies obstruct the usage of these alternatives. These challenges are outlined in Table 2.

Table 2: Challenges facing the implementation of alternative technology in South Africa

Problem	Explanation
Perceptions of Beneficiaries	<ul style="list-style-type: none"> -Alternative materials do not always carry acceptance from beneficiaries. -Beneficiaries are not always familiar with products and their benefits. -Beneficiaries often believe they are receiving a devaluated product. -Suppliers of alternative systems do not market their products sufficiently to the public.
Quality of structures	<ul style="list-style-type: none"> -Structural defects are often found a few months after completion. -In some cases units need to be demolished due to substandard workmanship. -Quality troubles contribute to the existing negative perceptions surrounding alternatives.
Institutional support	<ul style="list-style-type: none"> -Procurement and tender processes <ul style="list-style-type: none"> >A lack of procurement policies for alternative materials constrain usage. -Inspections <ul style="list-style-type: none"> >The inspection of units might be carried out by qualified engineers, but are not always undertaken by officials who understand the comprehensive certification conditions which the material or system carries. >In-house provincial inspectors are not experienced in the quality assurance of alternative building materials.

Source: Constructed based on Human Settlements Review (2012)

The implementation of alternative options ought to begin at a provincial and national level. Training should extend beyond the education of builders and contractors, to training the officials who are to instigate and apply the use of alternatives. According to the National Department of Human Settlements (SA, 2010) South African provinces have proven to be attracted to the use of alternative building technologies due to the inherent time-savings associated with these methods when compared to conventional brick and mortar construction. However, the Human Settlements Review (2010) states that most provincial officials who would be responsible for implementation, are often uncertain of how projects utilising alternative technologies and materials are to be managed from the procurement stage to construction.

The limited understanding of alternatives clearly limits large scale implementation. According to UN-Habitat (2011:2) housing guidelines which are regionally standardised will encourage and improve the provision of sustainable low-cost residential options, especially when these guidelines integrate local knowledge.

3.3.5 Moladi housing technology

Moladi technology involves easy to use plastic panels that are interconnected to make a plastic structure/form of any length and height for the different walls of a building (Moladi, 2008: online). The reinforcing, pipes, electrical installation, door- and window openings are cast before the concrete is cast into the walls. It takes approximately four hours to set up the plastic mould and about two hours to fill it with a special blend of concrete (McIlhone, 2012: online). The walls are left to dry overnight (15 hours) and the formwork then removed. The formwork can be used up to 50 times and can then be recycled for other components (De Lange, 2008: 35). Moladi technology can build house sizes between 52 and 80 square metres and it takes approximately 10 days from the laying of the foundation to revoke. This building method is believed to be stronger and more stable than ordinary brickwork (Pierre.C, 2010). As an alternative to traditional building methods Moladi technology is 50% cheaper than ordinary brick walls methods (De Lange, 2008: 35).

Moladi stands by the motto “Train the unemployed to build for the homeless” Moladi makes it easy to bring together construction with economic development, for the involvement of the communities in question. The Moladi way of building offers training locally for the unemployed thereby creating jobs and empowering the community as a whole, allowing for the enablement theory to come at play. This will empower the communities with skills that they could use in the future for housing incremental purposes and secondly for livelihood purposes (Mathauer, 2011). Owing to how simple it is to use this approach, the techniques used for the construction as well as the skills can be transferred to the community participants with ease in a short time. In this way, the communities benefit from affordable shelter and skilled entrepreneurs (in the area of low-cost housing) at the same time. The success of the Moladi construction technology (MCT) in over 20 countries is a testament to that affordable housing is an important key in finding solutions to promoting security and alleviating poverty, and with more consideration from a national and local level. This would play a pivotal role in tackling

the housing challenges faced by low-income earners and those that lack formal housing in informal settlements.



Figure 3.2 Phases of Moladi construction (master builders, 2015)



Figure 3.3: Stages of formwork setting for pouring concrete (Tose, 2015)



Figure 3.4 Demostration of the formwork set up with piping before pouring (Stone, 2009)



Figure 3.5 demonstration of poured in walls (Stone, 2009)

3.3.5.1 History of the Moladi construction technology

In the early 1980s, Botes the founder of the technology realized, in his own words, *“how difficult it was to put bricks on top of each other in a straight line, and, once the wall is built, to plaster it.”* The wall was eventually erected, but the frustration inspired him to search for new ways of building walls. In November 1985, Botes (the creator of the Moladi construction technology) started experimenting with a mould system which would enable him to cast entire walls at a time, rather than single bricks. *“My initial attempt failed, and the concrete I tried to pour ended up serving to build a duck pond in my garden. But now I stood before a challenge, and I decided to refine the concept,”*

he said. Botes also quickly realized that if he could cast one wall, he could actually cast all walls simultaneously for an entire house or a building, by pouring a concrete-based mortar into the casting and removing the casting once the mixture had dried inside the cavities. Botes looked at different types of materials that would be appropriate for the formwork (or casting), and initially looked at steel and wood, before settling for injection-moulded plastic components, since assembling plastic panels required no skilled labour in the form of carpenters and welders, which are in short supply in South Africa (Coetzer, 2010).

The plastic mouldings enabled him to successfully cast a wall. The basic concept was born, but Botes had many more milestones to reach: both on the technology side, and with regards to bringing the product to the market. Moladi has come a long way on both fronts since these early days in the mid-1980s (Coetzer, 2010).

Strategy Matrix

	Adapt products and processes	Invest in removing constraints	Leverage the strengths of the poor	Combine resources and capabilities	Engage in policy dialogue with government
Market information	Difficulties winning tenders at home			Resistance to new technology in the building industry	Low-cost housing market in South Africa dominated by government as main source of funding
	Seeking new markets for their products			Finding other partners to work with	Approached government authorities in order to promote its technology
Regulatory environment					
Physical infrastructure					
Knowledge & skills	Construction industry confronted with a shortage of qualified builders and artisans	Construction industry confronted with a shortage of qualified builders and artisans	Construction industry confronted with a shortage of qualified builders and artisans		
	Developed a technology where fewer skills are needed	Invest in training and transferring skills to people	Community members, unemployed and future homeowners involved in the construction		
Access to financial services					

Figure 3.6 Strategic Matrix Source: Moladi (2010)

3.3.6 Participatory technology development interventions in housing

Participatory technology development (PTD), as defined by Diop, (2001) is “an approach to delivering new technologies by working with people. The paramount aims being to enhance knowledge and skills in a participatory manner, extending choices and promoting ownership of technology, keeping in mind the objective of community empowerment.” PTD advocates for the use of new technologies in a particular community and context, and as such, has much in common with technology transfer. Full beneficiary participation is essential for the success of the housing projects, it replaces the top-down transfer of technology model with people-centered research and development and extension, moving towards the bottom-up approach, which includes the ideas of the people on how their housing issues should be solved. PTD allows for the recognition, enhancement and expansion of existing knowledge and can thus increase communities’ ownership and confidence of development interventions, while the involvement of those most affected increases chances of success. PTD should contribute to the development of technological capability and have a positive impact on the lives and livelihoods of poor people living in the informal settlement (Diop et al., 2001).

3.3.7 Co-production in housing

Stephens, Ryan-Collins and Boyle, (2008). state that co-production enables citizens, communities and professionals to share power and work together in equal partnership, to create opportunities for people to access support when they need it, and to contribute to social change. The concept is based on five valuable principles, which make for its success, value participants, build on their strengths, develop peer-support networks, equality and reciprocity and lastly facilitation not delivery. This is important, as the conventional model of public service delivery of low-income housing has disempowered those people who are most in need of housing on the ground, with its top-down approach. If not re-align the relationship between the state and citizens, they will be left with an unsustainable system and citizens who will have to fend for themselves. This in turn forces the increase of informal settlements.

One of the reasons why the provision of low-income housing is so challenging is the involvement (or lack of) of many different role players – usually operating from very different points of departure. While it is expected of government to supply the housing, it is often said that no adequate consultative process is involved. This results in the

target groups often rejecting the final product. In return, government might feel their attempts at helping the poor and homeless were not appreciated and, should they engage in similar future projects, might consult even less than before. In order to address this communication breakdown, various bodies have been created the world over to facilitate the process of low-cost housing delivery. Hence, co-production is vital aspect, which the implementation of low-income housing cannot be devoid of, as illustrated below on the graph.

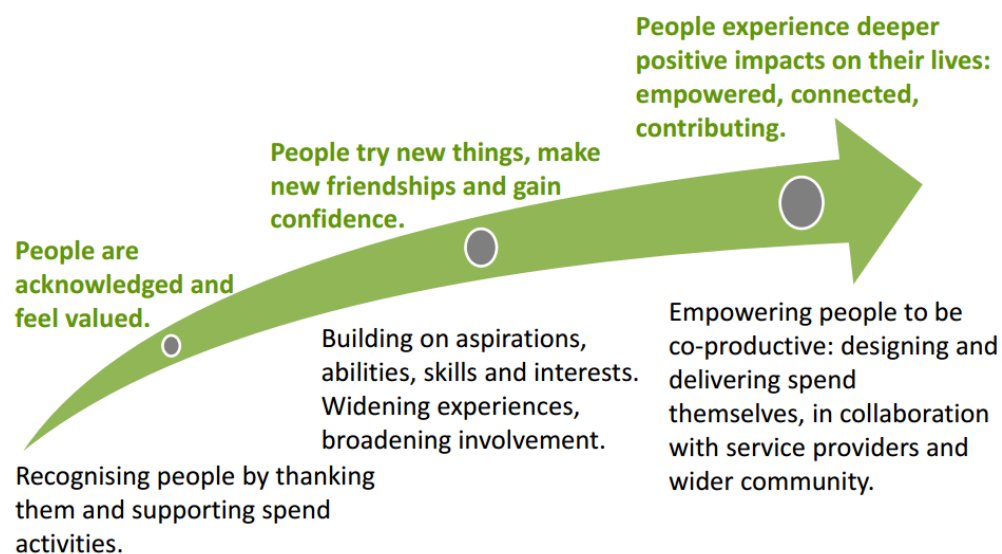


Figure 3.5: Co-production info-graph
Source: (Robinson, 2014)

3.3.8 Community participation in in-situ upgrade

The involvement of informal settlement communities, in the aim of giving them a voice, at every phase of the policy process and implementation, forms an elementary principle of the Upgrading of Informal Settlements Programme (UISP) through a process called *people-centred participation* (Revised Housing Code, 2009). Huchzermeyer (2006) reaffirms that community participation in the implementation of the UISP signifies a different characteristic scenario, where participation has been condensed to nothing more than an administrative facade. In reality, implementation has shown to be a basic top-down fashion with minimal regard for participatory processes. Hence, there is a need for a revaluation of the whole concept that move away from the upgrading, which has plans that are already re-designed by various experts, leaving little room for the community participation and influence (JordhusLier and de Wet, 2013).

Scholars' definition of community participation is classified according to its scale. These scholars argue that development will vary depending on the scope of the arena or field in which participation occurs (Goulet, 1995: 93). This view is popular because it may be difficult to handle participation of a larger group than it would be to deal with the smaller group. As a result, community participation is usually restricted to the project level rather than at national level.

Community participation may also be generated by the masses from below. Community based theorists argue for the handing over of development responsibility and implementation to the hands of local community structures' to drive the process. Advocates of bottom up approach, usually, although not always, base their trust in community driven development (Mbonambi, 1995). Alternatively, an external agent such as societal formation may promote community participation. In empowering communities, the project should enable the people to initiate actions on their own and consequently influence the process and outcomes of development. When people have been empowered, they should feel as an essential part of the project and gain confidence on the project, which will reduce heavy reliance on agencies. In fact, people will benefit from the empowerment that is brought about by the aforementioned. People may benefit from skills obtained during training for implementation of the programme. It is emphasized that the best of community participation ensures that everyone involved has a stake in the outcome and that therefore they have a measure of control over it (Hamdi, 1995).

3.3.8.1 People-centred participation

People-centred participation addresses issues of control and power. Its view is much more extensive than the specialized and administrative parts of programmes and projects. It is concerned with the nature of the society in which these programmes and projects are developed. It aims at the empowerment of communities. People-centred participation is solely based on the belief that ordinary people are capable of critical reflection and analysis, and that their knowledge is relevant and necessary. In instances that excluded ordinary people from decision-making and political discussion, or are discouraged from taking part, the importance of participation in giving them a voice may be magnified (Bass, Dalal-Clayton, and Pretty, 1995).

They must also share the benefits of the initiatives. Participation should enable those who are usually the most vulnerable and marginalised within their community to be heard and have their due influence on decision-making. Hence allowing for community members to have an autonomous choice on what type of construction methods to use on their housing projects (Bass, Dalal-Clayton, and Pretty, 1995).

3.4. History of Housing in South Africa

Throughout the apartheid era, land and housing in South Africa all solely based on one's racial standing resulting in the segregation of people within the urban areas. People were by and large allowed to take up accommodation in areas designated for the use of a precise racial group and the state played a great role in determining if and whether they qualified (Morris, 1998). The legacy of the apartheid had its roots deep in the colonial period and the decisions of the era profoundly affected and contributed to the manner in which the current housing, economic and social problems that are faced by the present generation of South African citizens. In a very direct sense, the problems of the past have strongly moulded the situation to which the present policy seeks to respond. Therefore, this section will solely delve into the history of South Africa and the crossroads it has come in the context of housing, more so on housing for the poor. This will help draw a conclusion that aims to clarify how the housing situation happens to be in the state it is currently.

3.4.1 Colonial Era (1700 - 1948)

All through the apartheid era delivery of housing differed from the post-apartheid era, the type of urbanisation forced on South African cities by the colonial governments favoured a white minority over the majority black South Africans (Mabin, 1992, Smith, 1992). In the past, there was segregation between whites and blacks. Apartheid policy imposed inequality between the two races. The 1923 Urban Areas Act extended segregation into cities, restricting African residency into urban areas. This restriction was altered subsequently to the beginning of mining and industrialization in the cities, and the creation of "black" locations were legalised by several pieces of legislation to allow for the exploitation of cheap black labour (Parnell and Hart, 1999). This shaped and pioneered the introduction of the Urban Areas Act (1923) and the infamous Group Areas Act (from 1950), that was governed and enforced by the Native Affairs Department. These acts were later incorporated into the apartheid legislation in 1952.

The justification behind these acts were that cities were seen as “the natural properties of whites due to the rationalism that urban areas were built by white colonists on land that was transferred to them through peaceful negotiations with local black tribes” (Smith, 2010).

3.4.2. Apartheid Era (1948 - 1994)

In 1950 when the first official apartheid law was legislated, the living areas of South Africa were segregated into different regions for people of different ethnicities. The set of apartheid laws aimed to group white communities into low-, medium- and high-density areas surrounding the central business districts of main cities, with non-white communities located at the periphery/fringes of cities. As a result, the communities were by and large regulated in the economic growth and social development aspects of life, and dispossessed of the rights to basic housing, shelter and security which the then minority community of whites enjoyed so no pity or shame.

3.2.3. Delivery Systems and Housing Policy (1979)

South Africa's housing delivery systems have not solved the problem of growing informal settlement. Prinsloo (1995) identified a number of different delivery systems and financial schemes in housing provision in South Africa.

3.4.4. Post-apartheid Democratic Era (1994 - 2013)

Informal settlements have been relentless in their growth and presence in urban areas in spite of widespread government subsidised housing delivery (Huchzemeyer, 2006). Bauman (2003) states that, urban informal settlements are a true reflection of living conditions marred by conditions of social ills, pollution and over population. Nonetheless, it is in terms of spatial disadvantage that South Africa's Apartheid housing policies pose unique challenges for post-apartheid housing policies that require new innovative housing solutions such as the use of alternative building and construction technology to help tackle the current housing backlog. The first post-apartheid housing policy was the Housing White Paper of 1994 (HWP) which was hailed as ‘the new housing policy strategy for South Africa’, formed at a time when informal settlements were growing persistently and spiralling out of controllable levels in South African urban areas (Huchzemeyer et al, 2006).

The formation of informal settlements was recognised by government as a growing phenomenon of peoples' struggle to access urban accommodation. The HWP recognised that given the inherent levels of inequality for low income households,

government subsidisation of the housing process was necessary for these households. The solution to levels of inequality was a housing policy approach for lower income earners in South Africa aimed at providing basic services through the Reconstruction and Development Programme (RDP) of the African National Congress (ANC) party, which led the first democratic government of South Africa since 1994. The housing built under this programme consequently inherited the term RDP housing, and constituted one of the largest redistribution programmes of the post-apartheid dispensation. At the onset of the RDP housing construction the government sought to enable the lower end housing market to function, through the provision of a maximum subsidy amount of R15 000. The Subsidy was granted to the lowest income beneficiaries, earning between R0 – 1500 per month, from 1994 to 2001, which was later revised in 2002, to try to keep abreast with the ever changing inflation. By April 2003, the subsidy amount had reached R25 580 (Napier, 2005 cited in Adebayo, 2010). The Urban Land Mark report (2008) makes mentions that most RDP and informal settlements in various parts of South Africa that most informal settlements provided real locational advantages to residents and there is an array of compound but gripping reasons that make them locate in these areas of settlements. *“A key finding was that the urban poor make conscious and informed decisions about where they want to live”*.

The democratic government of South Africa was faced with the two challenges inherited from the apartheid government, firstly, formal land release and infrastructure provision that does not parallel the rate of population growth and urbanisation levels within the urban cities. Secondly, the cost of authorised housing is more than the household income and the wage structures in relation (Amis, 1989 cited in Huchzemeyer, 2004). The democratic government thus had to at the same time focus on developing two interventions which necessary had very different strategies to dealing with these problems. The Housing White Paper (HWP) its main focus on one side of the human settlements issue which was to mass produce housing units.

However, since 1994 informal settlements have been gradually receiving more attention from the National Department of Housing. As a result of this attention and the lessons learned from the first decade of post-apartheid housing intervention, in 2004, the Department of Housing was renamed to the Department of Human Settlements and now intervenes in informal settlements using the Informal Settlement

Upgrading Programme (ISUP) with a subsidy mechanism dedicated to it. The ISUP is part of the larger refinement of the National Housing Policy presented in a document titled the BNG: A comprehensive Plan for the Development of Sustainable Human Settlements.

The ISUP advocates for the integration of informal settlements into the broader urban fabric as a way of overcoming spatial, social and economic exclusion suffered by households living in informal settlements (Department of Housing, 2004). As a result, the BNG policy represents a shift from not having a plan dedicated to the upgrading of informal settlements, which was the case with the HWP. To recognising the importance of informal settlements to poor households through creating a new intervention strategy that, aims to upgrade informal settlements on the same land, which they have been erected on (Huchzemeyer et al, 2006). Post-apartheid housing policy in South Africa therefore, only began to cater for the upgrading of informal settlements in 2004 through the ISUP, which pays particular attention to a phased in-situ upgrading of the informal settlements upgrading process.

3.5. Housing Framework, Policies, Regulatory Authorities and Subsidy-Based Assistance Programmes

To stand a chance in reducing the housing backlog with the best technical solution, there must be a holistic understanding of the South African housing sector, therefore the core policies and regulations associated with the housing delivery and subsidy system used in South Africa for housing delivery. The focus directed to those previously disadvantaged by the apartheid system, which by and large restricted the majority of black people to own houses within the urban set up. According to the Department of Human Settlements, several different policies and regulations have been developed and enacted since the first democratic election of 1994, when South Africa transitioned to a republic democratically realized. This came to fruition through endless consultation with the help of numerous influential people within the built environment and more so with those chiefly involved in the delivery of housing. The collection of developed policies determines the national housing policy framework, and provide the housing policy development implementation as followed by the state. The collection of developed policies determines the national housing policy framework, and provide the housing policy development implementation as followed by the state. The problem of meeting the underlying or evident demand for suitable accommodation of

a rapidly growing South African urban population, in particular, remains at the core of the current housing policy framework (Wilkinson, 1998). Hence it is important to fully understand and map out the transitions of the relevant policies that have come about in relation with the delivery of housing, to also assist the researcher in understanding how policy needs to change and accommodate the use of alternative building methods in assisting in the construction in-situ upgrade.

3.5.1 South African Constitution (1996)

The Constitution of South Africa explicitly states that all residents of the country have the right of “access to adequate housing, and makes it compulsory upon the State to take reasonable legislative and other measures within its available resources to achieve the progressive realization of this right” (Department of Human Settlements, 2009). This statement forms the constitutional basis of all other housing acts and policies that have been enacted in the country since 1996.

3.5.2 Housing White paper (HWP) of 1994

The housing White Paper marked the start of a process, in the history of South Africa, this was the first time there was a policy framework that was non-racial and inclusive of all its citizens. The approach espoused aimed to search for the creation of an enabling environment, not set out new rules of doing things. It aimed to contribute to the certainty required by the market, as well as give the Provincial and Local Governments their capacity to fulfil their Constitutional obligations, delivering housing to the citizens.

The Housing White Paper of 1994 set forth a new housing policy to replace those enacted and adhered to during the apartheid period. The White Paper came from the efforts of the National Housing Forum (NHF), which made up of the key players in the housing sector and political communities, in conjunction with the principles of the Reconstruction and Development Programme (Goodland, 1996). The RDP’s economic policy provided a strategic framework to address problems in that it recognizes the interrelatedness and necessity of meeting basic needs, developing human resources, building the economy and democratizing the state and society. In implementing programmes, changes are necessary in institutional arrangements as well as in the orientation policy (Gazette and Notice, 1994). RDP objectives were to be achieved through the leading and enabling role of the state, a thriving private sector and active involvement by all sectors of civil society. Housing was a major feature of

the RDP's published guidelines which set out the national goals of the new government that came

Housing White Paper also marked the end of a process. From its launch in 1992, the National Housing Forum played a pivotal role in creating the conditions necessary for a national consensus in housing, most notably the in National Housing Summit in Botshabelo on the 27th October 1994. Out of this consensus, the people of South Africa were tasked on bring together the required skills, energy and resources that the country proved had in abundance, and channelling them to the production of housing for its citizens (Gazette and Notice, 1994).

3.5.3 New Housing Policy (1994)

The Reconstruction and Development Programme (RDP), has become tantamount with low-cost government subsidised housing in South Africa. After the beginning of democracy in the country, the "New Housing Policy" White Paper was published according to the RDP strategy in 1994, as a means to eradicate the drastic need for housing in post-apartheid South Africa. An estimated 88% of all households received an income of less than R3 500 per month in December 1994, and thus most households would need assistance by means of financial subsidies to enter the housing market (Rust, 2006).

This housing policy states that all South Africans must have access to "*a permanent residential structure with secure tenure, ensuring privacy and providing adequate protection against the elements.*" In addition, "potable water, adequate sanitary facilities including waste disposal and domestic electricity supply" must be provided by the state (Department of Housing, 1994). The careful consideration of the special needs of youth, disabled, aged and single parent families are another factor. To achieve this, the policy embraces eight key strategies:

- 1). *Supporting the housing process.* Meeting the basic needs of households by promoting a wide variety of housing delivery approaches to ensure access to well-located land, basic services, secure tenure and on-going construction and upgrading of the public environment; investment in low-income housing projects;
- 2) *Stabilising the housing environment.* Pursuing an incentive based approach to private;

- 3) *Institutional capacity arrangements*. Housing will gain priority attention from government through the institution of a statutory and parastatal framework;
- 4) *Mobilising savings*. Utilising personal savings for credit advantage;
- 5) *Subsidy assistance*. Using a flexible, capital subsidy approach to empower those caught in the lower end of the housing market;
- 6) *Mobilising housing credit (short- and long-term)*. Providing accessible credit to those households that can afford it and thus gaining a valuable, positive credit record;
- 7) *Land facilitation*. Facilitating the speedy release and servicing of public land;
- 8) *Coordinated government investment in development*. Providing all stakeholders in the public and private sectors with an integrated mechanism at provincial and local government level, to coordinate their actions (Department of Human Settlements, 1994).

The housing policy framework enabled the provision of a single 30m² house on a 250m² plot of land to eligible beneficiaries. To qualify for this subsidy, each beneficiary would need to have an income of less than R3500 per month, and may not have owned a house previously (Rust, 2006). This subsidy was attainable through large-scale housing projects, flat-based renting of homes or funding to self-build a house by means of the Enhanced People's Housing Process (EPHP) or the Integrated Residential Development Programme (IRDP). (Rust, 2006)

An estimated R36.000 formed the budget for the core top structure of each housing unit, with each family earning less than R1.500 per month being eligible to free" housing. The higher income bracket of R1.501 to R3.500 required applicants to contribute R2.479, and then access to a subsidy value of R34.000 (the intention behind this subsidy split was a better quality and larger house for the top bracket of the population by utilising their access to additional credit from financial institutions).

The policy also advocated the use of 5% of the total government expenditure on newly created houses, to achieve a minimum of 350 000 units delivered per year (Department of Housing, 1994). This has not been realised however, as government decreased the annual expenditure to 2% to decrease the financial deficit facing the state in 1994 (Tonkin, 2008).

3.5.4 Breaking New Ground (2004)

Popularly known as the “Breaking New Ground” policy, the “Comprehensive Plan for the Development of Sustainable Human Settlements” enacted in 2004. This policy aimed to shift the delivery emphasis of low-cost housing from primarily core RDP houses to integrated and sustainable communities. In order to improve the quality of life for future beneficiaries, the policy advocated an increase in house floor area from 30m² to 40m², to accommodate a higher standard of living. Additionally, the policy complied with the United Nations’ Millennium Development Goals. The primary ends of the BNG policy being that of “*Sustainable Human Settlements*, by ensuring the balance of economic growth and social development by monitoring the carrying capacity of well-managed settlements”. Secondly, “*Integration*, by shifting the housing focus from core housing units to the creation of sustainable human settlements”. Lastly, the “*Housing as assets*, by providing property as a tool for wealth creation and empowerment to beneficiaries; and finally that which seeks to address the worrying phenomenon of the growing informal settlements, “*Upgraded Informal Settlements*, by integrating current informal settlements into the broader urban fabric of South Africa” (Rust, 2006).

To attain these objectives, the state made use of additional instruments to afford the means. These are:

- 1) *Reduction of Administrative Overhead*, by means of accreditation so that funding for projects can flow directly and so reduce unnecessary costs;
- 2) *Coordinated and Effective Inter-Governmental Relations*, by means of enhanced integrated planning frameworks and bilateral cooperation between stakeholders, this meant that the beneficiaries are to take part and actively involved;
- 3) *Demand-driven Delivery*, by enabling the state to determine the location and nature of housing, prioritising projects severely in need and tailoring each project to the needs of the communities by adopting a flexible approach (Rust, 2006).

The BNG policy intentions were not substitute the objectives set out in the RDP and National Housing Policy, but somewhat stretch the municipalities’ roles in housing.

The amount of subsidy allocation available for the top structure of a 40m² as from 2014-16 announced by the Department of Human Settlements (DHS) were R110 000

for construction of a house, R6000 for procurement of land and R45 000 was provided for servicing (water and sanitation). DHS had point out that it should be able to develop a decent product from the allocated subsidy quantum.

3.5.5 Building Regulations - South African National Standards

The standardisations of building practices are crucial to ensure acceptable quality, health and safety of the built environment. Referred to as the codes of practice issued by the South African Bureau of Standards (SABS), these sets of building regulations aimed to provide rules and guidelines for the design, construction and quality of civil works and housing in the South African built environment. There is also an on-going process to update the previously used SABS codes to revised South African National Standards (SANS), based on several international codes e.g. the British codes.

3.5.6 National Home Builders Registration Council

In order to ensure a high level of quality among homebuilders, the National Home Builders Registration Council created in 1995 is an entity that served the state. All homebuilders in the country by law are required to register with this council, in order to provide protection for the beneficiaries and consumers of houses. A Code of Conduct for Home Builders came into effect in March 2007 and aims to stop corrupt and inept builders from inundating the market with inferior quality houses by providing ethical and technical standards that must be adhered to (Brewis, 2012).

The council also runs a so-called Product Defect Warranty Scheme, which aims to pay for repairs of defects when homeowners make a claim. This scheme funded primarily by the registration fees required from members, and is valid for five years after the completion of the structure (Tonkin, 2008).

Additionally, the NHBRC also acts as arbitrator during disputes between the builder and homeowner, if major defects occur on the constructed building after hand-over (Brewis, 2012).

3.5.7 Housing Development Agency

The Housing Development Agency (HDA), established by Act 23 of Parliament in 2008 with the intention of creating a vehicle that will aid in the sustainable development of housing and human settlements, and thus the creation of positive societal economic growth in those communities that benefits thereof through the transfer of skills.

The functions of the agency, as set out in Section 7 of Act 23, are as follows (Housing Development Agency, 2008):

- “Develop plans and strategies for identification and acquisition of suitable land for residential- and community-development;

3.6 The history of informal settlement intervention by governments

According to Harris and Giles (2003), researchers have categorised what they refer to as the evolution of housing policy globally since 1945 into three phases. The first phase is public housing, which was the housing policy in 1945-1960s. During this period, the main form of housing tenure was state owned property. In the 1945 governments in first world countries built many public housing units to house the large numbers of homeless people in their countries that were displaced by the global economic crisis and Second World War. However, the development of public housing led to the enforcement of unrealistic housing standards which the poor could afford and government subsidies proved insufficient in this regard (Turner 1972).

After 1945 a series of global events, which included a global economic recession, led to the development of international housing policies as every poor or rich country was faced with shortage of housing, which governments feared would lead to political unrest, thus they developed public housing. The second phase is sites-and services. 1972-1980s, was the period when according to Mayo and Gross (1987) sites-and services was the delivery, by government, of shelter-related services, which depended on the beneficiaries’ ability and willingness to pay for the services.

The third phase is market enabling, 1980s-2003, which was the period when the World Bank Endorsed Housing Market enablement by stipulating that governments need to stimulate the demand for housing, facilitate housing supply and manage the sector to ensure that it is able to provide adequate housing for all. Thereafter, came the 1950s and 60s, a period in which housing policies around the world were being shaped by the recommendations of Multinational Agencies such as the United Nations and the World Bank. These agencies endorsed largely informal settlement upgrading housing development policies, which were developed from the ideas formulated by John F.C Turner, among other academics. These ideas by Turner came about from his work in the informal settlements of Peru and other developing countries. There, Turner was exposed to poor people’s attempt at housing themselves using informal methods and

materials. Turner saw this kind of 'informal' development as one that should be recognised by government as the poor people's attempt at housing themselves and therefore, should be assisted by governments through housing policy (Harris and Giles, 2003). Turner (1972) then stated that the misconception global governments had about the formation of informal settlements are that, these informal settlements were a result of poor people having too much control over housing themselves. This misconception was evident in the states refusal to endorse housing development policies that increase the households control over the choice of housing typology, among other choices. Additionally, Turner stated that the term housing can be used as a noun (meaning housing is a commodity) or as a verb (meaning the process or activity of housing). The latter advocates for states to allow poor people the freedom to build their own housing, make their own choices of where they choose to live, the materials with which they build must also be of their own choice, as well as the forms of tenure they prefer. Public housing had failed to align people's needs to the housing supplied institutionally and therefore, failed to provide for people's livelihood needs, and as a result people did not pay for the services provided for by public housing as they were unsatisfactory.

The World Bank in (1993) documented the evolution of its housing policies from the 1970s through to the 1990s, were the first decade of the Bank's housing policy mainly focused on 'sites-and-services' and informal settlement upgrading projects. Some of the first informal settlements upgrading projects were initiated in Senegal in 1972, which was seen by the Bank as a signal of the first fundamental shift in housing policy, from total public housing provision to public assistance in private housing construction. The Bank realised that in most developing countries the private sector was unable to develop housing units that were affordable to low-income groups and, the governments of these countries could not afford to build housing for these low-income groups. Therefore, the bank used the informal settlement upgrading approach as a practical solution to low-income housing development, because it had more affordable building standards and the provision of basic infrastructure services or core-housing units as opposed to the provision of completed dwelling units. Between 1972 and 1990, the World Bank was involved in 166 housing development projects of which informal settlement upgrading projects were a part of, in 55 countries. These projects yielded returns of between 19 and 22 percent for the bank

and were subsequently introduced to more developing countries globally. Nientied and Van der Linden (1985) state that in 1980-83, the World Bank approved housing development loans in 28 different countries, totalling US \$1778.9 million. A great portion of the loan has been and is still being used up mainly by sites and-services, informal settlement upgrading and integrated urban development projects.

The 1990s were marked with continued criticism of the structural adjustment housing programmes globally, and in developing countries poverty and inequality were on the increase. The World Bank, during this period, entered the second stage of the market enablement approach to housing development policy which led to the development of what was termed as, compensatory policies (Harris and Giles, 2003). Policies such as informal settlements upgrading were then used as a tool to alleviate the social costs associated with the World Bank's move towards endorsing market enablement, as a housing development approach driven by the World Bank. The market enablement approach to housing development adopted by the post-apartheid South African government continues to sustain global capitalism whilst poverty and inequality increase. The South African government had interpreted the World Bank policy of market enablement, by playing the role of 'supporter' of housing processes through its HWP of 1994 (where informal settlements had no defined intervention strategy) and the BNG Policy of 2004 (where informal settlements are upgraded using the Informal Settlements Upgrading Programme). The private sector, building contractors, are still involved in the delivery of South African informal settlement upgrading. However, the municipalities manage the implementation process of upgrading.

EThekweni municipality has a great array of policies aimed for the informal settlements upgrading programmes, such as the in-situ upgrading, although the policies are necessary, the implementation phase is more important. The difficult issue that happens in relation to project that involve the community in the upgrading process, is that people who live within the community end up not leading their development upgrade programmes, but instead being led by the state through a top-down model. This results to the people not always receiving exactly what they need as individuals or as a community. For example, the design stages or the physical planning process of the house is one sided only including a team of professionals from the government and the private sector, and has no inclusion from the beneficiaries (Bolnick, 2009). Bolnick argues that issues of bad spatial planning of neighbourhoods, and turnkey

projects limit the utilization of space. As a result, low cost houses, which are in any case assigned to the peripheries of the cities, are generally built as single storey freestanding dwellings separated by narrow corridors making the space between them non-usable without the consideration of new and innovative ways of construction.

3.7 International Case Study (Tanzania)

The research identifies the case study as the most ideal to test the precedence and analyse how the Moladi Construction Technology was applied in the construction of low-income housing in Tanzania. The features peculiar in the case study are the manner in which Tanzania used the method to tackle the challenge of the housing backlog, with making great strides toward reducing the housing deficit. Vicoba Moladi Housing Project is one of the notably successful housing projects that has utilised the MCT to provide for low-income housing. This case study of the use of innovative technology to provision for housing involved the collaboration of Moladi-Tanzania (the Tanzanian branch of the South African company) and Vicoba Microfinance and Development Company to deliver a total of 9,000 housing units to low-income earners through community based projects (Botes, 2012).

Lack of resources, insufficient funds, skills shortages, workflow control and waste are the key challenges to affordable housing. Moladi's technology addresses these issues and this is why this technology is considered as a valid alternative to the current building practice.

Part of Moladi's success lies in job creation within the communities it serves, by using and training the locally unemployed and in so doing, uplifting the community as a whole. Local entrepreneurs and building contractors receive Moladi training in the use of the formwork system, and subsequent technical support with ongoing on-site training (Botes, 2012).

The use of moladi construction technology has proven to tackle the housing challenge while allowing the community members to be involved on all level of the project.



Figure 3.6 Moladi on-site training for unskilled community labourers (Botes, 2010)



Figure 3.7 Assembling of light plastic framework (Botes, 2010)

3.8 Conclusion

This chapter provides the backdrop to the current housing challenges facing the country. To understand the scope of the challenge, it was necessary to examine the past and present housing policies as enacted by government. The primary challenges were identified in the literature review, and an alternative construction technology solution was proposed to combat this. However, the solutions have existed in the marketplace for some time, and due to specific challenges, they are struggling to gain large-scale adoption.

Chapter Four (4) Case Studies

4.1 Introduction

The chapter seeks to address and give an overview of the historical background of housing situation in the two selected case studies, namely Piesang River and Namibia Stop 8 (NS8), located in Inanda, in the outskirts of Durban. Both of the sites are within the Durban Metropolitan City. This is followed by contextual evidence/ information which respondent give the researcher during the encounters with the residents and those that are settled in the former informal now formal settlements in Piesang River as well as in NS8. Information gathered by the researcher will disclose the communities' current housing situation, the type of building/construction methods used in the housing project and their degree of involvement as the community in the construction of their houses. The chapter then goes on to outline the involvement of the community members in the in-situ housing upgrade of their settlements from informal to formal, the innovate methods that were used to achieve the these housing projects.

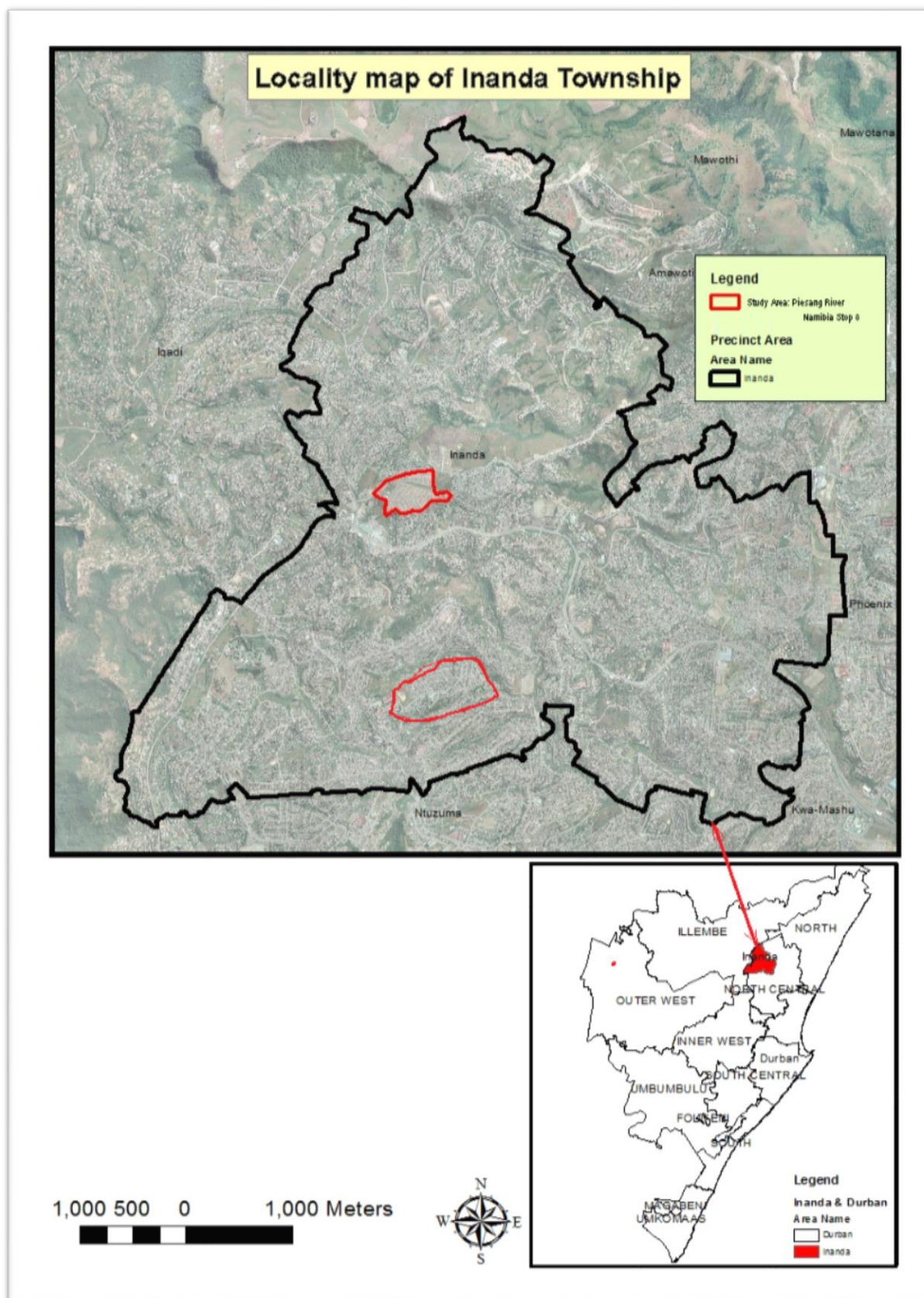
4.2. Location of Piesang River and Namibia Stop 8

4.2.1 Peisang River

Piesang River, also known as Soweto, is located in Inanda Township in Durban. Piesang River is 23 km away from Durban Central Business District (CBD), which falls within the North Central Substructure of the Durban Metropolitan Area in eThekweni Municipality. The settlement named after the geographical feature of a river stream that flows through the settlement, Piesang River (see map below, map 4.1).

4.2.2 Namibia Stop 8

Namibia Stop 8 is also located in Inanda, on the outskirts of Durban in KwaZulu-Natal, found 24 km in the inland north from Durban CBD. It is part of UMzinyathi under the umbrella of eThekweni in the greater Durban Metropolitan Municipality. Emtshebeni Phase 1 in the North, Congo in the East, Stop 8 in the South and Amatikwe in the West border of NS8 (see map below, map 4.1).



Map 4.1: Location Map of Case Studies Piesang River and NS8 (GIS, 2017)

4.3 Historical Background

The Piesang River land used to be a sugarcane farmer and now forms part of the Piesang River Development Trust. In 1980s, people invaded this area, putting up informal structure, seeing the birth of informal settlements. About 80% majority of Piesang River residents had been victims of evictions, while others came as tenants renting cottages (FedUP Profile, 2007). Between 1992 and 1999 government, community members, along with NGOs such as SDI and FedUP embarked on upgrading programme to formalise the dwellings to a formally recognized standard, prescribed in the NHBRC (FedUP Profile, 2007). This process of delivering housing to the people is still in the occurrence, as the people within the community who unfortunately did not benefit from the first phase are still working on seeing it becoming a reality.

Namibia Stop 8 came into existence in the early 1960s when people moved from rural areas into the city, hoping to find jobs. The settlement seen as to being in close proximity to several factories, allowed easy access to job opportunities. The community began to build permanent structures, as it became their adopted home. Many of the residents saw their move as a temporary measure, and they had planned to return to the rural areas. However, as the rural areas continued to decline as a viable place to live, whole families began to reside in Stop 8 (FedUP Profile, 2007).

The area was later incorporated into the five-year Housing Plan of Ethekwin Municipality. In 2005, preliminary studies prepare for a housing development for the whole area first took place, signalling the intention of the municipality to honour their promises and intention for the community. An enumeration proposed by FEDUP to determine the population of the area in relation to the land size, then had to place to have a clearer picture of how many households needed housing (FedUP Profile, 2007). Unfortunately, this never happened as the pre-feasibility studies done by the Municipality surpassed the whole process. Pre-planning and land appraisals were fast undertaken, whose results revealed that this specific piece of land could not accommodate the total number of households that existed within the project boundary. Hence, the project was then broken into two phases, phase one with 96 houses has been completed and handed over to the beneficiaries, while the second phase projected to start on the second quarter of the 2017 as the community said.

4.4 Housing situation

Information provided by residents in a preliminary study of both communities helped the researcher to establish the state at which the residents of the housing project stood currently in terms of the type houses and method of construction used for the housing. Most households were headed by single mothers, who constitute the of vulnerable population group within both communities, living in the conventional brick and mortar houses built by community members' in collaboration with uTshani Fund and FEDUP (See Figure 4.1 below). Piesang River houses were also subject to flooding in periods of heavy rains, especially those houses that were near the river. A combination of low incomes and high unemployment resulted in poor housing conditions for residents in the Piesang River area.

Namibia Stop 8, a greenfield project, which also involved uTshani Fund, the SDI Alliance and FEDUP who provided the support to facilitate the sourcing of the finance for the construction. All these organisations, along with community pulled in their efforts and knowledge in achieving the housing upgrading. The first phase of the project involved 96 houses through the People's Housing Programme (PHP) method centred on a community-driven participatory approach, allowing them to realize their ideas come to life (SA SDI Alliance, 2012). This collaborative approach managed to deliver significantly larger conventional brick and mortar (52m²) houses (see figure 4.2 below), better in quality and bigger than those built under the RDP model by the government implemented by the eThekweni municipality that only constructed (40m²) houses.

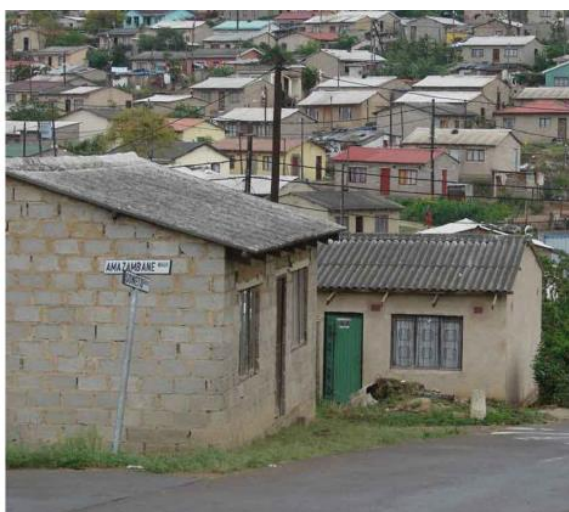


Figure 4.1 Housing built in Piesang River Figure 4.2 Housing built in NS8 (Author, 2016)

4.5 Background of Piesang River

The Piesang River Settlement, near the township of Inanda derived its name from the river on the banks of which the settlement developed. In the 1960s, an unofficial land sale took place between an Indian vegetable farmer and an African individual who then subdivided and allocated land to other African households in return for payment. This action followed by the gradual uncontrolled settling on adjacent portions of the land throughout the 1970s. As the demand for housing increased in the 1980s, a new residential trend emerged with the so-called 'train houses'. The residential densities increased due to one-room units packed and jumbled up against one another. This resulted in the densified settlement despite the steep slopes, leading to dwellings being close together with no private open space or yard surrounding the individual homes. Another factor was that people migrated from the adjacent rural areas under Amakhosi with a view to come closer to job opportunities (Huchzermeyer, 2004).

In 1992 the Durban City Council made available the sum of R18 million to upgrade the infrastructure of the area through the then minister of housing Joe Slovo. This due to the fact that most of the people living in the invaded area wish of moving, because the bond they grown to have with the place. Hence, part of the money contributed toward the land acquisition, while the rest towards the construction of the houses. With the help of the Federation of the Urban Poor (FEDUP) to construct the houses with community's involvement, through the community participation initiative to help empower the people in the decision of their housing (Huchzermeyer, 2004).

4.5 Socio-economic status of residents in Piesang River

The Inanda unemployment rate stands at 42%, with 80.2% of households earning below R19200/year (R1600/month) (Department of Provincial & Local Government, 2012). A rough estimation of highest level of education for most people in the community would be between grades 10 and 12, but although many had secondary education very few had gone on to tertiary institutions, for a variety of reasons. Young people in this community are highly affected by crime, early pregnancy and drug abuse but those who do survive past grade 12 continue with their tertiary education at Langeni College, which is in Ntuzuma Township, 15 minutes' drive from Piesang River and 25 minutes from NS8. While, those that are fortunate to get tertiary funding from government get the opportunity to Study at DUT and MUT within Durban (Sibiya, 2001).

4.6 Utshani Fund (NGO)'s in the upgrading of housing

After receiving funding of R10 million in Piesang River from former Minister of Housing the late Joe Slovo, the uTshani Fund was established to control the administration and funds of the federation (FedUP Profile, 2007). The uTshani Fund was a resource that enabled the federation to support house construction through a process of pre-financing, in which uTshani made a loan of R15000 to assist a member in building a house through sweat equity, which the beneficiary later repaid to allow for replication of the process. In 1997, the process was changed because beneficiaries were failing to repay the loans; instead government switched to paying the loan funds to the uTshani Fund after the beneficiary was first approved by the Department of Housing (DoH) as qualifying for the subsidy. The process has been replicated in other settlements where uTshani Fund has been involved the upgrade of informal settlements, more recently in NS8. The communities have over and above been encouraged to embark on saving schemes that would eventual help towards the construction of their housing, through the forming of savings groups.

4.6.1 Saving towards building and housing incremental

Within NS8 and Piesang River, there are several organized savings groups (Sivukile, Siyaphambili, Sesiyesabona, Landless and Inenja Savings groups), signifying a range of interests. The largest and most prolific being Syaphambili, a savings group, which started in the early 1990s, this group mainly made up of an older population crowd from both communities. All the members of this group have since benefitted for the first phase of housing completed in 2013. These savings groups have three types of savings consisting of “*Nsukuzonke (Daily Savings)*”, “*Inqolobane (Granary Savings)*” and “*Housing Savings*”.

- **Nsukuzonke (Daily Savings):** With this sort of savings, individuals are required to make an everyday commitment as low as 50c. These savings regularly help the members of the savings group to have access to emergency loans when they required assistance. Individuals can tap on this subsidizing in the event that they encounter monetary issues. This sort of reserve funds designed mainly because the poor cannot bear to save money on week-by-week or month-to-month premise. The saver keeps the record of his/her contribution.

- **Inqolobane (Granary Savings):** This saving is towards larger production and enterprise loans. All individuals are anticipated that would partake in this program. Commitment is made on a month-to-month premise. These assets are utilized to bolster individual and gathering salary producing exercises/activities.

Housing Loans: These funds deposited in Utshani Fund account in the form of deposits for Utshani Housing Loans.

4.7 Construction of the houses

The researcher gathered that the members of both communities, themselves associated to the Federation constructed houses by using their little gained skills. In other words, the building of houses did not use outsourced labour or professionals to do the actual construction. As mentioned above, the Federation in NS8 and Piesang River is made up of savings groups affiliated to it. Within the savings groups the members divided themselves into manageable groups of four to 10 members. These members, built houses for each other with the pulled in labour. During the process of building the house, the Federation made available to the community members on-site a skilled builder who would offer assistance and gives on-site training, facilitating the development of those who had no skills to the semi-skilled members. The payment for the skilled builder pegged at R50 per day and taken deducted from the member's loan allocation whose house was being built at that given time. This provided a greatly powerful instrument with which to transfer skills and training amongst the previously disadvantaged. This approach the dream of bigger houses attainable through the numerous cost cutting strategies allowing them to fully stretch the limited loans given to them. This only proved to the researcher that teamwork through the pulling in of communities' efforts made a dream work and become a progressive process to deliver the houses.

4.8 Conclusion

This chapter highlighted most of the information discovered through the research initial stages of the study though the interaction with the community members of the both communities. This chapter started by presenting the location and geographical features of NS8 and Piesang River. The chapter then discussed the housing background on the type of construction methods that were implemented in the

construction of the houses. It also hinted on some of the innovate methods that have been used in the construction. Lastly, it focused on FedUP as a supporting the communities in upgrading NS8 and Piesang River settlements through the loans offered to them by the Federation. It also looked at the involvement of the community in the construction phases in NS8 and Piesang River using the PHP approach.

Chapter Five (5) Data analysis

5.1 Data Presentation and Analysis

This chapter of the study seeks to analyze the data collected. The primary data collected through semi-structured interviews, focus group interviews, formal and informal discussions and observations on conventional and alternative housing construction technology. Primary sources, which included interviews, conducted with the following eThekweni Municipality Officials, Utshani Fund members, Savings group members, community steering committee with those that have benefitted from the previous/completed housing project of “*Umfeladawonye*” and those community members (landless group) that are still yet to benefit from the following phases of the housing project. Lastly, an interview with an official from Moladi Construction Company, to get an in-depth understanding of the concept and the challenges they encounter to fully rollout their technology of building in the country.

The study has been carried out to assess the feasibility of the use of Moladi construction technology to assist in-situ upgrading in Informal settlements with the participation of the community members within the eThekweni Metropolitan area in Piesang River and Namibia Stop 8 (NS8). The responses of all the interviewees were recorded with their consent on the Dictaphone, organized, presented and analyzed in this chapter. The structure of the information collected helped the researcher to achieve the study's objectives, by presenting the data in themes derived from the study's objectives, main and subsidiary questions. Additionally, this chapter forms a basis for the final recommendations chapter, which makes suggestions on how the local and the national government can use alternative construction technology to deal with the grappling housing backlog and possible deliver housing of sound quality.

Qualitative results drawn from the interviews and focus group discussions are presented in this chapter. Therefore, the findings from the study have been categorized into ‘themes’ that are gathered from the answers provided in the individual interviews and focus groups by the participants. The developed themes were in relation to the questions explored for the study. These findings intend to provide an understanding of informal settlement upgrade housing situation, policy environment, pros and cons of the use of alternative construction technology, facilitators of and barriers to community participation, and the structure and process of future participation and possible consideration of moladi in the next phases of the housing

project in the eThekwin metro. However, throughout the chapter, quotes from participants play a vital role to illustrate *key thematic areas* and conceptualizations of problems and prospects to address the research questions.

5.1.1 Demographic representation of informants in the case studies

Gender	Interval	Percentage
Female	34	77%
Male	11	33%
Total	45	100%

Table 5.1 Respondents demographics

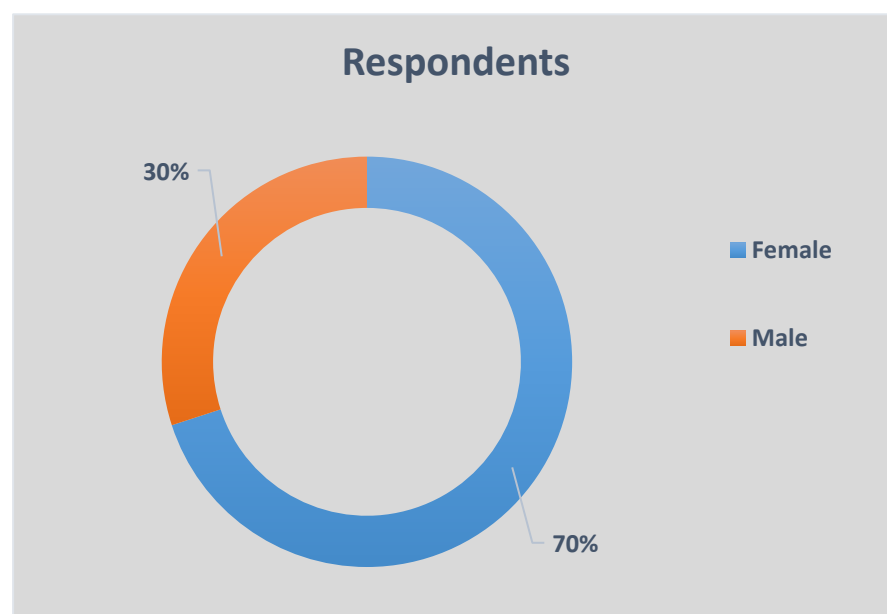


Figure 5.1 Sample demographics

5.1.1.1

Section 1: Respondent Profile

This first section of the survey intended to acquire the socio-demographics and financial profile of the respondent. This data gave a vital foundation to the populace mean, and additionally the connection to the respondent's inclinations/preferences.

Figure 5.2 shows the respondents' age. The bulk of the people within the sample are adult most in their mid-30s to above the age of 45, with 62.2% of the population encapsulated in this category.

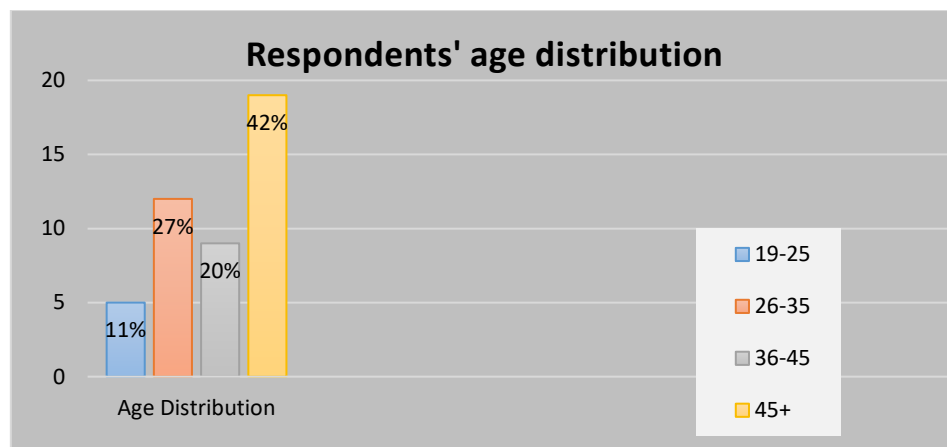


Figure 5.2 Age Distribution

Figure 5.3 shows the 45 respondents' marital status. A substantial amount of people within the interviewed are either living together (cohabitating) or single (single mothers), with a low rate of marriages within the older crop of the respondents.

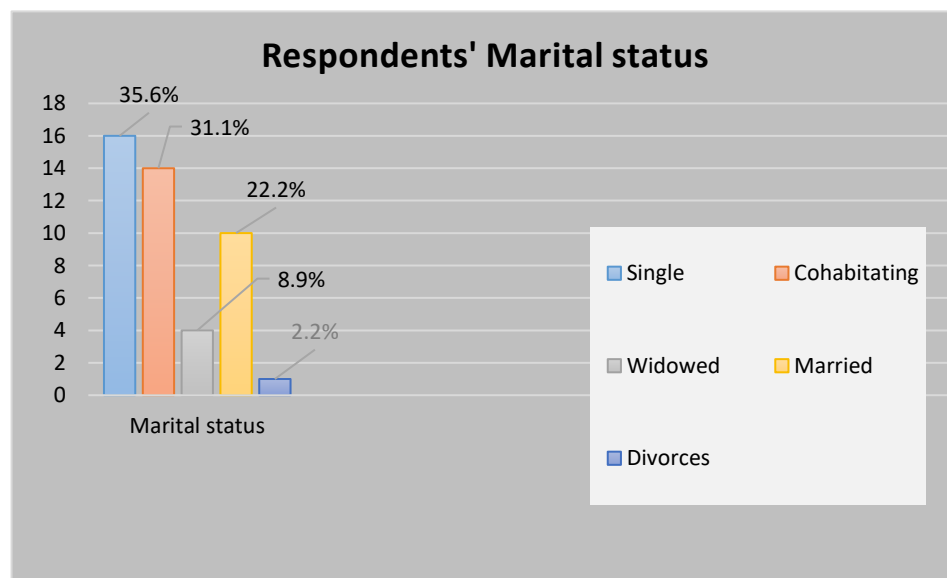


Figure 5.3 Marital Status of respondents from both case studies

Table 5.2 and 5.3 shows the distribution of additional people making up the household within a single housing unit. It is extremely worrying to note that amongst those respondents that were interviewed three families had more than 10 people residing within a two-bedroom house.

Children per household	No. of households	% percentage
0	2	4.4
1	6	13.3
2	9	20
3	8	17.8
4	15	33.3
4+	5	11.1
Total	45	100

Table 5.2 Number of children in a household

Children per household	No. of households	% percentage
1	17	37.7
2	9	20
3	8	17.8
4	5	11.1
4+	6	13.3
Total	45	100

Table 5.3 Number of adults in a household

5.1.2 Respondents Socio-economic status

The socio-economic outline of the interviewed respondents shows general status of the two communities' economic wellbeing, ranging from the rate of employment, values of income and lastly the level of education. All this, helped the researcher have a better understanding of the profile of both communities.

Table 5.4 shows the level education of the respondents, with a startling 11.1% having not gained any proper education, whereas 46.7% amongst the interviewed respondent

highlighted having obtained matric, but faced the lack of finance to continue with the tertiary education.

Education level	No. of respondent	Percent (%)
No schooling	5	11.1%
Primary	9	20%
High School (Gr.10)	8	17.8%
Matric (Gr.12)	21	46.7%
Tertiary	2	4.4%
Total	45	100.0

Table 5.4 Rate of education in both communities

Table 5.5 shows the work status of the people living in Piesang River and NS8. As expected, a majority is unemployed and have to make use of grants to sustain their families while other are seasonal workers depending of the availability of work.

Status of Occupation	No. of respondent	Percent (%)
No employment	25	55.5%
Fully employed	10	22.2%
Part-time Employed	10	22.2%
Total	45	100.0

Table 5.5 Respondents work status.

Table 5.6 shows that within the both communities put together an average of 84.9% qualify for the housing subsidy, with a monthly income of less than R3 500. This is expected; as a low-income drives people towards informal settlements, hence the government is somewhat obligated to assist its people through the subsidy.

Level of income (monthly)	No. of respondents	Percentage (%)
0 - R800	19	42.2%
R8 00 - R3 500	18	40.0%
R3 500 - R5 000	4	8.9%
R5 000 - R6 500	2	4.4%

6500+	1	2.2%
Total	45	100

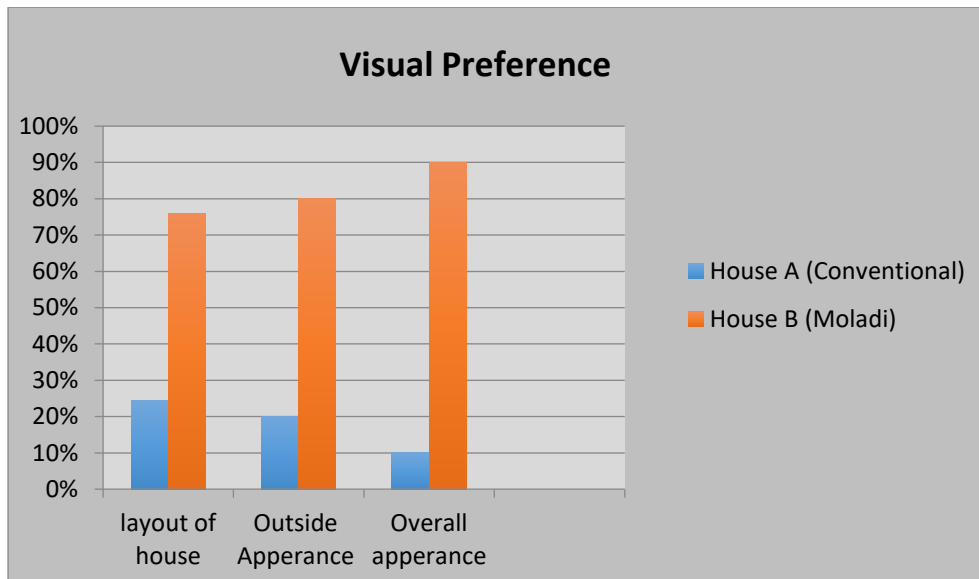
Table 5.6: Income level of the communities

5.1.2.1 Section 2: Opinion of Moladi housing vs brick and mortar Housing

The second section of the survey focused on the perceptions of residents on conventional and alternative (specifically Moladi technique) building methods. A progression of photos of the experiment Moladi House and the control case customary (brick and mortar) house were shown to the respondents. These photos represent the most common type of low-income housing found in the market. The respondents then picked which photo from the two solutions fulfilled their social needs. The photos that were utilized as a part of this question are given in (Appendix A page 106). The respondents were permitted to answer either for House A (the conventional house), for House B (the Moladi house), for both or for none. The main arrangement of inquiries identifies with the inside and outside appearance of the house. They obtained the visual inclinations of the respondent, and were as per the following:

1. Preference on Home layout (on how the rooms were layed out);
2. Preference on the outside appearance (the house structure, finish asthetics);
3. Preference on the overall house.

Figure 5.4 demonstrates the outcomes acquired from the respondents. The appropriate responses given by the respondents demonstrate a solid preference for the Moladi technique instead of the conventional house. This was mainly because the end product of the moladi housing was more aesthetical pleasing more than that of the conventional housing. This helped the researcher understand better that if the beneficiaries could not tell difference on which one of the houses utilized the alternative technique, it was easy to convince them to choose the alternative route without any persuasion based on the visuals.



Section 3: Opinion of Moladi versus Conventional with Precise data.

The last section of the survey explored whether the respondent based his/her preferences essentially on the physical qualities of the home, or on the visual appearance. In the wake of providing the respondent with a data sheet, that gives the genuine characteristics of the two housing solutions (with pros and cons of both building solutions).

5.1.2.2 Visual Preference (given Perfect Information)

Concerning the visual appearance section, the respondent had a second chance to decide whether he preferred the Moladi or conventional solution. The question was asked as: "Which house is the best looking?"

According to the results, 45 people interviewed, changed their mind from their previous results, with 26 people deciding that the Moladi house looked better, while 19 decided that the conventional solution looked better. The respondents stated that:

1. the moladi had a beeter finish that the convetional on;
2. had a better floor layout;
3. and looked more durable than the conventional one

5.2 Results and Findings

5.2.1 The current condition of housing

All respondent shared the same feeling with the type and the situation at which the housing was at in both settlements; this was partly because both settlements used the same delivery process of the PHP approach. 90% (as shown below) of the respondents from the savings groups focus interviews echoed their satisfaction with the end product that was delivered as it has brought a lot of change to their lives compared to the previous informal setup. While 10% felt their housing was better in structure but small in size compared to that which they owned in the informal settlement set up. This mainly due to the fact that the formalized allocation of land, subsidy allocation had to be uniform for all the beneficiaries and was not too flexible to the needs of individual households. 10% of the respondents out of the 45 residents interviewed, felt that not all the promised and envisioned housing specs delivered in the end; one respondent brought up the issue of the housing finish as one of the issues that were not really dealt justice with to their satisfaction.

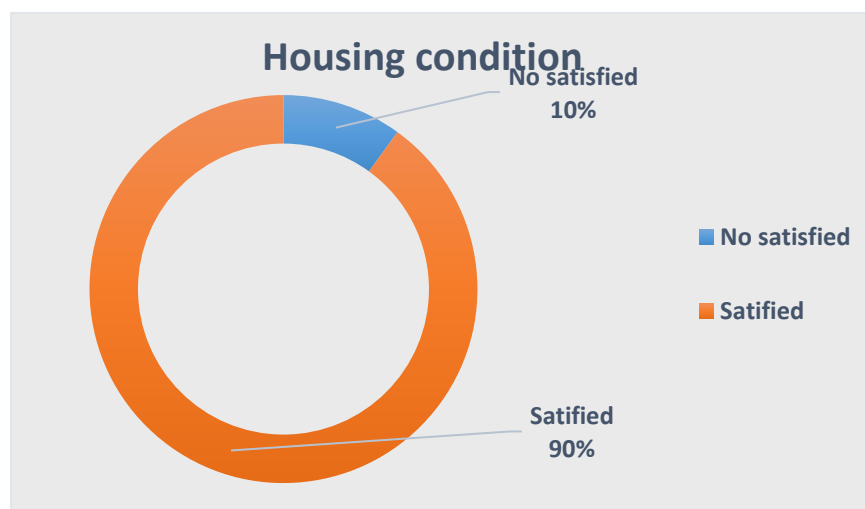


Figure 5.4 Beneficiaries satisfaction of Housing

In both settlements (NS8 and Piesang), all the residents interviewed expressed their satisfaction with the size of their houses, which in comparison were bigger as to those delivered by the municipality. The beneficiaries also stated that to this extent their houses allowed much bigger families to accommodate them. This was further affirmed by the members of the Namibia Stop 8 steering committee and the community construction management team (CCMT), that the houses that were constructed provided 50 square meter compared to the 40 square meter houses delivered by the municipality. They highlighted that the reason the community managed to achieve was due to the involvement of the community in the construction phases cutting down the construction cost giving allowance for the construction of bigger houses. The houses were all four-room houses and the plan was the same. The beneficiaries designed their own various housing plans and submitted them to the Housing Office, although this was evident in Piesang River rather than NS8 where the design was a replication of the precedent SDI housing projects decided by all the recipients of the housing projects. They said that they all agreed upon four-room design plan because it was a big house with privacy. The pictures below show diverse designs that submitted by the beneficiaries to the housing office as well as uTshani Fund prior to the commencement of the project. They chose four-room house. These designs were kept in the Piesang Housing Office to bring back memories of what they had been dreaming about for a long time.



Figure 5(a): Housing models built by the residents (Sibiya, 2002)



Figure 5.6 Complete houses built by the FEDUP
Source: (researcher)



Figure 5.5 Housing models built by residents from Piesang River Source: (Khumalo, 2013)

5.2.2 The use of alternative technology in the construction

In the focus group meeting with the steering committee, Community Construction Management Team (CCMT) and savings group, the respondents were asked if there used any form of alternative technology or material in the construction of the housing in the phases that had been completed. Most of the respondents from NS8 and Piesang River agree that there was not used any alternative building technology in the construction of the houses in the first phases. Some residents from Piesang River made mention of the use of alternative materials in place of the conventional ones. These mainly concerned the changes on the roofing. Interestingly enough, other members, within the communities living in Piesang river, alluded to the fact that the federation once tried to maximize the limited land that they had by constructing double storey houses (as shown below on the picture fig. 5.5), though the recipients of the mentioned houses highlighted that they were highly unsatisfied with the delivered product. They felt that there was not enough consultation with them when this decision was taken to actually go the double story route. They feel that there should have been a showcase house for them to view and see if they would have appreciated it to be used as an option over the single standing house.

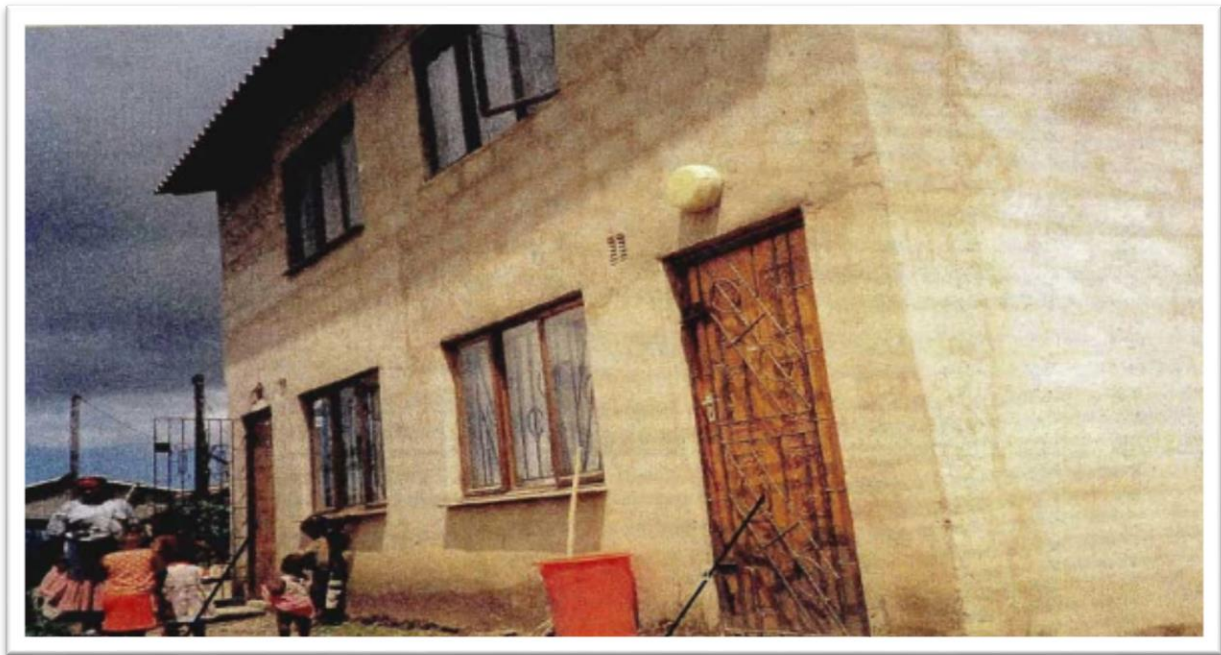


Figure 5.7 Double storey houses built in Piesang River (Sibuya, 2002)

The conventional construction method of brick and mortar that was utilized consisted of standard concrete blocks, fibrocement, wooden-door and window frames. Although residents from Piesang River highlighted that, the major problem with material was that certain elements such as windows, plastering and services were excluded from the residual material costs, of which the houses were left incomplete. 10% of the interviewed people were not concerned about the types of the building materials and the incompleteness of their houses.

5.2.3 Community opinion on Alternative Construction Technology (ACT) for Housing Solutions

Despite the fact that there have been numerous alternative options for housing designs proposed as showcase houses by various associations and organizations advocating for its use in low-income housing in South Africa, there is still little to limited use of alternative methods. The take-up of such options has not advanced to implementation on wide scale to help ease the nagging housing delivery issues. To this extent, out of all the low-income housing built and delivered to date in South Africa, only 0.68% has been built since 1994 using alternative construction methods and technology. Hence, the aggregate of low-cost alternative housing projects in South Africa delineates this circumstance. Negative recognitions that possible beneficiaries have about new building technology advancements adds to this sector's exclusion,

and community input has shown this to be a widespread problem (Department of Human Settlements, 2010).

5.2.2 Community participation in the construction

Information gathered from beneficiaries, leads one to assess that participation, at both settlements, is reaching the stage where it constitutes a degree of genuine citizen power. The communities' participation in the construction activities (planning, management, building, etc...) gives them an opportunity to gain valuable skills in self-reliance, and the knowledge and skills they acquire to contribute positively to their growth and empowerment. Evaluating their involvement, some respondents said that when they joined the organization (FEDUP) they did not have any knowledge on building a house, but on-going participation in the group had taught them the fundamentals of housing construction; therefore, they feel empowered on that regard.

This allows for greater community participation and as more than 90% of the construction team on a Moladi housing site consists of unskilled laborers, who are trained locally by a Moladi supervisor over a period of 2-3 weeks in order to transfer the required skills and knowledge to complete the entire construction process (Botes, 2016).

The training period is brief, yet allows for a high standard of proficiency, as the Moladi construction method centered on the objective to allow for an unskilled team of people to follow Moladi's optimized, repetitive and sequential processes that eliminates the probability of any errors occurring. These are crucial for the outcome of the structural quality or integrity of a Moladi housing unit. Yet, another developmental milestone is that women, who have traditionally been either reluctant or discouraged from working within the male-dominated sector, are encouraged to participate in the non-labor intensive Moladi building process, with a considerable number of households being headed by women in both communities, this will be an added advantage.

5.3 Cost-benefit analysis

5.3.1 Conventional construction

After all, analyses of the cost that go into the construction of the low-cost housing, through the government subsidy quantum of ZAR110.000, the cost were broken down as illustrated on the graph, figure 5.6 below.

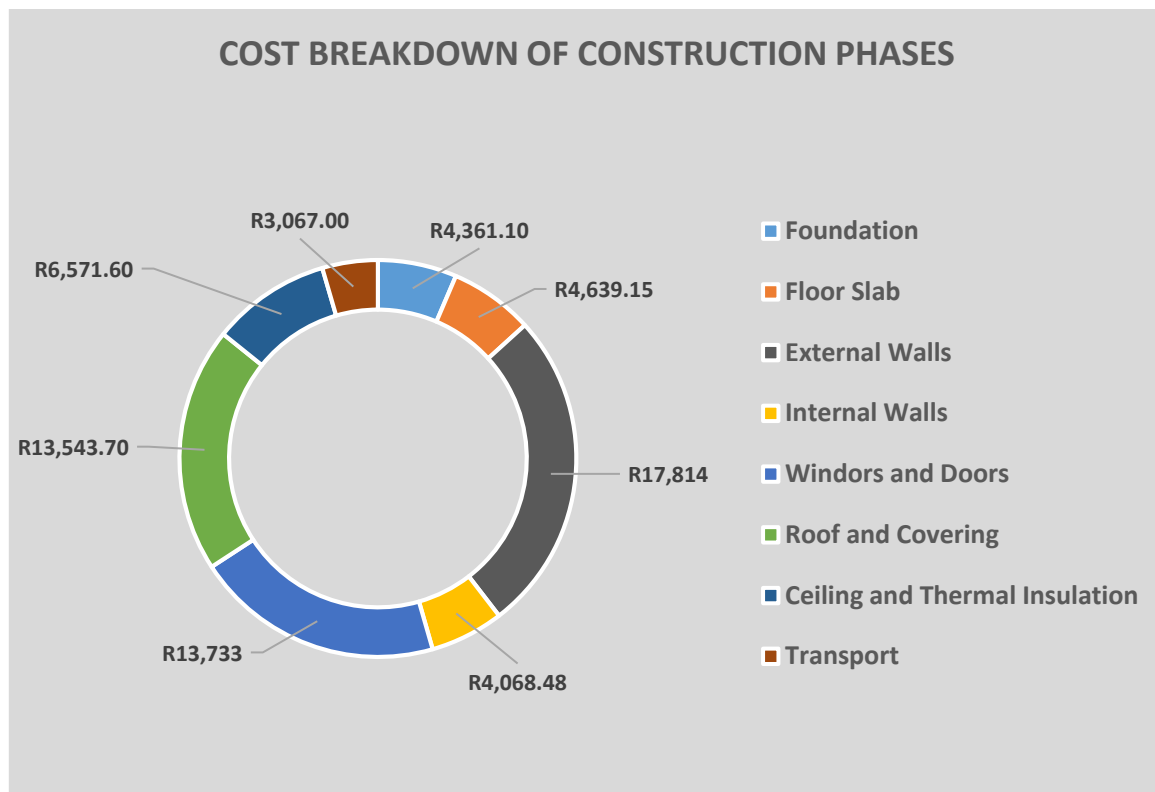


Figure 5.8a Graph showing cost of construct for a conventional house

Comparing the traditional methods to the moladi construction technology, it proves to be less in production cost, as it uses cheaper construction methods allowing for a 30% saving on the total cost of construction of the house. This substantial saving attributed to the fact that most of the money is saved on the installation of the eternal and interior walls on a Moladi house, which only require the poring of the concrete mixture eliminating the bricks normally used. Hence, if the Moladi construction technology is adopted and implemented at a larger scale, this will in turn allow communities will be able to construct bigger houses than the normal government conventional houses.

One of the officials from the moladi company even elaborate that savings on the total construction are also achieved throught the following factors that allow for cost effective, holistic design and building technology, that far outweighs many of today's retrofit schemes designed to:

1. strengthen existing poorly designed structures by demonstrating the use of moladi as opposed to costly solid concrete-block, masonry structures
2. eliminating waste

3. reduce theft
4. use of community members in the construction rather than expensive professions.

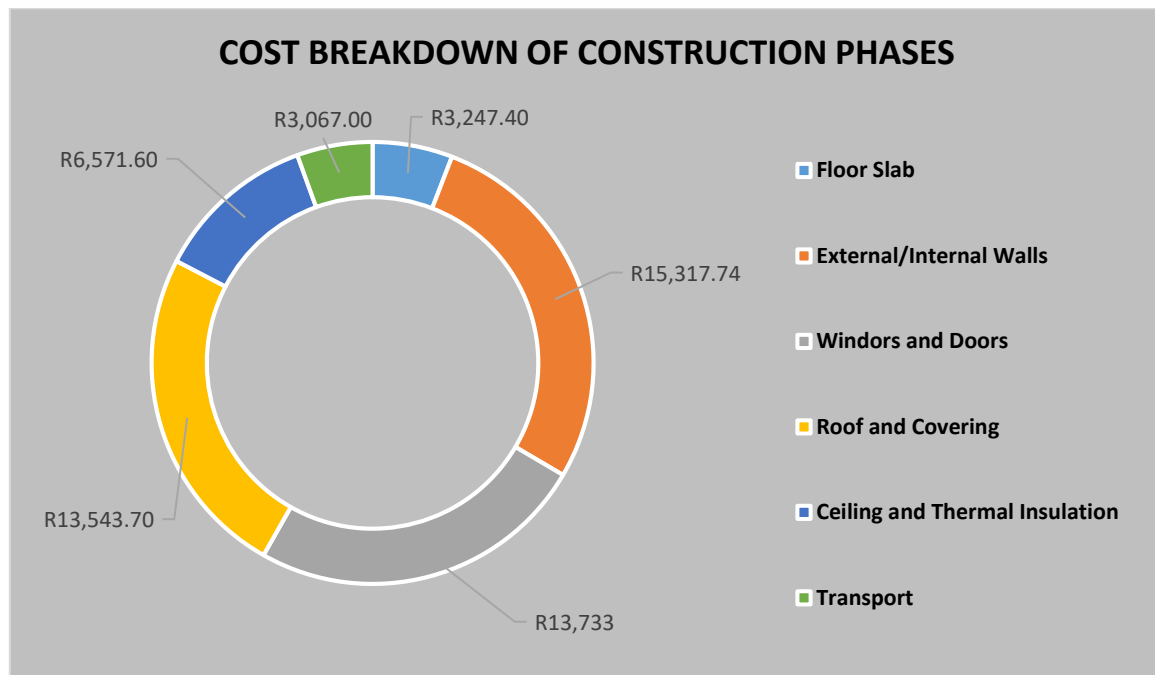


Figure 5.8b Graph showing cost of construct for a Moladi house

5.4 Comparison of Construction Time

5.4.1 Conventional Construction of a house

The Department of Human Settlements, along with a number of companies mention that the normal time on average for building a conventional house varies between 25 to 30 days when calculated at the end or completion of a housing project (Department of Human Settlements, 2010; Hart, 2013).

The estimated path of activities for construction of a conventional government subsidised house is as shown below on the Chart:

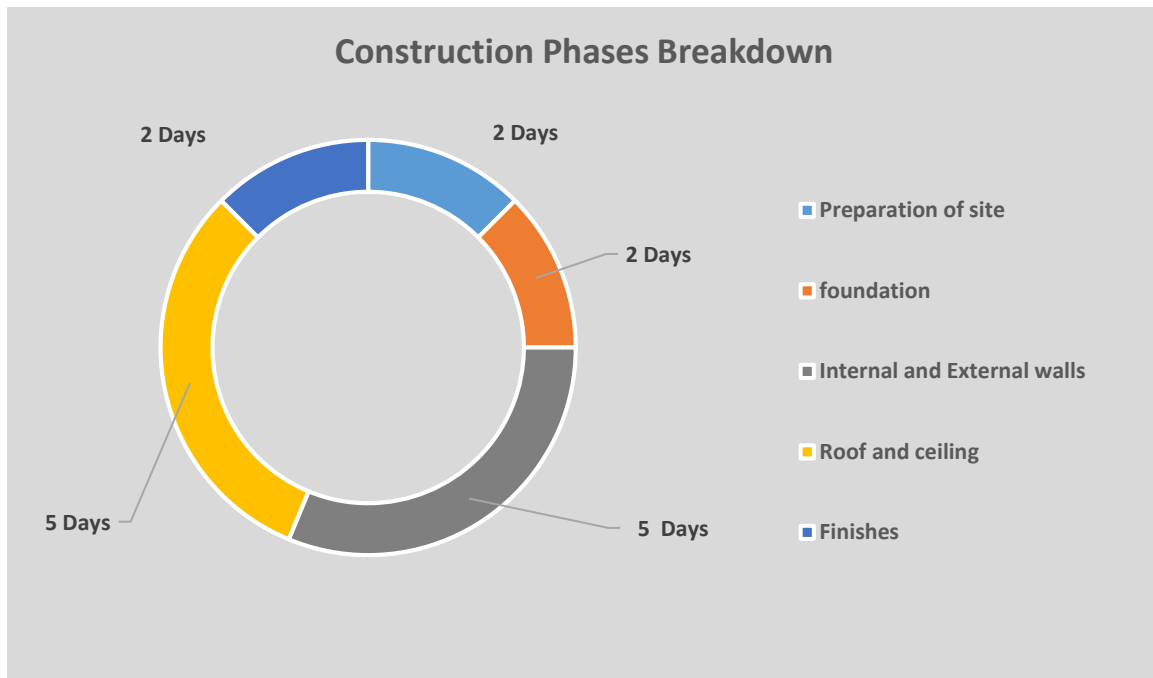
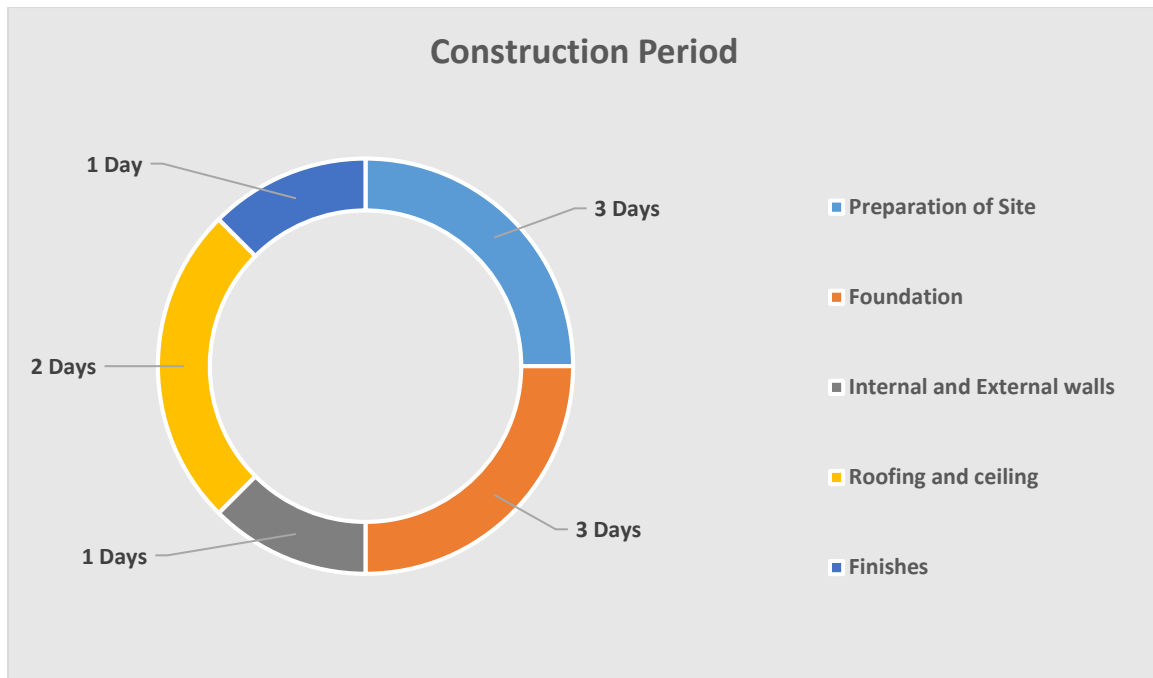


Figure 5.10 Graph showing time it takes to construct a conventional house

Therefore, the total estimated completion time is **16 days per home**, whereas that of alternative construction.

5.5 Alternative (Moladi) construction of house

The manager of the Moladi construction company stated, on a telephonic interview with the researcher, that the Moladi technology can build house sizes ranging between 52 and 80 square metres in approximately **10 days** from the laying of the foundation to revoke. This building is a method that is believed to be stronger and more stable than ordinary brickwork. The graph below fully illustrates the number of day it takes to construct a Moladi house.



Thus, an estimation of 10 days is required to construct a moladi house.

Similarly, time savings have been reported in one of the case studies mentioned in Chapter 3, in Tanzania in the Vicoba Moladi Housing Project, where 9,000 housing units for low-income households have been built through community based projects (Botes, 2012). When compared to conventional housing, constructed using brick and mortar, it is evident that there is savings on construction time with the use of moladi technology of up to a third of 30days projected for a single house constructed with the conventional method. The reason for this being:

- There is no use of bricks, but only the pouring of concrete is required which does not take more than a day to be complete.
- The already installed windows and doors before the walls are poured in to the formwork, also cut down on the construction times of the house.

5.6 Negative Perception of Alternative Housing Solutions

Negative perceptions that prospective homeowners have about new building materials and technologies contribute to this sector's exclusion, and community input has shown this to be a widespread problem (Department of Human Settlements, 2010). Thus, the underestimation of the complex relationship between society and housing in the alternative low-cost housing sector, is evident. This is reinforced by the disinterest of the government to fully move towards the use of alternative construction technology as mentioned by the eThekweni municipal officials.

All the respondents from both settlements seemed sceptical about the use of alternative construction technologies, due it being a method that is not been used for them to make a solid reference of, compared to the brick and motar houses. Therefore, the commnity memebbers believed alternative housing was not more durable than a conventionally built house, and from what they had experienced before the quality of the finished houses seemed compromised.

Thus, the unfamiliarity of alternative construction systems lead to scepticism against these technologies, due to inhabitants not understanding the full extent of what a new system entails. Beneficiaries view solutions, making use of alternative building technologies, as an inferior product, and thus believe they are devalued citizens by the state. This unfamiliarity is due to ineffective public participation and community feedback, as well as insufficient marketing of ACT homes, according to stakeholders involved the informal settlement upgrade (Freeman, 2016).

5.7 Conclusion

Conventional construction technology is presently used in most informal settlement low-income housing projects and comprising of concrete walls (brick and mortar), steel roof and steel and wooden doors and windows. Cost of Building tended to be lower, due to the type of materials, which were of shoddy quality, in turn comprising the standard of the product. Poor workmanship, corruption, tender fraud, lack of awareness, government policies that advance and see the improved use of alternative construction technology and bad management are the reasons for the backlog in the delivery of low-cost housing.

Alternative construction methods such as Moladi interlocking bricks will be suitable for sustainable low-cost housing in terms of cost, time and quality but it is difficult to determine the ultimate construction method as each has positive and negative attributes.

Chapter Six (6): Conclusions and recommendations

6.1 Introduction

Centred on the previous chapter of the data analysed, the subsequent conclusions put together serve to summarise the study and the recommendations are proposed.

6.2 Conclusions

South Africa's housing backlog continues to be a huge challenge for the government, the role-players in the built environment and the beneficiaries living in informal settlements owing to numerous, political, fiscal and societal issues. These issues prevent the effective supply of houses to people that are living in informal settlements. Yet, to address these challenges with a single solution has not come to the fore, since the democratisation of South Africa, and is assumed unlikely to meet the demand of the constantly increasing housing backlog.

This research study suggested that an alternative construction technology should be investigated instead, as it may prove to lessen some of the challenges confront the housing backlog in eThekweni and South Africa as a whole. The trend in **formwork moulded housing** is growing in other developing countries' such as Tanzania and Kenya, as the built environment provides a cost-effective solution of providing affordable housing to the low-income. Therefore, this study investigated the successful international and local projects that have utilised Moladi in the construction of low-income, and compared it with the conventional low-income subsidised houses, to assess the feasibility of the alternative technologies in the upgrade of informal settlements.

To compare the use of MCTs with CCT of the brick and mortar construction techniques, it seemed crucial to assess two important parameters empirically. In order to meet standard that is acceptable, the project must subscribe to economic and societal aspects, and therefore a decision to test the feasibility of this alternative technology method was taken according to these respective principles. The economic parameter summed up the cost, construction time of the houses. Whereas, the societal parameter investigated the opinion of several beneficiaries living in both communities, regarding the acceptance level of alternative construction technologies as compared to conventional brick and mortar homes.

The findings gathered for the economic parameter revealed that Moladi housing managed to save up to 25% of the money from the allocated government subsidy quantum of 110 000 ZAR than of the conventional housing beneficiaries the option to have slightly bigger housing as compared to that provided through conventional techniques. However, significant cost savings could be achieved if the community was involved in the construction processes, on a more hands on approach. The construction time of a moladi house is cut significantly by total amounting to 10 days less compared to the 30 days which is normally projected for the conventional technique, with the MCT solution taking a lesser amount of time to complete. Partly, due to the easy assemble and pouring in of the wall structural component of the containers that allows for the fast construction of the top structure of the house, and hence a tremendously fast erection time resulting in the early completion of the project as a whole. This will help in constructing more houses for the people in informal settlements, helping to curb the ever growing housing backlog. The quality of MCT housing versus conventional housing was difficult to investigate conclusively, as the design; type does not affect the end-product quality as much as the implemented quality control procedures. Secondly due to the constraint of not being able to get information from people who have benefited from the use MTC, partly because there has not been much success in fully implementing the technology in the country. Thus, it was decided to not investigate this parameter.

The findings gathered from the societal parameter that was used mainly on the beneficiaries of the houses helped determine the acceptance level of the construction method. It served to figure out if granted the option to choose between the conventional or the alternative house, which they would have selected to best fulfil their desired housing not deviating from the constraints of the budget. When the respondents were furnished with the detailed information sheet showing both techniques, mainly trying to showcase the better physical attributes that stood to be brought by the alternative building technology of the Moladi. When these two options were presented to the respondents, some of them seemed to be swayed on the moladi housing because of the physical attributes it came with, especially after learning that it would cost cheaper to construct and allowed them a leeway to building a slightly bigger house compared to the one built by the municipality. The respondents who still felt that the conventional house was a better route take than that of the moladi, due to

the cultural norms and housing preferences of the beneficiaries. The ideal house is described as a standalone unit on a small plot of land built of brick and mortar over a specified period to guarantee the quality of the end product. Interestingly, it was found that respondents would consider an MCT house if its visual appearance of the MCT house were implemented on a conventional house (namely flat finished walls instead of not plastered walls, concealed water and electricity installations etc.). Hence, the beneficiaries are likely to be persuaded into accepting alternative housing if enough marketing is done beforehand, if there are several other showcase houses of where MCT has been successfully used in housing projects and even to extent of building one MCT house in the community to display it, for them to be fully sold to the technology. This may also apply to all homes that utilise ACTs, and should be considered during conception for future ACT housing projects.

The findings on level of community participation on the housing project in both Piesang River and NS8 showed that community were empowered by the project because they were directly involved in various phases of the project implementation. The findings also showed that community not only influenced decision making in drawing plans, they also managed to build their own houses through the self-help approach. Hence, the researcher concludes that if this very same route of involving the community to have a say on the use of alternative technology in the construction of their house, it would probably gain the confidence of other community and see a huge roll out of the technique. This study gives endorsement to the implementation of the moladi or any other alternative technology. In fact, to be successful it is fundamental to apply a bottom up approach, where community participation plays a centre role in ensuring that the people have a say on what housing solution is used to build their houses, this helping them to gain a sense of pride and sense of ownership for their houses. Therefore, it will be feasible to use the MTC in the informal settlement in-situ upgrade for the following reasons. Firstly, because it allows for the reduction in cost and time in construction of the houses, hence allowing increased housing stock output. Secondly, the ease to seamlessly enabling the integration of the community members to be part and parcel in the construction of the houses, mainly attributed to the fact that it does not much technical understanding for one to implement. Hence, this method will be highly feasible.

6.3 Recommendations

In view of the above conclusions, the researcher would like to suggest the following recommendations. The findings show that the Moladi concepts can ideally help to offset the housing backlog in South Africa. In the two case studies, analysed, full community participation and co-production has been achieved and, through this method of delivery, if replicated by the government, should be able to deal with the housing backlog. Also, increasing the awareness of the use of alternative construction technologies, can eventually help to improve the speed and time at which low-income housing is delivered. Therefore:

- The government should support and introduce more non-profit organisation like 'FEDUP and Utshani Fund Initiative' which will provide advice, training for the community on how to provide housing for themselves by increase their understanding and the use of sustainable alternative building technology such as MCT.
- Develop and provide awareness training to manufacturers, general contractors and designers in the use of alternative construction technologies.
- Advancement of the production and application of alternative building and construction technology has to be sustained by a national scheme of incentives and governmental assistance, at least in the initial stages to gain the confidence of the beneficiaries.
- The quality of community participation that the study sought is the one that provided people with power of decision-making. If the government is to reach the balance between the needs of the users and what is delivered, then community participation should provide residents with choices amongst range of delivery options to choose from, than advancing one particular option and undermine the choices that the people may make.
- Municipality should allow for communities to have full control of their housing project, as they are the one who know what they need in the their communities. As the plights of the communities' differs from one community to another. Also by allowing for the process it allows those communities to gain skills from the experience allowing them to utilize the skills for economical participation.

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Annexure

Appendix A: Household Survey

Section 1: Profile of Respondent

Household Questionnaire

1. Age of house owner

	Year s
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2. Years of occupation

	Year s
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3. Marital status

Single	Married	Couple	Divorced	Widowed
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4. Number of people staying in the house

	Adults
	Kids

5. Educational level

Not educated	Primary school	High School	Matric	Tertiary
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6. Work status currently

Unemployed	Fully employed	Part-time employment
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7. Household monthly income

R0-R800	R800-R3500	R3500-R5000	R5000-R6500	R6500+
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8. Number of rooms in the house

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9. Any extensions of the allocated house

Yes	No
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10. Did you contribute to the construction of the house?

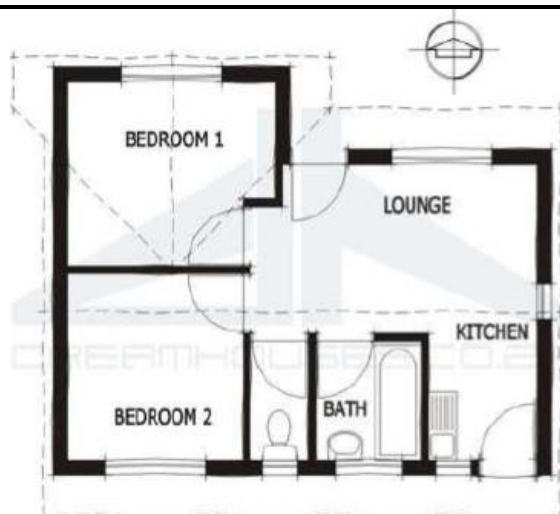
Yes	No
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Section 2: VISUAL OPINION

House A	House B
	
1. Which house do you choose and what are your reasons?	
House A	House B
	

2. Which house do you choose and what are your reasons?

House A	House B
---------	---------



3. Which house do you choose and what are your reasons?

House A	House B
---------	---------



4. Which house do you choose and what are your reasons?

House A	House B
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Section 2: PERCEPTION TEST WITH INFORMATION ON HOUSE

After explaining differences between House A and House B. THEN:

1. Which house is the best-looking?

House A	House B
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Why?

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2. In your opinion which house looks safe to stay in?

House A	House B
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Why?

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3. Would you stay in house B if you didn't know Alternative (Moladi) technology was?

	House B
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Appendix B: Focus Group Meetings

Interview Moladi officials

- 1) How long has this method of building been around and what were the reasons for starting this form of building?

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- 2) What is your take in the comparative difference between the Moladi building technology to that of the conventional way of constructing?

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- 3) What efforts have you put in place to try and get the Moladi building technology to be seen as another option that can be used to construct housing for low income earners?

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- a. Have you faced any challenges in doing so? Yes or No.

If yes, state the reasons

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- 4) What are the 'best available practices' of Moladi built housing in informal settlement upgrading projects?

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- 5) What do you think needs to be done for the environment to be more favourable to the Moladi building technology, and more so alternative building technology in the construction of low income housing?

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