



**The impact of the Integrated Residential Development Programme on
surrounding property values; Fleurhof, Johannesburg.**

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**A research report submitted to the Faculty of Engineering and the Built Environment,
University of the Witwatersrand, in partial fulfilment of the requirements for the
degree of Master of Science in Development Planning.**

Johannesburg, 2018

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 Science in Development Planning at the University of the Witwatersrand, Johannesburg. It has not been previously submitted for this purpose, or for any other degree or examination at any other university.

Nontokozo B. Mnisi

_____ Day of _____ (year) _____

Acknowledgements

Firstly, I would like to express my gratitude to my Lord and Saviour, Jesus Christ for the many blessings undeservingly bestowed upon me.

I would also like to thank my parents, ngibonge kakhulu boMvulane, for the constant support and always encouraging me throughout. And, to my sisters Lindelwa and Nompumelelo thank you for being my pillars of strength and always encouraging me to persevere.

And, I extend my thanks to my supervisors Professor Aly Karam and Prisca Simbanegavi for the role they played in making this work possible. The insightful inputs, comments and guidance have contributed immensely to quality of this work.

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Acronyms

ANC: African National Congress

BNG: Breaking New Ground

CBD: Central Business District

CoJ: City of Johannesburg

FLISP: Finance Linked Individual Subsidy Programme

FNB: First National Bank

GPF: Gauteng Partnership Fund

HPM: Hedonic Price Model

IDP: Integrated Development Plan

IHS: International Housing Solutions

IRDP: Integrated Residential Development Programme

MDGs: Millennium Development Goals

MRA: Multiple Regression Analysis

NDoHS: National Department of Human Settlements

NIMBY: Not in My Backyard

OLS: Ordinary Least Squares

RDP: Reconstruction Development Programme

SHRA: Social Housing Regulatory Authority

SHS: Sustainable Human Settlements

UN: United Nations

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Abstract

South Africa is challenged with an increased backlog of adequate subsidised affordable housing in well-located areas that provide access to urban amenities and places of employment. However, the perception of subsidised affordable housing developments built in close proximity to bonded properties is significantly negative (Edmiston, 2011). Although, many countries including South Africa have a great need for subsidised affordable housing many a time honoured property owners fear that such developments located in close proximity to their homes may decrease their property's value and their neighbourhoods will lose their unique personality (*ibid*, 2011). Questions continually arise about whether the sales and prices of their mortgage bonded properties are going to be affected by the close locality of subsidised affordable housing developments (Nguyen, 2005).

Property value is significantly important as rising values in a neighbourhood suggests that the neighbourhood is moving in positive direction, therefore increasing the attractiveness of that neighbourhood to potential buyers. A high property value on one's property acts as a measure of the quality of life they which is essentially difficult to assess numerically as this value reflects the types of amenities neighbourhoods are able to provide (McArthur and McArthur, undated). Location theory states that the more accessible or attractive a location is, the greater its profit potential and therefore its property value (Jordaan, Drost and Makgata, 2004). However, the relationship between subsidised affordable housing and the property value of mortgage bonded properties is multifaceted. As neighbourhoods are different and are characterised by their complex interrelated attributes which together determine the neighbourhood's character (Nguyen, 2005).

This study seeks to assess whether subsidised affordable housing provided through South Africa's Integrated Residential Development Programme (IRDP) looking at the case study of the housing development of Fleurhof located in Johannesburg impacts the property value of neighbouring bonded properties. The study considers the study area of Fleurhof as it was developed using IRDP and is located in close proximity to bonded properties. This study will use a quantitative methodology, employing the hedonic price modelling analysis. This model is used as it considers all the characteristics of a property from its physical attributes to the locational amenities that are located in proximity to each property and the characteristics found in the neighbourhood to which the property is located which in turn are reflected in the property's price (Barton and Madsen, undated).

Chapter 1:

Introduction – Background Statement to the Study

1.1. Background of the Study

Section 26 of the Constitution of the Republic of South Africa, 1996 (the Constitution), states that everyone has the right to access adequate housing. It is the responsibility of the National Department of Human Settlements (NDoHS) to ensure that this right is honoured and adhered to. The housing issue in South Africa has posed a great challenge to the post-apartheid government. The country's ever-increasing population growth and a limited supply of land has resulted in a decline in the delivery of subsidised affordable housing by an estimated 25% over the last five years as stated by Sisulu (2016).

South African municipal governments have adopted a variety of programmes in order to provide subsidised affordable housing to its residents. One of these housing delivery programmes that have been implemented to counter this backlog is the Integrated Residential Development Programme (IRDP). This programme aims to locate subsidised affordable housing in well-located areas which provides convenient access to urban amenities, including for example places of employment (NDoH, 2010). The emphasis of this programme is that it encourages a movement towards the mixing or integrating of communities of different socio-economic backgrounds. Advocates of integrated housing developments have an adverse reaction to the concentration of low-cost housing located on the periphery as it concentrates poverty and further residents miss opportunities by living on the outskirts of urban areas (Braun and Duffley, undated).

However, Braun and Duffley (undated), claim that property owners particularly Not in My backyard (NIMBY) homeowners see the development of subsidised affordable housing in their neighbourhoods as an invasion of unwanted residents into their communities that aim to undermine their quality of life, security and specifically their property values. It is common belief that the locality and closeness of subsidised affordable housing to bonded properties will automatically decrease a property's value. Property values are a complex phenomenon (Habitat for Humanity, 2013). The belief that subsidised affordable housing will decrease the value of other households in its proximity is based on the idea that subsidised affordable housing will be unattractive, poorly maintained and managed properties, which will also in turn, increase traffic and the level of crime in an area (*ibid*, 2013).

1.2. Problem Statement

“Not in My Backyard” complainants or commonly referred to as NIMBY is one of the main issues that arise from attempts to build subsidised affordable housing developments in well-located areas. Questions by bonded property home owners continually arise about whether or not the sales and the prices of bonded properties are affected when there is subsidised affordable housing located in close proximity to their properties (Sally and Tighe, 2015). Time-honoured residents in an area, specifically property owners, are always on guard for any possible changes that may occur in their neighbourhoods or neighbouring land uses which may impact their property values (Sally and Tighe, 2015). Many studies have found that subsidised affordable housing has neither long-term nor short-term negative impact on surrounding property values, however there have been other studies have which indicate that there is a negative impact (Cummings and Landis, 1993). In reality many local communities still believe it is a fallacy that subsidised affordable housing decreases property value (Nguyen, 2005). In many instances, the primary goals of a homeowner are to protect and/or to grow their property values. Thus, homeowners may be in opposition to the development of subsidised affordable housing. In many parts of the world, South Africa included, if one has the economic means odds are one is likely to move to nicer and better-looking neighbourhoods where NIMBY concerns exist (Sally, 2012).

In an effort to economically integrate housing developments, Gauteng Province has undertaken more integrated residential developments. Such developments are to cater for individuals across class, social and racial lines (Dlamini, 2012). According to Dlamini (2012, unpaginated), Mokonyane stated that “In Gauteng, we pride ourselves in the development of integrated housing systems where mixed housing projects are accelerated, as through the programme different income groups are catered for”. Some of the subsidised affordable housing developments in Gauteng which are provided as mixed-income housing developments or integrated residential developments include:

Housing Development Name	Locality	Development Commencement Date	Completion Level of the Development	Number of Units and Housing Type
Riverside View	Fourways, City of Johannesburg	Commenced early 2015	To be completed	Estimated 11 046 housing units
Lufhereng	Soweto, City of Johannesburg	Commenced August 2010	To be completed	Estimated 21 556 housing units including fully subsidised BNG housing, social housing and bonded properties
Leratong City	Leratong, Mogale City	Commenced June 2016	To be completed	Estimated 15 000 housing units including fully subsidised BNG housing, Social Housing and bonded properties
Cosmo City	Roodepoort, City of Johannesburg	Commenced late 2004	Completed	12 000 housing units with mixed typologies from fully subsidised BNG housing to bonded properties
Fleurhof	Randburg, City of Johannesburg	Commenced early 2011	To be completed	Estimated 10 411 housing units including fully subsidised BNG housing, Social Housing and bonded properties

Figure 1: Integrated Residential Developments in located around Gauteng Province (Source: DoH, 2017)

1.3. Research Aims and Objectives

The aim of this research is to analyse the impact of locating subsidised affordable housing provided through the IRDP by looking at the case of the integrated residential development of Fleurhof which is located in close proximity to bonded properties. This study also aims to aid planning policy and policymakers by shedding light on the specific circumstances of each neighbourhood under which the development of subsidised affordable housing would impact bonded property values. Additionally, this research aims to reveal the extent of the impact of the subsidised affordable housing development on bonded properties.

The objectives of this study include:

- to assess whether subsidised affordable housing has an impact on the property prices of bonded properties; and
- to uncover, to what extent does the integrated residential development affect property prices.

1.4. Research Question

How does subsidised affordable housing affect the value of its neighbouring bonded properties?

This question begins to interrogate the impact of the development of subsidised affordable housing developed in the urban core which is located in close proximity to bonded properties. The question further inquires whether subsidised affordable housing developments impact the property value of the neighbouring bonded properties. The term impact in this study refers to the possible effect that subsidised affordable housing may have on bonded property values. This question is important as it explores whether subsidised affordable housing developments do in fact influence the value of surrounding properties and, if so, to what extent. It considers whether such developments affect the buying of bonded properties that are in close proximity and considers if subsidised affordable housing affects bonded properties located further away.

In addition, this research seeks to answer the following sub-questions;

- What is the Integrated Residential Development Programme (IRDP)?
- Does the development of subsidised housing affordable housing deter the buying of homes in such an area?
- To what extent does the subsidised affordable housing development affect the neighbouring property values?

1.5. Hypothesis

The negative perception of subsidised affordable housing developments has led many critics of such housing developments to hypothesise that the close proximity of these developments affects bonded property values negatively (Lee, Culhane and Wachter, 1999). It is assumed that the development of subsidised affordable housing located nearby bonded properties affects has a negative impact on the bonded property values. However, this assumption is made in consideration of the impact of subsidised affordable housing developments in American context particularly looking at the impact of the Low Income Housing Tax Credit (LIHTC) housing scheme on surrounding property values. As stated earlier, this study aims to assess the extent of the impact of subsidised affordable housing on property values in South Africa, particularly in Johannesburg.

According to Luyenge (2011: 14), a hypothesis is “a proposed explanation based on limited evidence, used as a starting point for further investigation”. Based on this, this research study hypothesises that subsidised affordable housing development provided by the Integrated Residential Development Programmes in the case of Fleurhof does not impact bonded property values negatively.

1.6. Literature Review

The literature in this study will review literature related to South Africa’s subsidised affordable housing development, the provision of such housing and policy related to the development of subsidised affordable housing. Moreover, the literature details the importance of property value particularly to homeowners as the development of subsidised affordable housing raises issues of NIMBY protests. Subsequently, the literature considers the relationship between subsidised affordable housing and property value, this is done in an effort to understand the complexity of the effect of subsidised affordable housing towards property values of bonded properties.

1.6.1. Subsidised Affordable Housing

Housing in the South African context is of high importance and is somewhat framed by its historical institutionalised racial segregation and discrimination. These discriminatory practices are believed to have led to an increased level of inequality in the country. Because of the country’s historical discriminatory practices, the Constitution has embraced and mandated the provision of adequate housing is human right (Malete, 2014). In 1994, the Reconstruction and Development Programme (RDP) was established to rebuild and develop the country and to counter this inequality and to promote the vision of meeting free basic housing needs (*ibid*, 2014). A key aim of the RDP was to redress the country’s housing crisis, prioritising the marginalised that were previously located on the periphery away from economic opportunities (Burgoyne, 2008). According to Malete (2014:20) “The RDP was designed to integrate growth, development reconstruction, redistribution and reconciliation into one programme”.

However, in 2004, in order to strengthen and update the RDP policy in the housing context, the National Department of Housing (NDoH) released a Comprehensive Housing Plan called Breaking New Ground (BNG) focused on the development of Sustainable Human Settlements (SHS) (Langeberg, undated). One of the key aims of this policy was to increase

the delivery of well-located sustainable human settlements (Tissington, 2011). Within the BNG policy the implementation of Integrated Residential Development Programme (IRDP), was introduced to enforce the delivery of sustainable subsidised affordable housing in an integrated manner in well-located areas that provided access to urban amenities, including places of employment (*ibid*, 2011). A well-located area in this study refers to areas in the urban core. Subsidised affordable housing provided through the IRDP in this study is defined or constitutes of fully subsidised BNG housing, social housing and subsidised housing which bridges the shortfall of housing delivered by the government and houses delivered by the private sector, this housing is referred to as GAP housing (*ibid*, 2011). Gap housing is made up of individuals with a household income between R3 500 to R15 000 and are not able to participate in the private property market as they cannot afford to and do not qualify for government subsidised housing (*ibid*, 2011). According to Le Roux (2011), the Department of Housing (DoH) in Johannesburg is not only challenged with a housing backlog but also faces problems of inadequate quality of construction of housing, poor locality of housing and an ever increasing population growth into the metropolitan municipality.

1.6.2. Property Value

Property values are of major concern to property owners because rising values indicate that the neighbourhood is moving in a positive direction. Neighbourhoods with increased property values indicate that the neighbourhood is a desirable area to reside in for potential buyers and influences developers to invest in such a neighbourhood in the future (McArthur and McArthur, undated). “Property value is defined as an estimate of what a home or a piece of land is actually worth” (Sherman, undated: unpaginated). Property value or fair market value is an estimated value of a property generated from the actual price of the property that both the consumer and seller agree upon when making a property transaction deal (Hummel, 2011). In this definition, it is assumed that both the seller and the buyer have sufficient knowledge of the property and the property market (Sherman, undated).

Property value is affected by other factors such as market demand and the overall state of the house and size and elevation of the house whether or not the house has a view, a garden, the age of the structure, the style of the house and other factors including amenities close to the house and the property’ location (Goslett, 2011). However, when estimating an accurate value of a property the main element that must be considered is current market conditions, such as buyer confidence of the market in a particular neighbourhood, interest rates and the

lack of economic growth (Goslett, 2011). Property value is of importance to time-honoured property owners as it represents the quality of life that the individual holds. However, this “quality of life” is hard to measure as it is subjective in nature and its specific amenities that a consumer considers when buying a property such as access to good quality schools, employment and recreational areas depending on their subjective requirements (McArthur and McArthur, undated). However, declining neighbourhoods with increasing property values indicate hope for that neighbourhood as this means that the neighbourhood might be set for economic renewal. Increasing property values in an area including an increase in real activity and act as a benchmark for successful neighbourhood revitalisation (McArthur and McArthur, undated). The term property in this study refers to residential property.

1.6.3. Not in My Backyard (NIMBY)

Considering the importance of property value and an increased pride in one's property value, bring about fraught instances where the NIMBY attitude arises. Researchers (Dear, 1992 and Piat, 2000) state that this attitude is more about the selfish desire of individuals to abandon responsibility for upcoming developments. A NIMBY homeowner is an individual with a protectionist approach when opposing an unwanted development within his or her neighbourhood (Dear, 1992). This individual is not necessarily wrong in their attitude, as some developments in their neighbourhood may diminish that neighbourhood's distinct character. This attitude is not new according to Piat (2000); NIMBYism began in the late 20th century in Canada when a group of individuals opposed a subsidised housing development for deinstitutionalised disabled people. The communities' reaction was negative as the integration of these people into their neighbourhood brought up much fear. Established definitions of NIMBY assume that owner-occupiers fear that their property values will decline if subsidised affordable housing developments are developed in their areas. NIMBY owner occupiers when protesting the development of subsidised affordable housing in close proximity to their properties are characterised by Piat (2000) as selfish and ravenousness.

However, Pendall (1999) reveals that NIMBY homeowner protectionist/selfish attitudes are not only about the development of subsidised affordable housing in their neighbourhoods. And, that their attitude shows that they are level-headed investors that are not selfish as stated by Fischel (2000). Dear (1992) and Piat (2000) are opposed to NIMBY homeowners clearly stating that their attitudes are biased and ravenousness towards the development that goes against what they believe will de-value their neighbourhoods. Whilst Pendall (1999) and

Fischel (2000), provide a different perspective on the attitudes of NIMBY homeowners stating that these individuals are just protecting what rightfully belongs to them specifically their property values. As they believe that, since they own their property they have the right to veto any and all developments that occur in their neighbourhoods (Lewyn, 2014).

1.6.4. Subsidised Affordable Housing and Property Values

Housing markets in the public sector and the private sector are interconnected (Kin, 2004). A measure of the demand and supply of subsidised affordable housing and private property markets may be applied in an effort to understand the interconnectedness of these different housing markets (*ibid*, 2004). However, the relationship between subsidised affordable housing and bonded property values is fairly complex (Nguyen, 2005). Neighbourhoods are characterised by their complex attributes that together determine its overall character (Botein, 2002). This character is made up of the neighbourhood's location, housing stock, socioeconomic characteristics and other attributes. When considering the relationship or the impacts of subsidised affordable housing, housing market conditions need to be considered too. The impact of subsidised affordable housing developments on property values considerably in a depressed housing market may, in reality, generate positive reaction on the neighbourhood which will in the long-term improve the neighbourhood's property value (Woo, Joh, and Zandt, 2016). Many of the articles read state that subsidised affordable housing has no impact and that it is merely about the perception held by the public rather than an actual decrease in property values. Which brings one back to the attitudes of NIMBY homeowners. This shows the level of impact time honoured property owners may have in an effort to stop the development of subsidised housing in their neighbourhoods.

1.7. Study Area

This research examines the impact of subsidised affordable housing on nearby property values looking at the integrated residential development of Fleurhof, which is located between the Township of Soweto and Roodepoort, in Johannesburg. The location of this development is integral in this research as it is located in close proximity to bonded properties in the urban core of the City of Johannesburg. Fleurhof is an integrated residential development, with approximately 10 411 residential units, these include fully subsidised BNG housing units, social housing, affordable housing and open market bonded housing (Thome, 2017). The development houses an estimate of 83 000 people. Construction of the development started in 2011, with Calgro M3 Holdings as the main contractor and the development is yet to be completed (*ibid*, 2017).

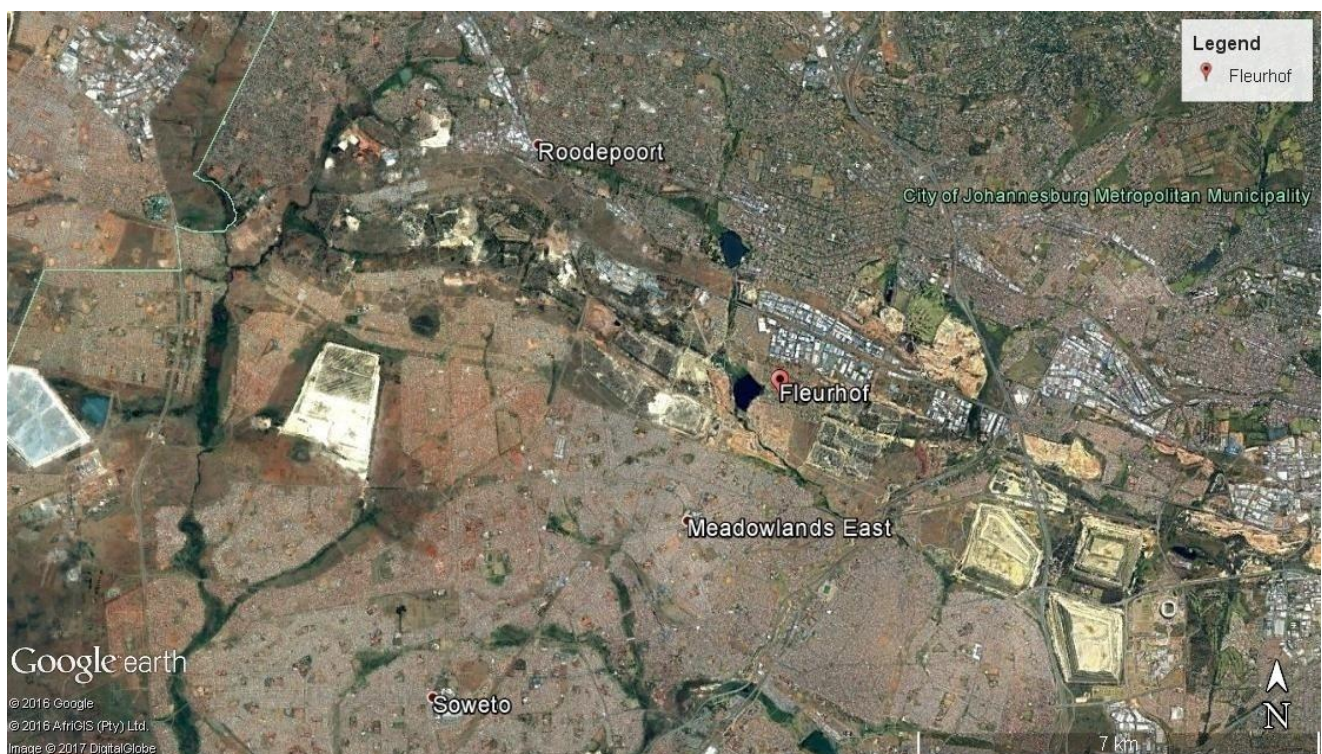


Figure 2: Fleurhof and Surrounding Areas (Source: Google Earth, accessed 9 May 2017)

1.8. Research Method

The research method used in this study is a quantitative method using the econometric method of the hedonic price modelling analysis considering the case study of the IRDP of Fleurhof. The hedonic price modelling analysis is used as it considers that housing unit is a multi-dimensional good that is affected by both its internal and external attributes (Xiao, 2017). A property is regarded to be a multi-dimensional good as its value is not only determined by the structure of the property but also determined by other factors such as where the property is located, amenities surrounding the properties and the value of surrounding properties (*ibid*, 2017). It describes the relationship between the market price of a property and its characteristics, and it differentiates positive and negative characteristics that may affect property value (Bernknopf, Gillen, Wachter and Wein, 2008). The hedonic model estimates a property price or how much an individual is willing to pay for a property according to the individual characteristics that a property holds (Lyons and Loveridge, 1993).

With this model, when the purchase price of a property is regressed onto a property's attributes, the resulting coefficient for any attribute is an estimate of the implicit marginal price of that particular characteristic (Xiao, 2017). The hedonic price regression is based on the hedonic value given to a property, where property value is considered a function of the properties attributes (Wilhelmsson, undated). The regression controls for differences in different individual properties by modelling the value effects of all those differences. For this reason, the hedonic price of the attribute is estimated (*ibid*, undated). For this study, the method will be used as a way to analyse the impact of the housing development of Fleurhof on the property value of bonded properties. This methodology will quantify defined variables such as property values in order to formulate facts and uncover patterns in the research of the bonded properties located in Soweto and Roodepoort which is located on either side of Fleurhof where the subsidised affordable housing development is located, where possible impacts are likely to occur. Data will be collected from Lightstone property, covering the time before the development of the Fleurhof and till 2017, in order to compare differences and consequently find the impact.

1.9. Conceptual Framework

According to the hedonic price model (HPM), the value of a property is determined by the different components that it holds. A property's price (P) is determined by the property's

structural or physical attributes (SA), its socio-physical attachment or neighbourhood characteristics (N) and the level of services it has in it reach or locational amenities (LA). The data this study utilises in terms of structural attributes includes the number of bedrooms and bathrooms a house has, the age of the property and whether the property has a garage or not. With regards to the property's neighbourhood characteristics this study considers the racial composition of the neighbourhood whereby a property is located. And in terms of locational amenities, this study considers a property's locality to police stations, schools, clinic and a retail centre as seen in figure 1.

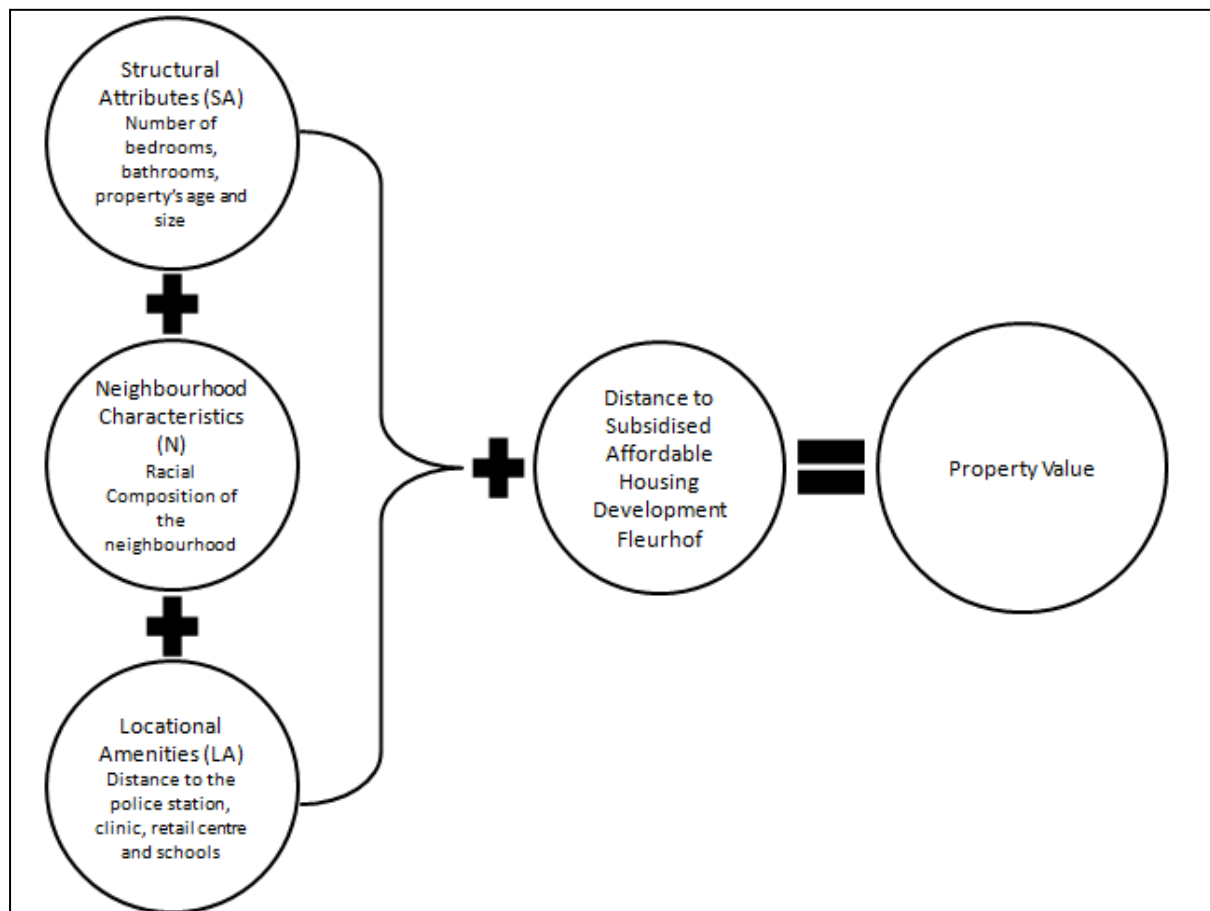


Figure 3: Conceptual Framework

The main features as depicted by figure 2 are the components which are intrinsic in determining a property's value using the HPM. Estimating the impact of subsidised affordable housing developments is a complex process because subsidised affordable housing developments have many factors which may affect a bonded property's value (Woo, 2014). Such as the quality of construction of the development or the type of individuals it brings into a neighbourhood (*ibid*, 2014). Considering, the way in which a property is valued using the

HPM, this research suggests a conceptual model which provides a comprehensive view of how to determine a property's value whilst taking into account the distance of the subsidised affordable housing development.

1.10. Limitations

The limitations of this study include the difficulty of gaining access to enough data to complete the study. As gaining access to property data in South Africa is not easily accessible. Data collected may not be large enough meaning it will not be robust enough to explain the complex concerns raised by NIMBY homeowners. It may be time-consuming and difficult to undertake a complete and rigorous regression and analyse the data collected. Additionally, a limited amount of research about the effect of subsidised affordable housing on bonded property values has been done particularly in the South African context.

1.11. Chapter Outline

In order to address the research problem as outlined above, this research report will be divided into the following chapters, each focusing on different aspects of the undertaken research.

Chapter one introduces this research report and gives an overview of what this study aims to achieve.

Chapter two encompasses a detailed review of relevant literature in an effort to analyse the relationship between subsidised affordable housing and property values.

Chapter three analyses at the Integrated Residential Development of Fleurhof as the study area for this research and introduce the Hedonic Price Modelling valuation technique, using the technique as the method to assess the impact of the IRDP programme on surrounding property values.

Chapter four measures the impact of the distance to Fleurhof on property values using the HPM. This is done to investigate its impact in an effort to uncover the extent of the impact.

Chapter five interprets and discusses the results investigated in chapter four.

Chapter six considers all the findings and in turn sets out the conclusions and recommendations that are drawn based on the research undertaken.

Chapter 2:

South Africa's Subsidised Affordable Housing and Property Values

2.1. Introduction

Twenty-three years into the South African democracy, the South African democratic government has had to deal with many challenges (Dhladhla, 2014). These challenges include the fact that South Africa is argued to be one the world's largest welfare states as stated by Schussler (2010 cited in Mail and Guardian, 2010). This means that many South Africans are dependent on the government for basic services. The dependency ratio in South Africa in 2010 stood at 3 people to one taxpayer, which is inevitably unsustainable (Mail and Guardian, 2010). The percentage of people that rely on the government for basic necessities has increased from 13% in 2003 to over 30% in 2015 (Sesant, 2016). One of the basic needs of humans which are entrenched Section 26 of the Constitution, is the right to access adequate housing. The right to access adequate housing in South Africa is an essential right because of the magnitude of poverty and unemployment post-1994 (Dhladhla, 2014). Housing delivery is one of the biggest challenges that the South African government faces presently (Malete, 2014). Apart from the colonialist-apartheid era which displaced many South Africans locating them on the periphery away from economic opportunities, challenges such as rapid urbanisation, migration, and insufficient state resources have increased the challenge for the government to deliver housing to the marginalised at the rate required (Burgoyne, 2008).

In an effort to advance the delivery of subsidised affordable housing in South Africa, the National Department of Housing established the "Breaking New Ground" (BNG) strategy in 2004 was introduced and aimed to redirect and enhance already existing housing delivery mechanisms in a more responsive, sustainable and effective way (Burgoyne, 2008). The policy also endeavours to "promote the achievement of a non-racial, integrated society through the development of sustainable human settlements and quality housing" (Department of Local Government and Housing, 2005:8). Thus, in the BNG strategy the Integrated Residential Development Programme was introduced, the IRDP is targeted towards the development of integrated sustainable human settlements located in the urban core whereby individuals of all socio-economic backgrounds are catered for (Van Der Byl, 2015).

However, the development of subsidised affordable housing in well-located areas means that such developments are built in close proximity to high-to-middle income neighbourhoods. The locality of these developments, therefore, raises issues whereby property owners and/or ratepayers oppose these developments because of the negative perceptions that these

individuals have towards such developments (Cummmings and Landis, 1993). These individuals are quick to assume that such developments will ruin their neighbourhood (Usrey, 2012). However, subsidised affordable housing activists argue that there is minimal to no evidence that suggests that the development of subsidised affordable housing has a detrimental impact on property values (*ibid*, 2012).

Furthermore, the opposition of the development of subsidised affordable housing developments by homeowner associations hinders the development and implementation of such developments. Property owners who oppose such developments who are also referred to “Not In My Backyard” (NIMBY) homeowners, perceive the development of subsidised affordable housing developments as a raid of undesirable neighbours into their neighbourhoods who seek to undermine their security, quality of life and property values as mentioned earlier (Braun and Duffley, undated). Other fears and arguments raised by NIMBY property owners about the development of subsidised affordable housing in their neighbourhoods include that such developments will bring low-income individuals, who will increase crime levels, traffic and essentially, place an additional financial burden on local governments and schools (Usrey, 2012). Opposition by these homeowners also stems from the belief that residents of subsidised affordable housing developments do not maintain their houses in the same way that bonded property owners do which leads to a decrease in surrounding property values and an overall decline in the character of the neighbourhood (*ibid*, 2012).

Property value is an important and an essential aspect of the property market (Ge and Du, 2007). However, the value of a property means different things to different people depending on which end of the transaction they stand (Caillard and Kaddour, undated). For instance, a seller may have an emotional attachment to the property and this, therefore, impacts the way in which they value their property, whilst, a buyer may be excited about buying the property but may see the value of the property differently from the seller. Additionally, an investor may want to know the purchase price of the property in which they are going to invest (*ibid*, undated). A property that is located in a great location and experiences rising values shows that the neighbourhood is moving in a positive direction. But a property that is not well located with declining property values in the neighbourhood shows that the neighbourhood is declining meaning the neighbourhood is not desirable for buyers or investors (McArthur and McArthur, undated). A property’s value is dependent on various factors such as its location, surrounding neighbourhood, its physical attributes and accessibility to amenities and

recreational activities (Ajibola, Awodiran and Salu-Kosoko, 2013). Property value does not only consider the price of the property it also considers these factors when determining its value (*ibid*, 2013).

The literature review begins with an explanation of what subsidised affordable housing means within South African context. This chapter looks at the locality of subsidised affordable housing and why it has historically been located on the periphery. Keeping in mind how the apartheid era relocated many people (non-whites) on the periphery far away from economic opportunities. In light of the abovementioned subsidised affordable housing being located in close proximity to bonded properties leaves many property owners in fear of the depreciation of their property values, as emphasised by the anguish of NIMBY proponents. With the assessment of NIMBY fears and/or assumptions, the aim of this study is to investigate whether these fears are rational or irrational, by analysing the relationship between subsidised affordable housing and property values.

2.2. Subsidised Affordable Housing

In an effort to define the term housing, the general perspective of the concept has to be closely examined and articulated as it entails a great amount. Housing may be defined as shelter or a building or a place of habitation for people. It is considered to be one of the most important life components as it provides warmth and a place of rest (Moroke, 2009). Tonkin (2008) adds that housing may be described as a comprehensive term that not only includes the different housing typologies that exist from tribal African huts to high-rise apartment buildings but it also comprises of infrastructure which includes the whole neighbourhood and public spaces. Housing is not only described or defined by its physical structure it also considers an array of attributes which essentially define it such as, “the availability of land, access to credit, affordability, economic growth, social development and the environment” as stated by Mahanyele (1997, cited in Moroke, 2009:6). This is seen particularly in the conceptualisation of the term in the South African context whereby housing is defined in the subject of housing rights and the guidelines as mentioned by Mahanyele whereby it is particularly dominant when discussing low-income government provided housing (Malete, 2014). The statement made by Mahanyele thus elaborates that housing is also influenced by other characteristics and that it is fairly important to consider these aspects when defining the concept and not only its physical structure.

As mentioned earlier, the definition of housing particularly in the South African context and in the South African legislative framework is defined in housing rights, whereby the housing is labelled as adequate housing. According to the Constitution of the Republic of South Africa (1996), section 26(1) enshrines that “everyone has the right to access adequate housing”. By stating that all individuals have the right to adequate housing enforces that everyone, therefore, has the opportunity to live in a safe place with peace and dignity (SAHRC, undated). Defining adequate housing is dependent on the context and circumstances of people and households, their needs and priorities (Tissington, 2011). Thus, when defining adequate housing several characteristics need to be measured to ensure that it may be considered adequate housing, these factors include where the house is located, shelter, affordability, availability of services, amount of space the house has, physical security, security of tenure and accessibility to amenities (Tissington, 2011).

The term affordability, as a concept is generic and holds varied meanings for different people based on their different income levels, for instance, a high-income earner perceives affordability different in comparison to a low-income earner (KPMG, 2010). This, therefore, makes the term affordable housing ambiguous as it too has a different connotation to different people, in the same way, that it has different implications in different places (Stegman, undated). Affordable housing includes different housing typologies, prices, and occupants. Different countries define affordable housing according to the economic potential of the individual buying a house (KPMG, 2010). Stegman (undated) states that housing may be considered affordable if the household income earning range falls between the low – or moderate range, whereby a household in that earning bracket can either rent or own their dwelling unit for an amount up to 30% of their total household income. Consequently, low-income households that pay more than the 30% for housing and utilities are considered cost burdened as they are unable to pay for their other needs (Pivo, 2013).

Affordable housing, low-income housing or subsidised affordable housing in the South African context is defined as “housing for people whose combined monthly household’s incomes are below R3 500 per month”, and this research will be using this definition hereafter (Le Roux, 2011). The purpose of subsidised housing is to assist individuals who fall in the low-income bracket access adequate housing thus deeming it subsidised affordable housing (Settlement.org, 2015). Subsidised affordable housing which is government economic assistance in order to gain access to housing comes in many forms whether it is for rental housing purposes or for ownership purposes, with this assistance individuals pay rent

or mortgages based on what they can afford and not the size and location of the house as seen with residential properties sold in the private property market (*ibid*, 2015).

2.3. Housing Context in South Africa

South Africa is characterised as a society that is continuously increasing in population size and becoming more urbanised, it has also had to a great deal of highly unequal and racially stratified settlement development pattern as a result of the apartheid era (Ramashamole, 2010). Housing is highly politicised in developing countries including in South Africa (*ibid*, 2010). The country has faced rapid urbanisation and has had to also administer the effects of the apartheid era. As the apartheid era caused a spatial segregation of residential areas by race and class (Malete, 2014). In this section, the historical background of housing and present state of housing will be discussed.

2.3.1. Historical Background

South Africa's housing background is depicted with a marred backdrop of colonialism and apartheid spatial planning which can still be seen presently with subsidised affordable housing settlements being built on the periphery (Burgoyne, 2008). Colonialism and apartheid spatial planning have caused great inequality amongst South Africans particularly with the locality of residential developments which were segregated by race and class (Malete, 2014). The main features of the colonial-apartheid era were the displacement of non-whites and the introduction of influx control laws of non-whites and racial segregation (Chipungu, 2015). Housing segregation during this era was mandated by law, this meant that non-whites could not live in white-designated areas (which were highly developed) in contrast with the non-white designated which tended to be in impoverished rural areas known as Bantustans or homelands which were located on the periphery of urban areas (SAHRC, undated).

The era brought an increased level of corruption on zoning ordinances which satisfied segregation by race motives and benefitted white people. The inefficient structure of urban areas caused by the apartheid era meant that non-whites lived on the periphery and, in overcrowded townships (Chipungu, 2015). In the 1980s the housing crisis in townships was characterised by severe inadequate infrastructure and service delivery backlogs (SAHRC, undated). Housing supply was erratic and intensely segregatory (Chipungu, 2015).

2.3.2. South Africa's Housing Situation Presently

The legacy of the past, presented the ANC government with a huge housing challenge (Luyenge, 2011). These complexities that were inherited by the ANC government post-1994, called for the government to put into operation a housing reform programme to address these socio-economic disparities in an effort to mend the ills created by apartheid spatial planning (Koma and Joseph, 2014). After the adoption of the Constitution of South Africa after the attainment of the democracy in 1994, the ANC government responded to its constitutional obligation by committing itself to building adequate houses for all the marginalised people of South Africa. Thus, the Reconstruction and Development Programme (RDP) was drawn, the RDP was the ANC governments manifesto for a post-apartheid South Africa (Malete, 2014). A key aim of this manifesto was to redress the country's housing debacle, prioritising the marginalised that were previously relocated to the periphery away from economic opportunities (Burgoyne, 2008).

The White Paper on Housing (DoH, 1994: 19) committed towards, "the establishment of viable, socially and economically integrated communities in areas allowing convenient access to economic opportunities as well as health, educational and social amenities". RDP housing was a package involving secure tenure of land, a top structure and the supply of basic services (Burgoyne, 2008). However, by the late 1990s according to Burgoyne (2008) concerns were rising over the delivery of RDP housing as the houses that were being built tended to be unviable and dysfunctional housing developments. Thus, there was a shift by the NDoH from focusing on quantity but rather ensuring that quality housing units were built instead (Charlton & Kihato, 2006). Another critique of the housing delivery programme was that the housing delivery policy delivered poor quality housing on the periphery, therefore, progressing apartheid spatial planning meaning that the marginalised were still living on the periphery without access to economic opportunities (Koma and Joseph, 2014).

However, in 2004, in order to strengthen and update the RDP policy in the housing context the National Department of Housing (NDoH) released a Comprehensive Housing Plan of the development of Sustainable Human Settlements; Breaking New Ground (BNG) (Langeberg, undated). This policy builds on existing housing legislation and policy and it additionally emphasises the need to accelerate the delivery of sustainable human settlements (SHS), the policy redresses colonial and apartheid spatial planning through the development of socially, economically and spatially integrated housing delivery processes (SAHRC, undated). The

aim of the BNG policy was to move from the merely delivering housing units towards the delivery of SHS (Koma and Joseph, 2014). The BNG policy is based on the principles contained in the White Paper on Housing and outlines strategies to be taken in an effort to achieve the governments overall housing aim ensuring a more responsive, flexible and effective delivery of human settlements (Tissington, 2011). Also, the policy places much emphasises on the delivery of SHS in well located areas close to economic opportunities, as the policy had recognised that the lack of affordable, well-located land in the urban core for subsidised affordable housing had led to the development of housing on the periphery of existing urban areas thus, achieving limited or in many cases no integration (*ibid*, 2011). The implementation of the IRDP was introduced to enforce the delivery of housing in well-located areas that provided access to urban amenities, including places of employment (*ibid*, 2011).

Despite, a notable provision of 4.3 million housing units to an estimate of 20 million previously marginalised individuals as stated by Sisulu (2016), South Africa still has a large housing backlog of at least 2.1 million housing units, 23 years after the country's democracy (Sisulu, 2016). This shows that the country is still faced with an increasing wave of urbanisation, the number of individuals continually moving from rural areas to urban areas and the number of individuals settling in informal settlements is continually growing (*ibid*, 2016). It is generally recognised that the government cannot deliver housing on the scale required, at a sustainable rate or in the means of low-income earners and poor households, and there is growing evidence that it will be impossible for South Africa's current settlement policy and practice to fully address the United Nations (UN) Millennium Development Goals (MDGs) target of slum-free cities (Tissington, 2011).

2.3.3. Provision of Subsidised Affordable Housing in South Africa

In spite of the significant level of importance required in the acknowledgment of the right to access adequate housing, this is more than just a lawful issue (Le Roux, 2011). Much of the legislation is broadly set, for instance, the right to housing presents a much lengthier and complex set of obligations particularly for the government (*ibid*, 2011). The Constitution states in section 26(2) that the state has the responsibility to house South Africans, with the use of all legislative and economic resources at its disposal (RSA, 1996). The responsibility to promote the right to adequate housing requires the government to not only educate the

public but to also encourage the public to strive to create a culture whereby this right actually becomes a reality (Le Roux, 2011).

Subsidised affordable housing provision has been one of the main priorities of South Africa's post-apartheid government since post-1994 (Dhladhla, 2014). One of the key election promises made by the African National Congress (ANC) during the run-up to the 1994 elections was "homes for all" (Powell, 2009:52). In order for the South African government to assist marginalised South African residents gain access to housing, programmes have consequently, been developed to address the housing need. In terms of the provision of subsidised affordable housing the government focuses on two main areas the first covers households with a combined monthly income of less than R3 500 and the second focus is households with a combined income range of R3 500 – R15 000 but still do not qualify for housing finance through the formal private banking sector (Le Roux, 2011). The former is therefore provided with a dwelling unit through the housing subsidy scheme whilst the latter, which is considered the un-served or underserved group gain access to end-user finance to the housing subsidy scheme, this housing subsidy scheme is referred to as the Finance Linked Individual Subsidy Programme (FLISP) (*ibid*, 2011). Since the subsidy scheme was introduced the subsidy has also increased in accordance with inflation rates however the eligibility ceiling has not changed since 1994 of R3 500 (Chipungu, 2015). This, therefore, means that a household that has the exact buying power presently and housing affordability levels was eligible for the subsidy in 1994, but is ineligible for the subsidy today (*ibid*, 2015).

2.3.4. Integrated Residential Development Programme (IRDP)

The IRDP was introduced to replace the Project Linked Subsidy Scheme, aiming to facilitate the development of integrated human settlements, located in well-located areas in close proximity to urban amenities, including places of employment (Chipungu, 2015). As one of the key lessons learned from a review of housing programmes prior to the IRDP, subsidised affordable housing continued to be located on the outskirts of urban areas without convenient access to social and economic amenities (DoHS, 2009). The programme also aims at creating social, economic and spatial integration thus promoting inclusionary housing (*ibid*, 2009). Inclusionary housing which is commonly referred to as inclusionary zoning or mixed-income housing is according to Tonkin (2008), "refers to a range of income and social groups living in the same habitable environment". Therefore, individuals of all income earning ranges live in the same locality The programme provides for the acquisition of land, servicing of stands

for a variety of land uses including commercial, recreational, schools, and clinics, as well as residential stands for low, middle and high-income groups, taking an area-wide planning approach which is based on the needs of the community. The land use and income group mix is based on local planning and a needs assessment approach (Chipungu, 2015).

The programme provides for the development and planning of housing and social amenities in one single phase or in several phases for instance whereby the development of housing is undertaken in an area whereby developed land is vacant and not occupied or whereby a project occurs in an existing township where undeveloped land is utilised for development reasons (Tissington, 2011). The IRDP provides a tool to plan and develop integrated settlements that include all the necessary land uses and housing types and price categories to become a truly integrated socially mixed community (Tissington, 2010). Additionally, the programme does away with the requirement found in other housing delivery programmes to identify subsidised affordable housing recipients up front by providing for both subsidised, as well as finance linked housing, social and rental housing, commercial, institutional and other land uses to be developed (*ibid*, 2010).

Housing units in this programme are constructed for low-income earners whilst vacant plots are sold to aspiring beneficiaries who can afford (Chipungu, 2015). The government only provides housing units to households that have never previously benefitted from government-provided housing assistance or individuals who have never qualified for fixed residential property (*ibid*, 2015). Additionally, it is of importance that the development of housing or social amenities in this programme are based on approved housing chapters of the Municipal Integrated Development Plans and the priorities and reservation of funds for project development are agreed upon between the MEC and the Mayors of municipality's and are thus documented in the Integrated Development Plan (IDP) (DoHS, 2009).

2.4. Residential Location Theory

According to location theory, the more accessible a location is to the positive elements in the environment, the more valuable it will be (Jordaan, Drost and Makgata, 2004). Therefore, the more accessible a location is, the greater its profit potential. However, this is also dependent on the way in which the land is used as land calls for different uses, for instance, residential land uses desire convenient access to social amenities (*ibid*, 2004). The importance of accessibility particularly to residential land is dependent on both monetary and non-monetary

factors such as the cost of travelling to work or school and in terms of non-monetary factors; this includes factors such as the level of peace and quiet provided with a location (Jordaan *et al.*, 2004). According to the theories of Von Thunen (1826) and Alonso (1960) cited in Jordaan *et al.* (2004), the value of land decreases the further away it is from the Central Business District (CBD). Thus, time and convenience are of great importance (Jordaan *et al.*, 2004). The concept of bid-rent theory underlying the mono-centric model of residential location decisions states that as distance from the CBD increases, a household will, therefore, spend more money on commuting and therefore bids less for land as a given utility level (Kim, 2010).

The relationship between personal income, place of employment and place of residence shows that subjectivity and conflicting interpretations are preminent (Jordaan *et al.*, 2004). Individuals choose where they want to live and larger social forces shape this decision thus, making a trade-off about whether they want CBD accessibility (the commute which needs to be made), more space in a residential property or land rent (Richardson, 1975). The decision of residential location not only determines the connection between the household with the rest of the urban environment, but it also influences the household's activity time budgets and perceived well-being (Kitamura Mokhtarian and Laidet., 1997). Neighbourhood differences affect the demand for housing services more than the supply of those services. For instance, some neighbourhoods may provide access to certain services that the households currently in that locality do not require but may in the future such as the provision of schools in a neighbourhood with first time home buyers without children (Jordaan *et al.*, 2004). According to Segal (1979, cited in Jordaan *et al.*, 2004), there are five major characteristics that are normally used when evaluating the attractiveness of a residential location. These include (Jordaan *et al.*, 2004);

- Physical characteristics of the neighbourhood such as housing structures in the neighbourhood.
- Socio-economic characteristics such as the socio-economic background of people living in the neighbourhood.
- Public services such as the quality of schools, roads and local recreational centres.
- Environmental qualities such as topographical features, landscape and the weather.
- Accessibility of the neighbourhood in terms of sites to which the household commonly travels to such as shopping centres.

Residential location decisions consider aspects of special accessibility (including concentration and complementarities) which are deemed relevant (Jordaan *et al.*, 2004). According to Harvey (1996:206), “there are three major determinants of residential location decision, accessibility, environmental characteristics, and rent”. However, a trade-off is usually preeminent between accessibility and environmental characteristics against rent (Jordaan *et al.*, 2004). Be that as it may, the limitation to this theory is that it assumes that a household is free to locate anywhere, thus, assuming that all households locate simultaneously and instantaneously (Richardson, 1975). It does not consider the time taken, the budget required and the lack of adequate information that exists when searching for a new residential location. These constraints may, therefore, make an individual chose the second best location (*ibid*, 1975).

2.5. Determinants of Residential Location Decisions

An individual’s or household’s choice of residence inherently reflects their choice of the surrounding neighbourhood, which as a result has a significant impact on their well-being and quality of life (Uchenna, 2014). There are several factors deemed as important that need to be considered when an individual considers an area to reside in, the ideal site that satisfies all requirements can rarely be found from the choices available to individuals in one area, thus individuals or households tend to compromise certain requirements which they consider to be the least important on their list of requirements (Kerry, 1995).

Other factors that have been considered as the major determinants of residential location decisions other than land costs and commuting costs include the diverse preferences and tastes of households as they change over time (Kim, 2010). For instance, the quality of schools may be one household’s priority when deciding on a location of occupancy, as high performing good quality school impacts positively on a property’s value according to the hedonic price modelling theory (*ibid*, 2010). Other important factors may include a variety of housing and neighbourhood features such as the style of the structure. Researchers (Giuliano, 1989 and Wheaton, 1979) provide evidence that the variations in household demographics, preferences, and locational amenities reduce the importance of commuting effects in urban spaces.

Other factors which may be considered to be important in determining residential location decisions include place features, such as the appearance of the residential property and the

type or attractiveness of a neighbourhood, and proximity to amenities. Whilst spatial factors such as change in employment location according to Kim (2010) are considered to be less important. This emphasises the fact that place-specific factors play an important role in comparison to accessibility to the workplace. Oyebanji (2003) examined eight factors that determine an individual's choice of residential property location in an urban area. These include an individual's income levels, the site or the physical condition of a residential property, access to amenities, accessibility, environmental quality, security, access to job opportunities, and socio-culture surrounding that property.

In terms of socio-cultural factors, Oyebanji (2003) discusses how households will choose a location because of the socio-cultural background of other residents already residing in that particular location, as this is the bond that brings people of the same social class and similarity and cultural background into that location. Households of the same socio-cultural background tend to concentrate together in the same neighbourhood, for a feeling of security (Uchenna, 2014). Cho, Rodriguez, and Song (2008, cited in Uchenna, 2014) state that factors that determine residential location by households include (Uchenna, 2014:24);

- Housing stock or site characteristics: this includes factors such as occupancy status, tenure status, structure of the unit, the property's age, number of bedrooms, number of bathrooms, the design or style of the property.
- Neighbourhood amenities: the factors identified include the accessibility of the fire station, police station, shopping malls, sports facilities, public transport, and quality of schools, water supply, electricity and drainage systems in place.
- Accessibility characteristics: this includes factors pertaining to the accessibility or the ease of access to places of employment, shopping centres, and places of worship, recreation sites and the airport.
- Household characteristics: these include income, size of the family, and age of the family head of the household and race or tribe.

2.6. South Africa's Residential Property Market

According to Els and Fintel (2008: 4), "all countries with established property rights, residential property is a large part of many investment portfolios of companies and is naturally also important for individual consumers". This is the case for South Africa too, South Africa has a well-established property market and a world-class cadastral which offers

procedural protection for buyers, sellers and financiers (Rust and Gavera, 2013). The residential property market is one of the largest components of South Africa's property market making up an estimate of 86% of all property assets in the country (CAHF, 2015). However, the residential property market in South Africa behaves in very different ways, across numerous property market indicators - growth in values and sales prices, transfer rates of new properties and resale's, access to bonds and lending, and growth in equity (*ibid*, 2015).

An estimate of 63% of South Africa's residential property market in 2013 was made up of homes valued below R600 000, about 44% of this includes housing units that are valued at less than R300 000 which also includes of subsidised affordable housing (*ibid*, 2015). This shows that there is a significant amount of subsidised affordable housing in the country since 1994. Every year, as new residential properties are built whether through government programs or by the private sector for ownership or rental purposes, the size, and composition of the residential property market changes (CAHF, 2013). However, according to the Rode's Report (2017) growth in nominal house prices in the country have been in decline. Housing markets in the country operate in two different economies, those that fall below the R600 000 property value mark, which includes subsidised affordable housing and those above the R600 000 property value mark, which consists of residential properties brought forth by the private property market (*ibid*, 2013).

In 2013, the number of registered residential properties increased by 5% since 2009, much of this rapid growth occurred in the lowest market segment (property that fall below the R600 000 mark) (CAHF, 2013). This shows the amount of subsidised affordable housing units which are delivered in the country, and , it also shows that there is a shift in the composition of South Africa's property market with lower value properties increasing at an increased rate in comparison to the rest of the market (*ibid*, 2013). This corresponds with the distribution of the population in the country. In comparison to the rest of the country, property values in metropolitan municipalities have increased at a lower rate (Rode's Report, 2017). The property value of subsidised affordable housing units has increased significantly in comparison to upper-market property values (CAHF, 2013). Despite this, there has been a clear gap of average property values between upper-market property values and lower-market (subsidised affordable housing) properties as shown in figure 4. The figure shows that there was a R2 million difference between the average upper-market property value and the market segment for houses priced below R300 000. However, the gap between the lower segments

are closer, showing a greater chance for household economic mobility as families sell their homes in order to purchase a new home in a higher market segment (*ibid*, 2013).

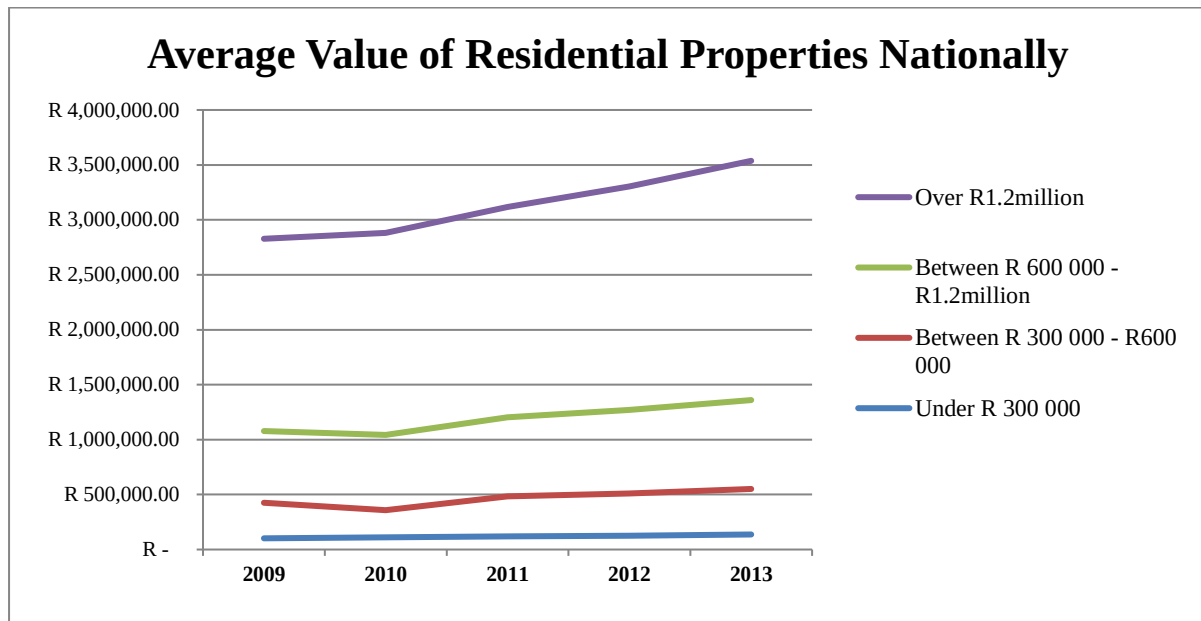


Figure 4: Average property values by market segments (Source: CAHF, 2013)

2.7. Property Value

Value is not intrinsic but results from estimates, made subjectively by able and willing buyers for their personal benefit and satisfaction. The value assessed is for the interest of the buyers in an open market (Ijasan, 2017). The term value means the worth of a commodity in exchange and for the sake of convenience it is measured in terms of money. It is an estimate of what the price ought to be (Ijasan, 2017). Value is a function of usefulness or purchasing power (*ibid*, 2017). According to Shapiro, Mackmin, and Sams (2013:14), “what is valued is not the physical land or buildings but the legal interest which gives legal rights of use or enjoyment of the land of buildings”. In order to have value a commodity must have the two essential qualifications which include that it must possess utility and it must be transferable or marketable (Ijasan, 2017). Value is a function of time, place and purpose. It is caused by four main factors which include scarcity, utility, desire and effective purchasing power (*ibid*, 2017). What needs to be understood is that property value does not merely entail the price of a property but it also includes its worth too (*ibid*, 2017). According to Sherman (undated, unpaginated), “property value is an estimate of what a home or a piece of land is actually worth”.

However, there are different types of values, for the purpose of this research; the most important is market value. Market value is the most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and the seller each acting with due consideration, knowledgeably and assuming the price is not affected by undue stimulus (Ijasan, 2017). Market value is the estimated amount for which an asset or a liability should be exchanged on the valuation date between a willing buyer and a willing seller in arm's length transaction after proper marketing wherein parties had each acted knowledgeably and without compulsion (Shapiro *et al.*, 2013). Market value differs from time to time depending on the demand and supply of property in a location. It is also affected by other miscellaneous factors such as changes in the property market, changes in the type or style of property or trend at a particular time, cost of materials and labour (Ijasan, 2017). Property value or fair market value is an estimated price that a consumer and seller agree on when making a deal. Therefore, it is assumed that both the seller and the consumer have sufficient knowledge on the property and the market (Sherman, undated).

When determining property value several methods such as the comparative sales method, may be used but for the case of this research the hedonic valuation technique is the most appropriate, as the method considers that housing is a hedonic good. As it represents a bundle of attributes (both intrinsic and extrinsic) that contribute to a consumer's utility and as such are thus, valued by the consumer (Mourouzi-Sivitanidou, 2011). Intrinsic attributes are those attributes that characterise the property itself such as the size or the number of bedrooms a property has, whilst extrinsic attributes consider attributes that are external to the property, such as the environmental attributes, locational attributes of the property and the exterior design of a property (*ibid*, 2011).

2.7.1. Importance of Property Value

A home is often one of the biggest assets an individual owns, it is also a form of investment that an individual hopes to sell in the future to make a good return (Davies, 2017). It is of great importance to many owners as it is sometimes the largest investment and adds a significant portion to an individual's total wealth (Bogin, 2012). Real estate is a heterogeneous good that is made up of a bundle of unique characteristics and not only just its location, but other amenities such as the quality of the neighbourhood and infrastructure (Ajibola, Aworiran and Salu-Kosoko, 2013). Property value also may be a representative for quality of life factors that can be hard to measure and may often reflect access to good

schools, jobs, parks and other amenities (McArthur and McArthur, undated). In regards to homeowners particularly those that depend on home equity to provide resources for retirement or finance for a child's education, property values are of great importance (*ibid*, undated). Ge and Du (2007) opine that property value is an essential aspect of property markets worldwide and determined by a variety of factors and the determination of those factors is a significant part of property valuation.

2.7.2. Factors Affecting Property Value

Property is a multi-dimensional commodity characterised by its durability, structural inflexibility and spatial fixity (Tse and Love, 2000). Property has no value if it has no utility, scarce or is effectively demanded, this utility is not derived from the brick and mortar alone but it is a combination of unique attributes a property holds together with the property's location and neighbourhood which may be equally desired by a consumer (Oloke, Simon and Adesulu, 2013). The value of a residential property is dependent on several characteristics such as housing is a heterogeneous commodity; these factors that affect its value are equally of different kinds, with location being the key factor that affects a property's value (Xin and Yue, 2007).. Location holds a time – distance relationship between a property or neighbourhood and all the different possible origins and destinations that people may go to or come from the property or neighbourhood (Herold and Leonard, 1991). Herold and Leonard (1991) state that the more distance travelled to get to a location, where a property is located, which has many attractive features and amenities despite the long commute will command more value than closer locations which lack attractive features and amenities.

Factors affecting property value may be grouped into four categories as seen in figure 5 which include (Tse and Love, 2000);

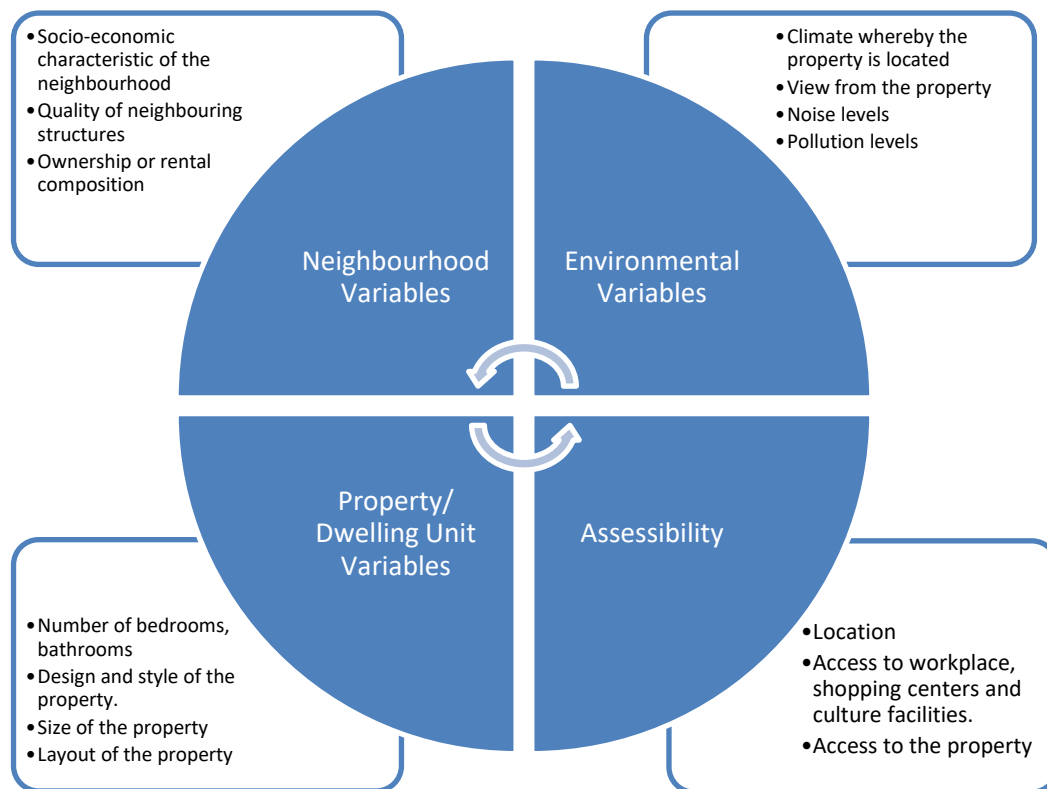


Figure 5: Factors affecting property value (Source: Oloke, Simon and Adesulu, 2013)

Environmental variables: these variables are concerned with the environment and the neighbourhood of the property. Properties positioned in areas that are serene, clean, have decreased levels of crime and traffic and have increased property values, as according to Lee (undated), these factors improve an individual's quality of life which sequentially means consumers demand properties located in such areas more and therefore increases a property value.

Neighbourhood variables: this includes the social amenities in the neighbourhood which a consumer would consider when purchasing a property and may be expected to produce a positive effect on property values. The condition of the neighbourhood where a property is positioned adds to that property's value. For instance, a property in excellent condition in a well-kept neighbourhood in great condition tends to have an increased property value (Tamplin, 2016). Properties located in areas with good quality schools, clean and child-friendly parks, hospitals and police stations also hold a higher property value (*ibid*, 2016).

Accessibility variables: accessibility variables include the variables a consumer considers as they determine the time and cost of travel to other locations. The ease of access of a property

to amenities such as bus stops, train station or the highways means that such a property is highly demanded thus it has a higher property value (Lee, undated).

Property variables: property variables include the structural characteristics of the subject property. Much of a property's value comes from the number of bedrooms and facilities the property has to offer (Clarke, 2017). According to Clarke (2017), the number of bedrooms, bathrooms and garages a property holds greatly influences a property's value. Additionally, the space and flow also adds to a property's value, for instance a property with an open-plan living style has a higher property value in comparison to old-fashioned property's with separate rooms in today property market (*ibid*, 2017).

2.7.3. Importance of Location

Location is an important determinant of a property's value. Location is important as it is the physical structure which eventually depreciates whilst the land in which this physical structure is located continuously appreciates in value (Walker, 2004). The locality of a property and other aspects such as the how well the property is built and its design, how the property is modelled into the environment, social and economic characteristics found in the neighbourhood where the property is located in and other aspects are the attributes that affect the daily lives of individuals or households, their security, health and wellbeing (Musa and Yusoff, undated). Location remains the most important factor in determining the value of a property as it adds to the profitability of a property investment thus, informing the way a consumer may choose to buy or rent a property (Seth, 2017). The reason that location is so important is that it also inherently considers factors such as social benefits, crime, schooling, and investment (Walker, 2004).

In terms of social benefits, Walker (2004) discusses that this would constitute the way in which individuals are often content to buy a property in an area whereby their neighbour is of the same socio-economic background (*ibid*, 2004). The fear of crime is another factor which encourages people to head to the locations they reside in as these areas are relatively safer and established residential areas (Walker, 2004). In regards to buying property for investment reasons, an investor may prefer properties in a well-located area whereby property values appreciate at an increasing rate than in areas whereby property values continually depreciate (*ibid*, 2004). However, the choice of location usually involves an element of compromise.

When it comes to choosing the location the fewer compromises that one makes the better it is.

2.8. The Relationship between Subsidised Affordable Housing and Property Values

As mentioned earlier, the relationship between subsidised affordable housing and bonded property values is fairly complex (Nguyen, 2005). This may be because of varied reason such as increased complaints of how subsidised affordable housing developments may depreciate home values. However, different studies suggest otherwise stating that subsidised affordable housing development encourages the diversification of neighbourhoods as it integrates more people of different socio-economic backgrounds (Jan, 2017). However, before discussing the complexity of the relationship between subsidised affordable housing and the interconnectedness of bonded property values, the discussion of the perception of subsidised affordable housing developments by property owners will be explored.

2.8.1. Not in My Backyard (NIMBY)

Many people particularly bonded property homeowners have a negative perception of subsidised affordable housing and this seems to be the case for many individuals around the world, South African's included (Snell, 2011). Subsidised affordable housing is misrepresented in the public eye. When it comes to the social mixing of housing in neighbourhoods or communities time honoured residents in that neighbourhood may have concerns about the loss of their property values (*ibid*, 2011). An increased pride in one's property value and being a time-honoured resident in a neighbourhood brings fourth instances whereby the 'Not in My Backyard' (NIMBY) attitude arises. NIMBY refers to opposition by residents in a neighbourhood to any land use changes in or in their surrounding neighbourhoods (Koebel, Lang and Danielsen, 2004). This attitude is more about the selfish desire of individuals to abandon responsibility for upcoming developments, such as subsidised affordable housing developments (Piat, 2000). A NIMBY homeowner is an individual with a protectionist approach when opposing an unwanted development in their neighbourhood (Dear, 1992). NIMBYism does not only occur when the proposal of the development of subsidised affordable housing is announced it also arises when other developments such as power plants, mental institutions, waste facilities and other developments are proposed in close proximity to opposing residents (Koebel *et al.*, 2004).

NIMBY sentiments are at a heightened level at the beginning of the development process, residents may mobilise to block a development immediately after the development has been announced (*ibid*, 2004).

Although, the term was not coined till the 1980s in America, NIMBY sentiment has clear traces in the historical record (Dear, 1992). NIMBYism is inherent to mankind and has been seen and mirrored throughout human history mostly in the form of a barrier towards change and development (Nimby.com, undated). NIMBY opposition in land-use decision making according to Piat (2000 cited in Koebel *et al.*, 2004) began in the late 20th century, when there was a popular movement to discharge groups of disabled people from institutions. In order to meet the needs of these individuals, different types of housing developments were built. And as a result, the rapid development of these housing developments produced other problems such as the poor integration of these individuals with the rest of the community and a negative community reaction (NIMBYism) (Piat, 2000). This reaction was mostly about the locality of these individuals in their neighbourhoods and how this would impact the way that their neighbourhoods functioned and looked (*ibid*, 2000). The traditional conceptualisation of NIMBY assumes that property owners fear that their property value will decline if the proposed subsidised affordable housing development will be built. This definition, therefore, leads housing advocates to characterise NIMBY attitudes as selfish. However, Jay (2005), who is a proud NIMBYist identifies his attitude as a protectionist attitude and this thus shows that NIMBY attitudes are more complex.

NIMBY homeowners are not only concerned about the decline in their property values because of the development of subsidised affordable housing in their neighbourhoods but they also fear that such a development will change the ambiance of the neighbourhood, increase crime in the neighbourhood and add more congestion into the streets (Snell, 2011). NIMBY homeowners as stated by Dear (1992) are valid in their attitude, as some developments in their neighbourhood may decrease its distinct character. People who advocate NIMBYism may be opposed to specific types of housing changes to the character of their neighbourhoods, such as population growth or any type of development additionally the style of houses to be built into their neighbourhoods (Snell, 2000). NIMBY concerns may in some cases be a mask for deeper issues of economic, racial and/or ethnic heterogeneity (Snell, 2011). The attitudes of NIMBY homeowners can in some instances be the driving force behind zoning ordinances and regulation policies that are put in place (*ibid*, 2011). Communities with organised neighbourhood groups can have great influence over local

politics, enough so as to place restrictions on subsidised affordable housing developments that are proposed to be developed in their area (*ibid*, 2011).

However, Pendall (1999) reveals that a NIMBY homeowner's protectionist/selfish attitude are not only about the development of subsidised affordable housing in their neighbourhoods. And, that their attitude shows that they are level-headed investors that are not selfish as stated by Fischel (2000). Dear (1992) and Piat (2000) are opposed to NIMBY homeowners clearly stating that the attitudes are biased and ravenousness towards the development of subsidised affordable housing and that such a development goes against what they believe will de-value their property value. Whilst Pendall (1999) and Fischel (2000), provide a different perspective on the attitudes of NIMBY homeowners stating that these individuals are just protecting what rightfully belongs to them. As they believe that, since they own their property they have the right to oppose any and all developments that occur in their neighbourhoods that they believe do not belong in their neighbourhoods (Lewyn, 2014).

In addition, to rapid urbanisation and migration, the NIMBY phenomenon also adds to challenges of delivery of housing in South Africa, this may be seen in the Western Cape whereby residential areas are still segregated by class or social status (Human Settlements Reference Group, 2005). NIMBYism in Cape Town has manifested in the form of resistance by the middle class towards largely the development subsidised affordable housing located in close proximity to higher income neighbourhoods (*ibid*, 2005). This attitude hinders the achievements of the objectives of the BNG strategy to achieve functionally and physically integrated human settlements where the marginalised are located in areas which improve their quality of life, access to opportunities and urban amenities. The unequal distribution of wealth and class separation which was mainly caused by apartheid spatial planning is still clearly pervasive in Cape Town and therefore heightens resistance of subsidised affordable housing in the urban core (*ibid*, 2005).

2.8.2. Subsidised Affordable Housing and Property Values

The relationship between subsidised affordable housing and bonded property values are fairly complex (Nguyen, 2005). As neighbourhoods are characterised by the complex attributes that combined determine the neighbourhoods overall character (Botein, 2012). This character includes various attributes such as neighbourhood's location, housing stock, socio-economic characteristics and other attributes (*ibid*, 2012). When considering the relationship or the

impacts of subsidised affordable housing development, housing market conditions need to also be considered. As the development of subsidised affordable housing have quantifiable effects on housing markets (Bento, Knaap, and Lowe, 2008). Bento *et al.*, (2008) state that the development of subsidised affordable housing in a particular context would, therefore, mean that the number of low-income households in such an area would thus increase in number and the price of homes in that neighbourhood with a particular socio-economic character would eventually increase whilst the size of such dwelling units would increase.

Housing as any other land use has an impact on the surrounding neighbourhood. However, different types of dwelling units are anticipated to impact neighbourhoods differently, this may be seen in the different types of zoning regulations used for different residential uses (Botein and Freeman, 2002). The impact of subsidised affordable housing developments on property values particularly in a depressed housing market may, in reality, generate positive externalities which will in the long-term improve a neighbourhoods housing prices (Woo, Joh, and Zandt, 2016). A positive externality includes the benefits that bonded property homeowners would gain when a subsidised affordable housing development is developed in the neighbourhood such as the revitalisation of their neighbourhood (Mourouzi-Sivitanidou, 2011).

However, a review of different literature that has looked at the impact of subsidised affordable housing on property values does not have a single conclusive answer about the overall impact of subsidised affordable housing on property value (Cummings and Landis, 1993). Many of the articles read state that subsidised affordable housing has no impact and that it's merely about perception rather than an actual decrease in property values. Which brings one back to the attitudes of NIMBY homeowners. Woo (2014), reveals that the way in which different subsidised affordable housing units are provided impacts differently on nearby property values, he makes particular reference to the fact that different characteristics that each housing program, unit, and neighbourhood environment would result differently in terms of the overall impact on property value. For instance, the single-detached housing unit provided through the BNG policy would have a different impact on a neighbourhood's property value than the medium-to-high rise residential units provided through the social housing program (Nguyen, 2005).

Many studies have been conducted exploring the impact of subsidised affordable housing on property values, however, majority of the findings were fairly inconsistent (*ibid*, 2014). In

addition, many of these studies are context-specific and therefore difficult to use or generalise in different contexts (Nguyen, 2005). Some of the results found that the development of subsidised affordable housing either had negative spill-overs or externalities towards the neighbourhoods thus affecting property values, the development for instance brought undesirables such as noise and traffic into the neighbourhood (Cummings and Landis, 1993). Whilst, in some neighbourhoods the introduction of subsidised affordable housing in their neighbourhood did not only increase property value but also meant that their neighbourhoods experienced a revitalisation by eliminating dis-amenities (such as deteriorating buildings) in the neighbourhoods (Woo, Joh, and Zandt, 2016). Botein and Freeman (2002) also add that the reason why some neighbourhoods experience an increase in their property value may be because the development of subsidised affordable housing is built into an area whereby the socioeconomic characteristic is similar to that of the existing neighbourhood. Figure 6 provides a summary of the results found in prior studies that were carried out investigating the impact of subsidised affordable housing on nearby bonded property values.

Author	Year	Study Area	Subsidised Affordable Housing Type	Research Methodology	Results
Nourse	1963	St. Louis	Public Housing	Test versus Control Area	- (+) in one site - None in two sites
Lyons and Loveridge	1993	Ramsey County	Section 8 New Construction and Rehabilitation Section 8 Existing Vouchers BMIR project Public Housing	Cross Sectional	- Section 8 Existing Vouchers, and BMIR: None - Public Housing: (-) - Section 8 New Construction and Rehabilitation: Mixed
Lee, Culhane, and Wachter	1999	Philadelphia	Public Housing LIHTC Section 8 Certificate and Voucher Federal Housing Administration (FHA) Housing	Cross Sectional	- Public Housing: a modest (-) - LIHTC: a slight (-) - Section 8 Certificate and Voucher: a slight (-) - FHA Housing: a modest (+)
Bento, Knaap and Lowe	1988 to 2005	California	Inclusionary housing		(+) in household prices in neighbourhood (-) in the sizes of households
Castells	2010	Baltimore, Maryland	Three HOPE VI complexes	Difference-in-Differences	- One complex: (+) - Other two complexes: None
Du Preez and Sale	2012	Walmer or Gqebera Township in South Africa	Social Housing	Random Utility Model (RUM)	Negative effect
• (-) indicates a negative impact was found • (+) indicates a positive impact was found • None indicates no impact was found					

Figure 6: Results of prior studies in impacts of subsidised affordable housing on bonded property values (Source: Woo, 2014)

Figure 6 thus helps conclude that the impact of subsidised affordable housing on bonded property values may be different because of the different types of subsidised affordable housing programs such as BNG housing or social housing. Secondly, the impact of subsidised affordable housing on bonded property values could be different because of the different characteristics that neighbourhoods hold or the size of the subsidised affordable housing complex (Woo, 2014).

2.9. Conclusion

Much of the literature reviewed, currently considers many aspects of the impact of subsidised affordable housing to property values. However, the literature review reveals different results because of various factors, such as the context of the study area or the methodology used to assess the overall impact. In addition, much of the literature does not consider the perception of the bonded property homeowner in proximity to their property. Moreover, many of the articles only look at the impact of Low-Income Housing Tax Credit housing subsidy system which is based in America and their neighbouring property values. Although this provides a background and helps with an understanding of the relationship between subsidised affordable housing development and property values it is, however, limited in terms of looking from an African or South African context. Additionally, previous studies revealed that the impact of the negative perception of subsidised affordable housing developments by time honoured residents may in some instances halt the development of subsidised affordable housing developments. The next chapter will consider the study area of Fleurhof and the surrounding neighbourhoods which are likely to be impacted by the subsidised affordable housing development. The chapter also details the hedonic price modelling technique used and how it will be used to investigate the impact of the integrated residential development.

Chapter 3:

The Hedonic Price Model and the Integrated Residential Development of Fleurhof

3.1. Introduction

Research on the impact of subsidised affordable housing on bonded property values in the South African context is very limited. This is because of several reasons such as the limited amount of information available to the public on residential properties in the country. In order to investigate the impact of subsidised affordable housing on bonded property values, a quantitative research methodology using the hedonic price modelling analysis was used in this study, by specifically looking at the case of the integrated residential development of Fleurhof located in the City of Johannesburg (CoJ). Fleurhof is located between Soweto and Roodepoort. This integrated residential development has been chosen for this research because it has been chosen as one of the CoJ's success stories in terms of the delivery of human settlement developments and a private-public partnership between the municipality and Calgro M3, the construction managers of the development (Calgro M3, 2016, EMPEA, 2012). Although, Fleurhof has bonded properties located in the housing development, the development was chosen as it holds more subsidised affordable housing developments than it does bonded properties.

The main methodology in this study is the use of quantitative research methodology using a hedonic price modelling (HPM) analysis technique. For this study, the methodology will quantify defined variables such as property values in order to formulate facts and uncover patterns in the research of the bonded properties located in Roodepoort and Soweto where possible impacts are likely to occur (Investopedia, 2017). This chapter presents the theory of the hedonic price modelling technique and the study area of the integrated residential development of Fleurhof; it further discusses the application of the hedonic price modelling analysis.

3.2. Types of Research

There are two types of data that may be used in research and analysis these data types include qualitative and quantitative data (Dodds, 2010). This study will be using a quantitative research methodology as mentioned earlier as this emphasises objective measurements and statistical or numerical analysis of data which may be collected in various ways including questionnaires or surveys (USC, 2017). According to Kumar (2005 cited in Dodds, 2010), the choice of using a structured quantitative research approach is dependent on the aim of the analysis and the use of findings in the future (process understanding).

Quantitative research examines a hypothesis that is composed of various variables which may be analysed individually or as a whole. The result of this analysis of the hypothesis is expressed numerically through the means of statistics (Dodds, 2010). The numerical data used in this study is sorted with the use of Microsoft Excel and analysed with STATA 13.0 software. The results of the analysis are subsequently expressed numerically. The hedonic price analysis of the explanatory variables which have been selected in this study are considered to impact a property's value and are measured in the form of quantitative research.

3.3. Theoretical Framework of the Hedonic Price Model (HPM)

The hedonic price model which is also referred to as the hedonic regression model determines the price of a property by both its internal characteristics and external characteristics which affect a residential property's value (Investopedia, 2017). This means that the price of a dwelling unit is determined by its internal characteristics which include the property's size, appearance and condition and a property's external characteristics which include factors such as the property's accessibility to schools, shopping centres and the value of other homes surrounding that residential property (Woo, 2014). The term hedonics which comes from the Greek word *hedoniks* means pleasure, in the sense that the model measures the marginal costs of a housing units characteristics that consumers appreciate when buying a property (*ibid*, 2014). Based on the origin of the word this implies that hedonic price model (HPM) is used to estimate a property's price by looking at the utility of that property (*ibid*, 2014). This, therefore, means the HPM is used to estimate the extent to which each characteristic (internal or external) that a property holds affects the price of a property (Investopedia, 2017).

The HPM is based on the assumption that people value the characteristics that a property holds rather than the property on its own for instance, it assumes that a property buyer prefers how many bedrooms a property has than the property without considering its components (Leong, 2003). This emphasises the fact that the method only works well on goods that have varying amounts of attributes and are differentiated by the goods make-up meaning it works sufficiently for a housing unit (Konstantina, Tsiloginnis and Deully, 2016). In the case of a housing unit that is valued using this method, the property's price, therefore, reflects the value of the property based on the set of characteristics that an individual would consider important or desirable when purchasing that property (Opaluch, Grigalunas, Diamantides, Mazzotta, and Johnston, 1999). The HPMs theoretical work is greatly influenced by

Lancaster's (1966 cited in Chin and Chau, 2003) theory of consumer demand and Rosen's (1974 cited in Chin and Chau, 2003) theoretical model.

Lancaster's study (Thanasi, 2015) which is based on the theory of consumption states that the demand for a heterogeneous product (such as a residential property) depends on the different features that a product has which creates a consumers benefit. According to Thanasi (2015:1), "Lancaster defined the concept of utility of products through the value of their special characteristics considering a linear relationship". Lancaster was the first to discuss hedonic utility however his work does not say anything in regards to pricing models (*ibid*, 2015). Hence, Rosen (1974, cited in Leong, 2003), presented a theory on hedonic pricing. Rosen's theory states that a product's price may be valued by its characteristics but those characteristics are considered as the sum price of the product while considering that each attribute has a unique implicit price in an equilibrium market (Chin and Chau, 2003). According to Rosen (1974, cited in Thanasi, 2015), a property is a heterogeneous product and its total value is composed of the sum of each feature that the property holds which has its own unique value, this finding thus concluded that the HPM is not linear as stated by Lancaster. Rosen (1974, cited in Thanasi, 2015) states that a property is made up of a set of attributes that cannot be separated from each other and for that reason are selected according to a combination of what an individual prefers when buying a property. Fundamentally, both theories by Lancaster and Rosen accredit the prices of products based on the relationship between the products price and the number of features that a product would hold (Chin and Chau, 2003). Figure 7 discusses the different contributions made by Lancaster and Rosen toward the HPM.

Lancaster's (1966) Model	Rosen's (1974) Model
Presumed that goods are members of a group and that some or all of the goods in that group are consumed in combinations, subject to the consumer's budget	Assumes there is a range of goods, but that a consumer typically does not acquire a preferred attribute by purchasing a combination of goods. Rather than each good is chosen from the spectrum of brands and is consumed discretely
Lancaster's approach is more suited to consumer goods	Rosen's model is associated with mostly durable goods
Assumes a linear relationship between the price of goods and the characteristics contained in those goods	Postulated that unless it is possible for consumers to trade attributes by untying and repacking them, a non-linear relationship between the price of goods and their inherent attributes would be more probable

Figure 7: Lancaster and Rosen's contribution to HPM (Source: Leong, 2003)

3.3.1. How the model works

When the HPM is used as a valuation method for a property, it firstly assumes that the value of a housing unit is a heterogeneous commodity which has different components to it (Woo, 2014). The model acknowledges the fact that a property has a variety of attributes in it and that these attributes may not be separated from each other (*ibid*, 2014). This is important because when an individual buys a property, that person purchases a package of inherent attributes that come together with a property which therefore refers to the implicit price of a property (*ibid*, 2014). Hence, the HPM hypothesises that housing characteristics are traded as a bundle of inherent attributes (Woo, 2014, Chi and Chau, 2003). The HPM dictates that the market price of a property is accounted for as a function of the different features that a housing unit has (Woo, 2014). Consequently, the basic hedonic equation states that the market price (P), which is considered a dependent variable, of a property, can be expressed as a function of attributes a property has such as the property's structural attributes (SA), neighbourhood characteristics (N) and locational amenities (LA) which are also referred to as the explanatory variables or independent variables in this study (Eq. 1) (Randeniya, Gayani, and Amarawickrama, 2017).

$$P = f(SA, N, LA) \quad (\text{Eq. 1})$$

The price of a property is the aggregate of all implicit prices that are associated with the different features an individual property has. The implicit price of each attribute of the property is derived from a regression analysis (Woo, 2014). This price represents the preference and the willingness of a consumer to pay for each of these attributes (Chin and Chau, 2013). The application of the HPM is based on some key assumptions; firstly the HPM assumes that the market operates under perfect competition whereby all market participants, both buyers, and sellers, have perfect knowledge and all the information on a property's attributes and prices in an effort to achieve price equilibrium (Leong, 2003). This assumption may be valid in the sense that there are many market participants because of the number of buyers searching for houses and the number of developers supplying houses in the market (Woo, 2014). The HPM also assumes that the market is in equilibrium and there are no interrelationships between the implicit prices of a property's features (Xiao, 2017). However, market equilibrium is hard to assume because of the imperfections that exist in reality in the residential property market. Additionally, the assumption that there are no interrelationships between implicit prices on a property's attributes is not plausible because it is clear that

implicit prices of a property's attributes vary throughout different areas and property types (*ibid*, 2017).

3.3.2. Practical Problems with the HPM

The HPM is complex because of the different factors in it which imply that the relationship between price and the characteristics of a property may not be linear. Essentially, this may be seen in instances whereby the price of a property increases at an increasing or decreasing rate when the property's characteristics change (Opaluch *et al.*, 1999). For example, a property's price may decrease when its neighbourhood is subjected to change such as the development of subsidised affordable housing located in close proximity. There are additional limitations in the use of the HPM these limitations include;

Information: the HPM requires that all individuals have prior knowledge of positive and negative externalities that they may face when they have purchased a house (Wheatley, 2011). For instance, they should have prior knowledge of any housing developments that may be constructed in close proximity to their property and how this may or may not affect them (*ibid*, 2011). Additionally, the model can only be applied in the presence of a good number of market exchanges, as the model representing the market requires a good number of properties to be placed into the regression (Forrest, 2015).

Market limitations: the model ideally requires that a variety of different houses are available so that individuals are able to obtain a particular house of their choosing, with a combination of characteristics they desire (Wheatley, 2011). However, in reality, this may not be case, for instance, a nuclear family of four wishing to purchase a large to medium size house with a garden in a busy city centre may find that the city centre only contains small houses, or houses without gardens (*ibid*, 2011). The model also requires that the market is sufficiently transparent (Forrest, 2015).

Price changes: the model also assumes that market prices adjust immediately to changes that occur in attributes. In reality, there will likely be a lag associated with this, especially in areas where house sales and purchases are rare (Wheatley, 2011).

3.4. Study Area; the Integrated Residential Development of Fleurhof, Johannesburg

Fleurhof is an integrated residential development situated on the South West of Johannesburg, Gauteng. It is located between the township of Soweto and the affluent suburb of Florida next to the already existing residential township of Fleurhof extension 1 (Dube, 2013). Fleurhof is situated in the CoJ's Region C and is one of the largest integrated residential developments in Gauteng (CoJ, 2017). The development is located in the urban core of the major urban concentration areas in the City of Johannesburg. This band of development stretches from the Johannesburg Inner City westwards along the mining belt up to Krugersdorp (Khan, 2014). Fleurhof is strategically located as it considers the CoJ's development plans to develop the East-West and North-South corridors of the city.

Fleurhof is located on the urban edge of the CoJ and has good access to the R41 and Fleurhof Drive which as a part of the development of the housing development of Fleurhof has been earmarked as a main connector route between Main Reef Road in the North and Soweto Highway to the South (Khan, 2014). Fleurhof Drive links the segregated areas of Florida and Roodepoort located in the north to Meadowlands in the South. This will therefore, give residents greater access to more economic opportunities and access to urban amenities (Calgro M3, 2016).



Figure 8: Locality of Fleurhof (Source: GIS Data and Fleurhof, undated)

Fleurhof covers a total of 4.4km² with a total of 10 411 residential units, housing an estimate of 83 000 people (Calgro M3, 2014). The development is a mixed mode human settlement development which includes various housing typologies and tenures which are targeted at specific economic markets which comprise of fully subsidised BNG housing, social housing, open market rental housing and open market bonded housing as depicted in figure 9 (Khan, 2014). This makes the development appealing to different markets and users allowing people from all classes, race and financial backgrounds to integrate in a once-segregated city (Calgro M3, 2014). Additionally, the development provides more integration between various incomes earners as the development has introduced high-density residential and mixed land uses on the site (Khan, 2014). As an integrated development Fleurhof also has other urban amenities such as crèches, religious sites, business centres, schools, parks and a community centre (Calgro M3, 2016).

Housing Tenure	BNG Houses	Social Housing	Open Market Bonded Housing	Open Market Rental Housing
Total Number of Housing Units	3 236	4 429	2 122	624

Figure 9: Total Number of Residential Units according to Housing Tenure (Source: Calgro M3, 2016)

Construction of the housing development of Fleurhof began in 2011 by the City of Johannesburg together with Calgro M3 and International Housing Solutions (IHS) which is an investment manager on community-centred affordable housing projects in sub-Saharan Africa (EMPEA, 2012). IHS funded majority of the development, investing R105.8 million while other financiers of the development include the Gauteng Partnership Fund (GPF) and the Social Housing Regulatory Authority (SHRA). Other stakeholders of the development include Gauteng Department of Human Settlements, First National Bank (FNB) and Madulammoho Housing Association (Madulammoho, 2013). Calgro M3 managed and oversaw the development of Fleurhof (EMPEA, 2012). The development is due for completion in 2018 (Thome, 2017).



Figure 10: Layout of Fleurhof (Source: Calgro M3, 2016)

The aim of the development of Fleurhof is to address Soweto's growing housing need in an integrated way to reverse the spatial planning of the apartheid era (*ibid*, 2012). The partnership between the CoJ and Calgro M3 to develop the integrated residential development of Fleurhof aimed at firstly alleviating the housing and municipal service backlog in Johannesburg and also the development was inspired by the National Housing's call for improved human settlement delivery according to the BNG policy (Calgro M3, 2014). Additionally, CoJ and Calgro M3 aimed at making this development a benchmark particularly in Gauteng on how to sustainably and efficiently manage the country's rapidly growing urban population (Dude, 2013). The integrated residential development of Fleurhof is in line with BNG housing policy principles and follows the guidelines of the IRDP found in the Housing Process Guide (*ibid*, 2013).

3.4.1. Surrounding Neighbourhoods

The integrated residential development of Fleurhof as mentioned above is located between the formally established township of Soweto and the affluent suburb of Florida in Roodepoort, next to the pre-existing township of Fleurhof extension 1 (Calgro M3, 2014). The locality of the development is ideal in the sense that it is on the urban edge of

Johannesburg and this follows the guidelines of the Gauteng Provincial Government in 2007 (*ibid*, 2014). This section briefly describes the surrounding neighbourhoods of the housing development of Fleurhof which are likely to be impacted by the development.

- **Soweto**

Soweto which is the English syllabic abbreviation for **South Western Township** is a township located on the South-West of CoJ in Gauteng as the name indicates (Ramchander, 2004). This name was adopted by the Non-European Affairs Department of Johannesburg City Council in 1963 (Molelu, 2014). Soweto was its own municipality separate from Johannesburg, but now it has been integrated into the City of Johannesburg Metropolitan Municipality (Property24, undated). Soweto is accessible from major road links including the N1, N12, N17, M1 and M70.



Figure 11: Soweto (Source: Google Maps)

Soweto is the largest black residential area in South Africa with a total population of 1.6 million people. This is because the area was originally designated for the black working population during the apartheid era (Quantec, 2016; Ramchander, 2004). Soweto consists of 34 suburbs covering an estimated area of 106.44km² (Ramchander, 2004). Soweto which is located in Region D in the CoJ, is largely composed of old tiny matchbox housing units made of a mix of iron, wood, and brick which were built during the apartheid era to provide cheap accommodation for the city's workers (CoJ, 2013).

According to Stats SA (2011), a large portion of households (28.6%) in Soweto rent their housing units. However, much of that percentage 10.4% is made up of households renting

backyard shacks. An estimated 21.4% of households in Soweto own and have fully paid off their housing units. However, this number also includes informal human settlements and fully subsidised affordable housing provided by the government. Figure 12 depicts the average household income of the residents of Soweto in 2011. The figure shows that an estimate of 19% of the population of Soweto fall in the no income bracket and only 2.4% of population earns more than R307 600 a year (Quantec, 2011). This asserts Lightstone (2017) findings which conclude that Soweto's predominant Living Standard Measure (LSM) is between LSM 4 – LSM 7 low, which indicates that many of the residents of the township have a low standard of living and disposable income.

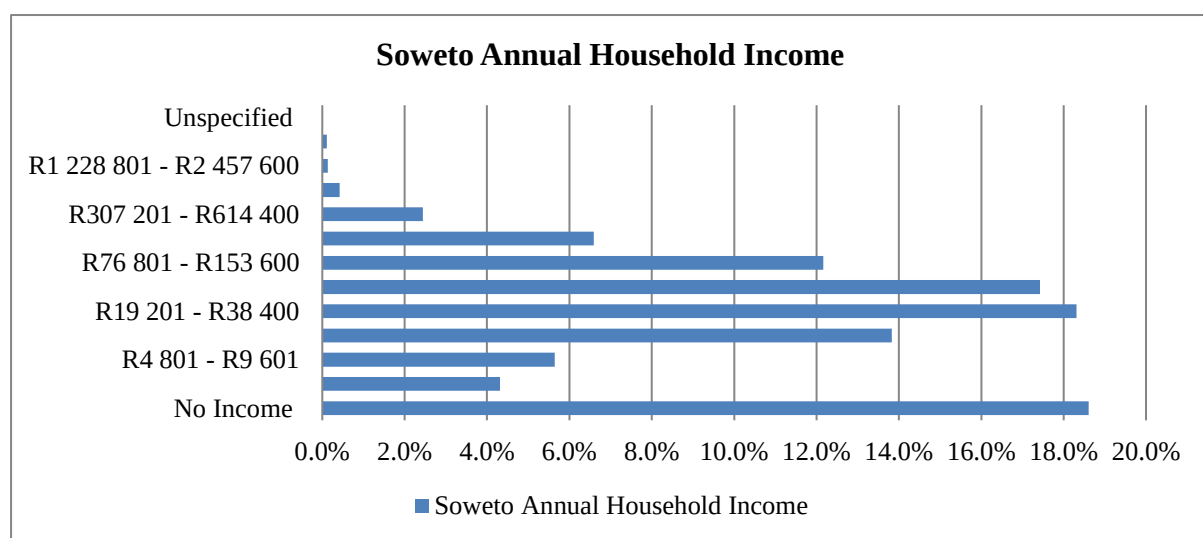


Figure 12: Soweto's Annual Household Income in 2011 (Source: Quantec, 2011)

- **Roodepoort**

Roodepoort which means red valley in Afrikaans forms the Western edge of Witwatersrand (Chipkin, 2012). Roodepoort-Maraiburg was established as a municipal district in 1903 and later in 1963 Roodepoort-Maraiburg municipality was changed to Roodepoort and gained city status in 1977 also dropping Maraiburg from its name (Roodepoort Info, 2012). In the 1990s Roodepoort became a part of the CoJ following the reorganisation of the local government. Roodepoort covers a total area of 161.50km² with a total population of 225 000 which is dominated by black Africans, who make up 51.42% (in 2011) of the total population in the area (Frith, 2011, Roodepoort Info, 2016). Roodepoort is predominantly a residential area with 67 residential suburbs, it also however has agricultural holdings which are located in the north of Roodepoort, part of the mining belt in the South and some areas of commercial activity and other urban amenities may be found in the area (Roodepoort Info, 2016).



Figure 13: Map of Roodepoort (Source: Google Maps)

Roodepoort has a growing population because of the increasing number of small industries and businesses located in the area including the university campuses located in the area (Roodepoort Info, 2016). Of the total population of Roodepoort, 65% are economically active and 24% are of the school going age. According to Quantec (2011), much of the population of Roodepoort (65.3%) reside in formal concrete housing units. However, Roodepoort also has a large amount (10.4%) of backyard informal human settlements in the area. Figure 14 depicts the annual household income of residents of Roodepoort in 2011. The average household income range of Roodepoort's population ranges from R45 000 to R55 000, with 16.5% of the population earning between R307 201 - R614 400 (Lightstone, 2017, Quantec, 2011). The influx of middle class individuals and families into the area is because of the close proximity of Roodepoort to other larger Gauteng cities and also the well-established and advanced infrastructure that Roodepoort has to offer, including transport routes (Property24, undated). According to Lightstone Property (2017), Roodepoort has a LSM of 9 indicating that many of the residents in the area have a high standard of living and disposable income.

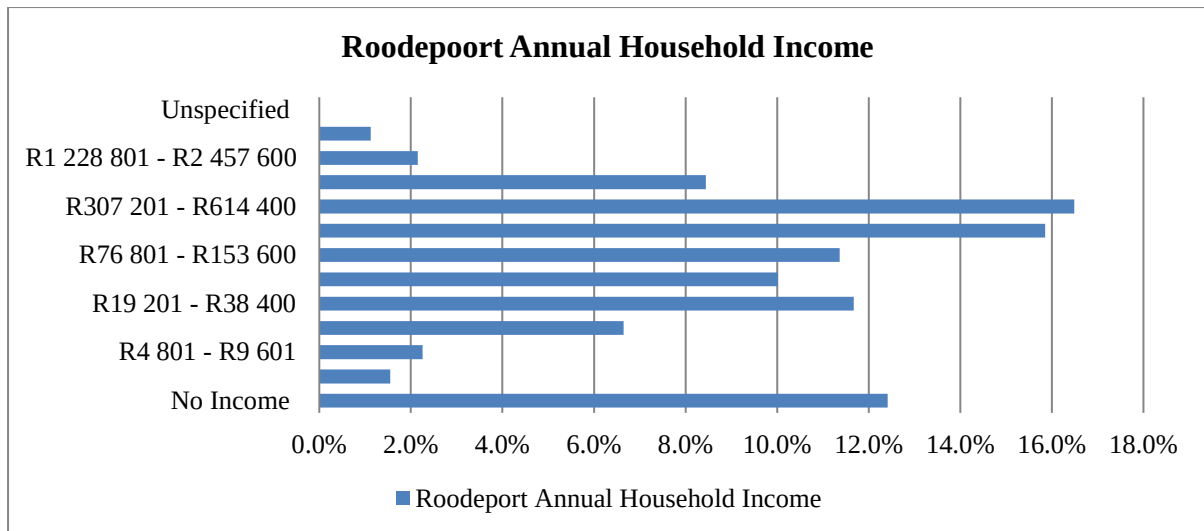


Figure 14: Roodepoort's Annual Household Income in 2011 (Source: Quantec, 2011)

- **Florida**

Florida is a residential suburb located about 20km from the central business district of Johannesburg in Roodepoort (Rawson, undated). It was predominantly a dormitory town; housing white employees of the mines mainly the shift bosses during the apartheid era thus the area was designated as a white area (Cameron, 2010). However, post-1994 Florida has witnessed the movement of mainly coloureds into the area, this is because of the area's close proximity to the coloured townships of Bosmont and Coronationville (*ibid*, 2010). Presently, Florida is made of black Africans making up 35.94% of the total population of 20 082 in the area (Quantec, 2016). The suburb still has a sizable population of coloureds (29.6%) (Frith, 2011). The main types of housing in Florida consist of free-standing houses as well as flats.



Figure 15: Map of Florida (Source: Google Earth, 2016).

As Florida has grown over the past years, the suburb has seen more modern homes and apartments being built (Rawson, undated). The suburb has become a distinctly a middle class node with many of the houses sold around the area starting at R350 000 for a flat to R2.1million for a large luxurious family home. Florida has an average household income range of R17 000 – R25 000. The suburb is mostly attractive to first home buyers in their early 20s to 40s as this age group accounts for up to 70% of all property purchases (Property24, undated). According to Lightstone Property (2017), an estimate of 43% of the recent buyers of property's in the area fall between the ages of 36-49. Florida is well served by public transport and has easy access to the N1 freeway (Rawson, undated).



Figure 16: Fleurhof and Surrounding Neighbourhoods (Source: Google Earth)

3.5. Methodology

This study assesses the impact of the integrated residential development of Fleurhof based on housing sales data dating from 2001-2017 from the suburbs of Meadowlands East Zone 1 and Orlando West in Soweto and Florida in Roodepoort. This section describes the data sources and the format to be used in the study to analyse the impact of the housing development on surrounding property values. The HPM determines how various attributes of different housing units affect value. The traditional HPM technique is based on a multiple regression model, which observes a large number of property transactions which are shown as an independent variable and the value determinant as a dependent variable (Bello, 2009). Because it is impossible to sell a property's attributes separately the regressions coefficients

give way to the marginal contribution of each attribute to the sales price for the respective property, this, therefore, accounts for the differences in the way the price index of real estate is constructed from other property types. Hence the use of equation 2;

$$P = f(SA\beta, N\gamma, LA\alpha) + \varepsilon \quad (\text{Eq. 2})$$

Where;

- P : a vector of observed logarithm of house values or prices
- SA : a matrix of physical attributes of the property
- N : the neighbourhood's characteristics
- LA : the distance of a property to amenities
- ε : the disturbance or the error term

The parameters (α, β, γ) describe the relationships between property prices and the measures included in the 3 classified attributes (SA , N , and LA). The incremental change in the price of the house represents the additional amount house buyers are willing to pay for a marginal change in the attribute holding all the other attributes constant (Ham, 2011).

3.5.1. Explanatory Variables

The unit of analysis in this study is the integrated residential development of Fleurhof. Data for housing duration and sales prices for the surrounding suburbs of Meadowlands East Zone 1, Orlando West and Florida were acquired from Lightstone Property. The advantage of acquiring data through Lightstone Property is that it is a reputable property data acquisition company with reliable residential property data. The data also holds all sales transaction records. As mentioned earlier the data spans from 2001 to 2017, this is important as it considers the time before the construction of the development of Fleurhof to where the development stands presently (pre-construction and post-construction). Available structural attributes, locational amenities and neighbourhood characteristics for the bonded properties around Fleurhof are shown in figure 17. These variables have been considered as the explanatory variables or the independent variables which have an impact on a property's value, they have been considered according to the HPM basic equation (seen in Eq. 1).

Classified Attributes	Attributes
Structural Attributes (SA)	Erf size Bedrooms Bathrooms Property's Age Garage
Locational Amenities (LA)	Distance of bonded property to the integrated residential development of Fleurhof Distance to Schools Distance to Clinics Distance to Police Stations Distance to a Retail Centre
Neighbourhood Characteristics (N)	Race Attributes

Figure 17: Explanatory Variables (Source: Authors Own)

Structural Attributes (SA): also referred to as the internal attributes of a residential unit describe the physical characteristics of the house (such the number of bedrooms, bathrooms and the size of the house) (Xiao, 2017). The value of a property is frequently related to these attributes, if a property has more desirable attributes in comparison to other properties, the valuation of these attributes would be reflected in higher market prices for the house (*ibid*, 2017). Additionally, property owners are willing to pay more for a larger house especially if that property has more functional space (Randeniya *et al.*, 2017). Kohlhase (1991) found that the significance of structural attributes can change over time, and may vary between nations. While attributes relating to the number of rooms and floor area are relatively important across nations, other attributes change with the tradition of building style or the climate (Chin and Chau, 2003).

Locational Amenities (LA): the accessibility to urban amenities and the CBD, no matter how accessibility may be defined, directly affects the price of a property (Kohlhase, 1991). Leong (2003) notes that many property owners prefer buying properties with good views such as the sea, river or a park and are willing to pay more for such a site. However, there are special cases based on the country or culture (Leong, 2003). Some location attributes impact positively while others have a negative impact on the value of a property. For instance, the view of a cemetery may have a negative impact on a property's price (Randeniya *et al.*, 2017). In the case of this study, the distance of Fleurhof's subsidised affordable housing development is closely considered.

Neighbourhood Characteristics (N): depict the quality of economic and social characteristics of the neighbourhood (such as the racial composition of a neighbourhood in the case of this study). As according to Metz (2016), the concentration of race particularly of black people in

a neighbourhood decreases an areas property value when socio-economic conditions are controlled for. Other neighbourhood characteristics include the quality of Municipal services (such as schools, hospitals and places and worship) located in a neighbourhood and externalities such as the crime rate, traffic noise and airport noise (Randeniya *et al.*, 2017).

3.5.2. Data Collection

Collecting data was a complex and tedious exercise, however, primary data for this study was eventually derived from Lightstone Property, and 1100 bonded properties around the development of Fleurhof in suburbs of Meadowlands East Zone 1, Orlando West and Florida were selected. Houses were selected randomly to do a cross-sectional analysis of Fleurhof's housing development impact on surrounding house prices. The large number of properties is considerably important as it makes the analysis more robust as Forrest (2015) states that a good number of market exchanges are important when running regressions. Zerga (2010) states that, a larger sample size with a wider location and many property types' results in a stable coefficient. The overall regression with a larger sample frame may result in some instances whereby the results have biased coefficients because of wrong specifications. Whilst, a smaller sample frame may not be enough to correctly apply a regression (Zegra, 2010). The number of houses selected for this study per suburb is depicted in figure 18.

Town	Suburb	Number of Bonded Houses	Market Timing Variables
Soweto	Meadowlands East Zone 1	329	2001-2017
Roodepoort	Florida	585	2001-2017
Soweto	Orlando West	186	2001-2016
Total		1100	

Figure 18: Houses per Suburb (Source: Calgro M3, 2016)

The data also includes market timing variables; this indicates the year that each property was sold. Neighbourhood demographic data (racial composition data) was obtained through Quantec data and Geographic Information Systems (GIS) shapefiles which were available from the University of Witwatersrand Geography department in the form of qualitative data. Once data is received in an Excel Spreadsheet, the data is then carefully inspected for any inconsistencies particularly the property prices and the characteristics. Corrections were made to the data when inconsistencies were found, this is so that when the data is put into a regression there are no faults, problems or any omitted data. The data is applied into the regression using STATA which estimates the hedonic price and STATA identifies the

specification that best suits the data that is collected (Mourouzi-Sivitanidou, 2011). The regression subsequently estimates the implicit prices of the different explanatory variables to estimate the total price of the bundle characteristics of the individual property (*ibid*, 2011).

3.5.3. Data Analysis

In order to investigate the impact of Fleurhof's integrated housing development on surrounding property prices, a simple Ordinary Least Squares (OLS) regression or a linear regression was utilised using STATA software to run the regressions. A regression measures the impact or the relationship of one or more independent variables on a single dependent variable, determining how the independent variables influence on the dependent variable (Corsini, 2009). The results given by the regression can be further used to predict future results (Monson, 2009). In the case of this study, the property's price or property value was considered as the dependent variable and the explanatory variables (such as the houses structure, location to amenities and the neighbourhood characteristics) were the independent variables. A regression analysis is particularly useful in this study as it allows for the measurement of the level of significance (or insignificance) of each individual variable on the dependent variable (*ibid*, 2009).

An OLS regression is a generalised linear modelling technique which is used to model a single response variable which is recorded on at least an interval scale (Hutcheson, 2011). The OLS technique uses the least squares principle to fit a pre-specified regression function through collected data, whereby it minimises the sum of squared in the difference between the observed and predicted values of the dependent variable (Pedace, 2013). The OLS multivariable model has been used in this study as it allows for the use of more than one independent variable and allows for the determination of statistically significant variables according to the considered independent variables as mentioned earlier. The use of more than one independent variable provides for the best regression model in the case of this study as it increases the robustness of the model.

The hedonic OLS model allows for the estimation of the effects of a residential property's physical characteristics, neighbourhood characteristics and locational amenities, and the distance to the housing development of Fleurhof on bonded property prices. The statistically significant variables were identified using adjusted R-squared ($\text{adj } R^2$) statistic and P-value. R-Squared is the proportion of difference in the dependent variable (property price) which

can be explained by the independent variables (locational amenities, neighbourhood characteristics and structural attributes) (Frost, 2013). While, adjusted R-squared regulates the R-squared for the independent variables which have a significant impact in the model. Thus, this study considers the adj-R^2 is used as to identify significant variables in the regression. R-squared was also considered as it is an overall measure of the strength of the regression and does not reflect the extent to which any particular independent variable is associated with the dependent variable (UCLA, undated). Essentially, adjusted R-squared represents the percentage of the response variable variation which is explained in a linear model. The percentage of adjusted R-squared falls between 0 and 100%, whereby (Frost, 2013);

- 0% in the regression results shows that the model does not explain the variability of the response data while,
- 100% in the regression results shows that the model explains all the variability of the response data.

The higher the adjusted R-squared, the better the model fits the data. However, adjusted R-squared does not show whether a regression model is adequate or not. For instance, a low adjusted R-squared value may indicate a good model or a high adjusted R-squared value may be shown for a model that does not fit the data, thus the P-value was also used in this study to ensure that the independent variables were significant in the model (Frost, 2013). P-value in a regression measures the amount of statistical evidence which supports an alternative hypothesis (Dodds, 2010). The p-value also measures the statistical significance of each individual independent variable in the regression. According to Keller and Warrack (2003 cited in Dodds, 2010) the P-value results may be interpreted in the following way;

P-value Findings	P-value outcome
If P-stat is less than 1%:	Overwhelming evidence of statistically significant or highly significant.
If P-stat lies between 1% and 5%:	Strong evidence of statistically significance or result is significant.
If P-stat lies between 5% and 10%:	Weak evidence of statistically significance or result is not statistically significant.
If the P-stat is greater than 10%:	No evidence of statistically significance.

Figure 19: P-value level of significance (Source: Dodds, 2010)

The p-value shows the level of randomness, when P-value is high the t-Stat is low, and vice-versa. A low P-stat means a good fit for the independent variable under analysis (Dodds, 2010).

3.6. Limitations

Limitations of this study include the lack of sufficient and unlimited information pertaining to the collection of data on each independent variable for this study. Firstly, the access to data was challenging as initially more variables were considered to be used in this study, however once data was received the data was insufficient with fewer variables and with missing details thus more collection needed to be done. Secondly, the use of the STATA initially posed to be a problem, however, after much work the software was clearly understood and therefore easy to use. The possession of the software also posed to be a challenge.

Furthermore, the limitation of the quantitative research methodology is that the findings after data collection may be difficult and time-consuming to characterise in a visual way. The data may be difficult to analyse and may not fit into standard categories. Additionally, the limitation of undertaking a quantitative research is that finding the relevant data may be difficult and in addition since a multiple regression model will be used which one does not clearly understand may prove to be another limitation especially interpreting the data in a logical manner.

3.7. Conclusion

To conclude, the study uses a quantitative research methodology using the Hedonic Price Modelling technique using STATA software to run regressions. The case study of the integrated residential development has been considered in this study based on the locality to bonded properties situated around the housing development. Properties selected in this study include properties situated in the suburbs of Meadowlands East Zone 1 and Orlando West in Soweto and the suburb of Florida in Roodepoort. The next chapter details the preliminary findings of the impact of the Fleurhof on surrounding property values. By firstly, testing the correlation of the selected variables in this study in an effort to ensure the reliability of the data.

Chapter 4:

Reflecting on the estimation results of the HPM on property values

4.1. Introduction

This study applied a multivariable OLS regression with the use of the linear formulation and log-log formulation using STATA to run the regressions. The hedonic model used 10 independent variables. This chapter of the study presents the results of empirically estimating the HPM and the regression results. The hypothesis of this study states that the integrated residential development of Fleurhof has a does not have an impact on surrounding property prices. To test this hypothesis, the methodological approach of this study factors in the distance of each individual property to the housing development of Fleurhof to the property price of each property to investigate whether the integrated residential development affects housing values.

This chapter analyses the hedonic price of residential properties in the selected suburbs of Meadowlands East Zone 1, Orlando West and Florida. The analysis starts with the definition the selected explanatory variables and dependent variables. Data adjustments and the descriptive statistics computed for the data are explained. Then the hypothesis is tested for. It is tested for in this study by applying two models the first is by testing to see the impact by suburb and the second looks at property prices before the construction of the housing development in comparison to property prices presently at the current stage of the housing development. In the last part of the study, estimation results are presented.

4.2. Data

4.2.1. Data Capture

The data from the hedonic price model was coded with the use of Microsoft Excel, explanatory variables were selected from those provided by Lightstone Property and then analysed using STATA software. This allows for the data to be analysed using quantitative methods. After the data was analysed through the use of a multivariable OLS regression model and a correlation matrix, the data was interpreted.

4.2.2. Selection of Model Variables

Explanatory variables chosen for this study are detailed in figure 20. Variables were categorised into three main categories which include structural attributes, locational amenities and neighbourhood characteristics as mentioned earlier. A total of 10 variables were selected

for this research. These variables were selected because as mentioned earlier a property is considered a hedonic good which is impacted by both its intrinsic (structural attributes) and extrinsic (locational amenities and neighbourhood characteristics) attributes which impacts a property's value.

Dependent Variable	
Purchase Price	The purchase price of the property
Structural Attributes	
Variables	Definition
Erf Size	Size of the house on the plot
Bedrooms	The number of bedrooms in each individual property
Bathrooms	The number of bathrooms in each individual property
Property's Age	The age of the property
Year	The year the property was sold
Locational Amenities	
Variables	Definition
Clinic	The distance of each property to the nearest clinic
Police Station	The distance of each property to the nearest police station
School	The distance of each property to the nearest school
Retail Centre	The distance of each property to the nearest retail centre
Fleurhof	The distance of each property to the integrated residential development of Fleurhof
Neighbourhood Characteristics	
Variables	Definition
Racial Composition	The racial make-up of each property specifically the makeup of black people in a neighbourhood

Figure 20: Definition of selected variables (Source: Authors Own)

4.2.3. Data Adjustment

Cleaning and the organisation of the data was a tedious however it was necessary as it is regarded as highly important (Zegra, 2014). The original data acquired included sales from 2001-2017 for the suburbs of Meadowlands East Zone 1, Orlando West and Florida. The dependent variable (purchase price) was adjusted in order to account for inflation and the general increases in housing prices over the 16-year sample period. Purchase price was adjusted according to 2017 property prices using a property index. The property purchase price was adjusted for as according to Ball (cited in Dodds, 2010), it is better to run regression which have the escalated purchase price for the property rather than running regressions with the average purchase price. The calculations were calculated using Stats SA inflation index data as depicted in figure 21.

Month	Inflation Index	Inflation Percentage
2017	103.3	4.77%
2016	98.6	5.94%
2015	93.1	4.97%
2014	88.7	6.35%
2013	83.4	6.34%
2012	78.4	4.94%
2011	74.7	5.19%
2010	71.1	3.75%
2009	68.5	5.17%
2008	65.1	13.41%
2007	57.4	7.03%
2006	53.7	5.02%
2005	51.1	3.41%
2004	49.4	1.48%
2003	48.7	5.20%
2002	46.3	9.70%
2001	42.2	5.20%

Figure 21: Inflation Index (Source: Stats SA, 2017)

Data such as the number of garages was omitted from the regressions as the data showed inconsistencies. Additionally, data such as the racial composition specifically the makeup of black people in each neighbourhood per property, which was initially collected qualitatively (acquired in text-form), was numerical transformed on excel. This was done so that the data would run on the regressions. In order to account for the log-log formulation to achieve linearity and normality in the data, variables in the data were transformed into a linear form with the use of LN (logarithm) function on Microsoft Excel. Logarithmic transformations were applied to both independent and dependent variables to decrease the skewness of the data.

4.2.4. Descriptive Statistics

Figure 22 below depicts the descriptive statistics of the variables for 1100 observations or properties used in running the regressions. It presents the average purchase price (dependent variable) of houses located close to the subsidised affordable housing development of Fleurhof at R437 045.10, with a minimum value at R222.63 and the maximum value at R6 624 090.00. Other descriptive headings include standard deviation; maximum and minimum values of structural attributes, locational amenities and neighbourhood characteristics of the houses selected which affect a property's value. As depicted by the table there are some big

differences that may be spotted particularly with the ERF size of properties. The variables used in the descriptive statistics are divided into 3 categories (structural attributes, locational amenities, and neighbourhood characteristics) under structural attributes the data includes the property's age, number of bedrooms, bathrooms and the transaction year (depicted as year in the table). Under locational amenities variables include the distance to the housing development in Fleurhof, distance of each property to the clinic, schools, police station and a retail centre. And under neighbourhood characteristics, variables include the racial composition in each property.

The average ERF size of properties located in the 3 suburbs (Meadowlands East Zone 1, Orlando West and Florida) is 537m² with the smallest property being 21m² and the largest 3267m². This is because the data includes houses located in low-income suburbs of Meadowlands East Zone 1 and Orlando West and the affluent suburb of Florida.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Dependent Variable					
LNreal purchase price	1100	11.57904	2.208159	5.405511	15.70622
Real purchase price	1100	437045.10	523303.60	222.63	6 624 090.00
Structural Attributes					
erf size	1100	537.0364	590.2749	21	3267
LNproperty age	1100	3.456305	0.5001687	2.188296	4.47553
bathrooms	1100	1.330909	0.5220777	1	4
bedrooms	1100	2.468182	0.7375823	1	6
year	1100	2006	4.24898	2001	2017
Locational Amenities					
LNdist to Fleurhof	1100	7.479643	0.0719978	7.243484	7.570777
clinic	1100	6281.252	5520.331	1164	122199
LNclinic	1100	8.474055	0.7376852	7.059618	11.71341
school	1100	1524.925	756.4968	39	4200
LNschool	1100	7.157952	0.6817952	3.663562	8.34284
police station	1100	2816.974	1301.336	162	6058.714
LNpolice station	1100	7.81779	5309471	5.087596	8.709253
retail centre	1100	4527.19	2519.35	330.5654	8814
LNretail centre	1100	8.22915	0.6519196	5.800805	9.084097
Neighbourhood Characteristics					
racial composition	1100	0.6563636	0.4751375		

Figure 22: Suburb Model - Descriptive Statistics (Source: Authors Own)

4.2.5. Correlation Analysis

The first step in a Multiple Regression Analysis (MRA) is to identify the dependent variable (the purchase price of bonded properties) and the explanatory variables, these variables are therefore included in the model. A random number of properties are selected and the variables are recorded for each property. The next step is to identify the relationships between the dependent variable and the independent variables. This relationship analysis which is also referred to as the correlation matrix was computed using STATA (Dodds, 2010). When examining the regression model that is created, it is important to measure the relationship between the independent variables and the dependent variable using the correlation matrix (*ibid*, 2010). The matrix helps investigate the direction and strength of the linear relationship using an upper and a lower limit of -1 to 1. If the coefficient equals -1, a negative relationship exists and if the coefficient equals 1, a positive linear relationship exists (*ibid*, 2010). Variables with a coefficient higher than 50% suggest a strong correlation. If a relationship is established a multivariable regression may consequently be applied for further analysis (*ibid*, 2010). The correlation matrix was computed using STATA in order to understand the relationship of the variables on each other as the aim of this study is to understand how the independent variables impact the dependent variable.

Correlations between the explanatory variables used in this study and the dependent variable are depicted in figure A (Suburb Model Correlation Matrix) found in the appendix. The figure shows a rough estimate of the interaction between the explanatory variables and purchase price. The table depicts that purchase price has a positive relationship with the variables ERF size, bathrooms, bedrooms, year, distance to schools and distance to police station. The figure depicts that the dependent variable has a strong correlation with distance to schools and the police stations. This shows the importance of these variables in determining the price of a property and consequently has a high explanatory power in a multiple regression model. The table also shows that the dependent variable has a negative relationship with the distance to Fleurhof variable as its coefficient is negative (-0.1304), this gives some perspective as how the distance of the housing development impacts bonded property prices. All the other variables have a weak correlation with purchase price as they hold a coefficient below 40%.

4.2.6. Functional Form

The choice of a functional form in a regression is important as it impacts the interpretation of the parameters that are to be estimated. It is determined empirically by testing different functional forms such as linear, log-linear (semi-log) and log-log functional forms (Academlib, undated). The functional form is based on deduced assumptions about price influencing characteristics. This study applied the log-log functional formulation. The log-log formulation transforms both the independent and the dependent variables with natural logs. By transforming both sides of the equation (the dependent and the independent variables) linearity which is the desired criterion in the OLS model is achieved (Academlib, undated). The logarithmic transformation of the variables thus makes it easier to calculate statistically. This study uses the log-log functional form to explain the impact of the housing development located in Fleurhof on bonded house prices. The log-log hedonic equations that are estimated are given by;

$$\ln P = \alpha + \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \dots + \beta_{10} \ln X_{10} \dots + \delta_1 Z_1 \quad (\text{Eq. 3})$$

Where $\ln P$ represents the log-transformed property value of the investigated houses. X_1 to X_{10} represents the different explanatory variables that are considered which affect a property's value. While Z_1 represents the perceived dis-amenity which is the distance of each individual property to the integrated residential development of Fleurhof. The dependent variable used in estimating the hedonic equation was the purchase price of individual properties located close to the integrated residential development of Fleurhof.

4.3. Model 1: Suburb Model

The first model in this study will be running regressions by the acquired suburbs of Florida, Meadowlands East Zone 1 and Orlando West. This is done to test for the impact of the integrated residential development of property values on the different suburbs.

4.3.1. Multicollinearity

Multicollinearity is defined as the perfect or the exact relationship among some or all the explanatory variables in a regression (Gujarati and Porter, 2012). This means that one or more explanatory variables in the regression can be used to predict another explanatory variable because of its high correlation. This, therefore, makes the information superfluous

and skews the results in the regression (Anadale, 2015). Multicollinearity was tested for as its presence in a regression model may inflate the confidence intervals in the regression thus resulting to bias regression results which creates a problem when evaluating the regression. Multicollinearity was calculated for using STATA's variance of inflation factor (VIF) command. VIF measures how much variance of an estimated regression coefficient increases if explanatory variables are correlated. If the variance of the coefficients increases, the model will not be as reliable. The VIF is calculated by taking an explanatory variable and in the case of this research the variable of interest is the distance to Fleurhof, and regressing it against every other explanatory variable in the model (Andale, 2015).

Variance inflation factors range from 0 and upwards. The numerical value for VIF which is in decimal form indicates the percentage of variance that is inflated for each coefficient. According to Heckman (2015), the higher the variance the less reliable the explanatory variable is in the regression.

Status of Explanatory Variable	No explanation	Not Correlated	Moderately Correlated	Highly Correlated
VIF	0	1	Between 1 and 4	Greater than 4

Figure 23: Rule of Thumb when interpreting VIF (Source: Andale, 2015)

Variable	VIF	1/VIF
LNretailce~e	3.35	0.298628
LNclinic	2.33	0.42936
LNpolicest~n	2.05	0.487155
racialcomp~n	2.03	0.491942
LNschool	2.02	0.494878
bedrooms	1.66	0.602749
bathrooms	1.65	0.604449
erfsize	1.63	0.61417
LNproperty~e	1.63	0.614448
LNdisttoFl~f	1.2	0.834907
Mean VIF	1.96	

Figure 24: Suburb Model - VIF summary output (Source: Authors Own)

Figure 24 depicts the VIF of the explanatory variables; bathrooms, bedrooms, retail centre (log), police station (log), erf size, racial composition, school (log), clinic (log), property's age (log) and distance to Fleurhof (log). Based on the rule of thumb as depicted in figure 23 the variables lie between moderately correlated which means the variables may be considered to be reliable in the regression.

Another approach to detecting multicollinearity is to have a look at the correlation matrix as depicted in figure B (attached in the appendix) of the explanatory variables, where a strong correlation between two variables can indicate a collinearity problem (Weißer, 2013). A correlation matrix displays the correlation coefficients among the explanatory variables in a regression analysis (Killam, 2014). In a correlation matrix, the positive or negative sign tells you the direction of the relationship while the number tells you the strength of the relationship (Killam, 2014). In order to judge the strength of the correlation consider the number of the correlation coefficient as the direction of the coefficient or the sign does not affect the strength of the relationship and that is what the matrix is looking for the strength of the relationship of the coefficient against other explanatory variables (*ibid*, 2014).

Correlation	Strength of the Linear Relationship		
1	Perfect		
0.8 – 1.0	Very strong		
0.60 – 0.80	Strong	+1.00	Perfect positive relationship
0.40 -0.60	Moderate	0.00	No relationship
0.20 - 0.40	Weak	-1.00	Perfect negative relationship
0.00 – 0.20	None to extremely weak		

Figure 25: Correlation Matrix Interpretation (Source: Killam, 2014)

Figure B Suburb Model Correlation Matrix of the Explanatory Variables (attached in the appendix) depicts the correlation matrix of the explanatory variables chosen in this study. The figure depicts a correlation coefficient of 1.00 which means that the two variables are perfectly correlated. In the figure where the correlation coefficient is 1.00, this shows the correlation of the explanatory variable with itself, which suggests that the variables are perfectly correlated, which is expected because the variable should perfectly correlate with itself (Killman, 2014).

The variable of interest distance to Fleurhof shows a weak relationship with the other independent variables indicating that multicollinearity is not an issue in this study. The other explanatory variables also show a weak relationship with the other variables with the exception of variables such as clinic and LNclinic, school and LNschooll, police station and LNpolice station and retail centre and LNretail centre which is the log transformation of the original variable. This is not concerning as regressions run with clinic are run without LNclinic, for instance, as this affects the reliability of the regression.

4.3.2. Heteroscedasticity

Heteroscedasticity is a Greek term which refers to the systematic pattern whereby the variability of the disturbance term (ϵ seen in Eq.2) of the model is not constant or unequal across the range (Taylor, 2013). The variance of the disturbance term may be greater for some observations than for others (*ibid*, 2013). For instance, this would be seen where the variance of the disturbance term differed between the different housing typologies used in a study (Dodds, 2010). Heteroscedasticity was tested for as it is commonly encountered in cross-sectional analyses and the OLS model assumes that all variables in the analysis are equally reliable. The presence of heteroscedasticity means that the regression is an inefficient and an unstable regression model which could yield unconventional predictions at a later stage. Heteroscedasticity was tested for using the Breusch-Pagan-Godfrey or the Breusch-Pagan test on STATA. The Breusch-Pagan test measures how difference of errors increase across explanatory variables (Andale, 2015).

Breusch-Pagan/Cook-Weisberg test for heteroscedasticity	
Ho:	Constant Variance
Variables:	Fitted Values of LNrealpurchaseprice
Chi ² (1)	= 0.00
Prob > chi ²	= 0.9803

Figure 26: Suburb Model - Testing for Heteroscedasticity - Breusch-Pagan Test (Source: Authors Own)

A large chi-square (χ^2 (1)) would indicate that heteroscedasticity is present in the model (Williams, 2015). Figure 26 depicts a low chi-squared value, which indicates that there is no heteroscedasticity present in the model. Additionally, if the p-value ($\text{Prob} > \chi^2$) is (preferably) 0.05 or smaller, then the null hypothesis is rejected and there is significant evidence that there is heteroscedasticity (*ibid*, 2015). The figure depicts a p-value higher than the preferred 0.05 at 0.9803 which suggests that the model has no significant evidence that there is heteroscedasticity.

4.4. Regression Analysis by Suburb

The preliminary investigations as depicted in figure A and B (attached in the appendix) and figure 26 give some basic understanding of the relationships of the explanatory variables on the dependent variable and the relationship of the explanatory variables on each other. The

multivariable regression analysis is applied to further investigate and understand the complex relationship between the explanatory variables with a keen interest on the distance to Fleurhof variable on property values. This section will run regressions on the individual suburbs of Florida, Meadowlands East Zone 1 and Orlando West and then a regression on all the suburbs in one will be computed for a final summary.

4.4.1. Florida

Regression Statistics				ANOVA		
Source	SS	df	MS	Number of obs	585	
				F(10, 574)	86.02	
Model	174.785838	10	17.4785838	Prob > F	0.0000	
Residual	116.627083	574	0.203183072	R-squared	0.5998	
				Adj R-squared	0.5928	
Total	291.412921	584	0.498994728	Root MSE	0.45076	

LNrealpurc~e	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
LNdisttoFl~f	0.25261	0.3136589	0.81	0.421	-0.3634492	0.8686693
erfsize	0.0001608	0.0000341	4.72	0.000	0.000094	0.0002277
LNproperty~e	0.1147412	0.0714506	1.61	0.109	-0.0255952	0.2550777
bathrooms	0.0455874	0.0425419	1.07	0.284	-0.0379694	0.1291442
bedrooms	0.0387829	0.0306697	1.26	0.207	-0.0214556	0.0990214
LNclinic	-1.432304	0.0834942	-17.15	0.000	-1.596295	-1.268312
LNschool	0.3600483	0.0654834	5.5	0.000	0.2314319	0.4886647
LNpolice~n	0.6273366	0.0670734	9.35	0.000	0.4955974	0.7590759
LNretailce~e	-0.1561434	0.0789351	-1.98	0.048	-0.3111802	-0.0011066
racialcomp~n	0.348817	0.0447145	7.8	0.000	0.260993	0.436641
_cons	15.64634	2.459997	6.36	0.000	10.81464	20.47803

Figure 27: Florida Regression Output; 585 Observations (Source: Authors Own)

Figure 27 depicts the summary regression output of the affluent suburb of Florida located in Roodepoort. The figure depicts that the regression observed 585 housing units as these properties are located in Florida. The p-value for this regression is statistically significant as it is below 0.05 at 0.0000. The regression is statistically significant with an adjusted R^2 of 0.5928 (59%). This means that 59% of the variation in the purchase price of a housing unit is explained by the explanatory variables that have been selected in the regression. Which indicates that the model is statistically significant as an adjusted R^2 closer to 1 signifies a good model than an adjusted R^2 which is closer to 0 which indicates a bad model.

4.4.2. Meadowlands East Zone 1

Regression Statistics				ANOVA	
Source	SS	Df	MS	Number of obs	329
Model	467.009895	10	46.7009895	F(10, 318)	82.17
Residual	180.73255	318	0.568341351	Prob > F	0.0000
				R-squared	0.7210
				Adj R-squared	0.7122
Total	647.742444	328	1.97482453	Root MSE	0.75388

LNrealpurc~e	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
LNdisttoFl~f	1.415479	0.570172	2.48	0.014	0.2936933	2.537265
Erfsiz	-0.0001847	0.0010149	-0.18	0.856	-0.0021814	0.0018121
LNproperty~e	-1.217175	0.3957726	-3.08	0.002	-1.995838	-0.4385113
Bathrooms	0.2214084	0.1805521	1.23	0.221	-0.1338192	0.5766361
Bedrooms	0.0105028	0.0901401	0.12	0.907	-0.1668435	0.187849
LNclinic	-0.0783711	0.0685708	-1.14	0.254	-0.213281	0.0565387
LNschool	-0.0395824	0.090037	-0.44	0.661	-0.216726	0.1375611
LNpolicest~n	0.6877029	0.1197993	5.74	0.000	0.4520035	0.9234023
LNretailce~e	-1.610518	0.158612	-10.15	0.000	-1.92258	-1.298457
acialcomp~n	-0.953979	0.1971714	-4.84	0.000	-1.341904	-0.5660538
_cons	13.77749	5.018718	2.75	0.006	3.903404	23.65157

Figure 28: Meadowlands East Zone 1 Regression Output; 329 Observations (Source: Authors Own)

Figure 28 depicts the summary regression output for the suburb of Meadowlands East Zone 1 located in the township of Soweto. The regression model depicts that 329 residential properties located in the suburb were observed in the model. The p-value of the regression model is statistically significant at 0.0000. The overall regression is statistically significant with an adjusted R^2 of 0.7122 (71%) specifying that the variation in the purchase price of a housing unit is explained by the selected explanatory variables (LNdisttoFl~f, erfsiz, LNproperty~e, bathrooms, bedrooms, LNclinic, LNschoo, LNpolicest~n, LNretailce~e and acialcomp~n).

4.4.3. Orlando West

Regression Statistics				ANOVA	
Source	SS	df	MS	Number of obs	186
Model	185.425241	9	20.6028046	F(9, 176)	101.22
Residual	35.823186	176	0.203540829	Prob > F	0.0000
Total	221.248427	185	1.19593744	R-squared	0.8381
				Adj R-squared	0.8298
				Root MSE	0.45115

LNrealpurc~e	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
LNdisttoFl~f	0.47373	1.953083	0.24	0.8090	-3.380747	4.328207
erfsize	0.0014404	0.0005499	2.62	0.0100	0.0003552	0.0025256
LNproperty~e	-0.6302727	0.1809879	-3.48	0.0010	-0.9874586	-0.2730868
bedrooms	-0.1449868	0.0750931	-1.93	0.0550	-0.2931856	0.003212
clinic	-0.0000177	4.18E-06	-4.24	0.0000	-0.000026	-9.47E-06
LNschool	-0.0344941	0.0445958	-0.77	0.4400	-0.1225055	0.0535173
LNpolice~n	1.240419	0.1286002	9.65	0.0000	0.986622	1.494216
LNretailce~e	-1.535427	0.1861571	-8.25	0.0000	-1.902814	-1.168039
racialcomp~n	-1.150472	0.2824398	-4.07	0.0000	-1.707877	-0.5930677
_cons	14.01758	14.81994	0.95	0.3460	-15.23009	43.26525

Figure 29: Orlando West Regression Output; 186 Observations (Source: Authors Own)

Figure 29 depicts the summary regression output of the suburb of Orlando West located in the township of Soweto. The figure presents that 186 properties were used in the regression model. The p-value of the overall model is statistically significant at 0.0000. The regression is statistically significant with an adjusted R^2 of 82% showing that the variation in the purchase price of a residential property is explained by the explanatory variables used in the regression. The individual p-values of the independent variables are statistically significant at a level less than 0.05 showing a 95% confidence level.

4.1.1. Overall Model

Regression Statistics				ANOVA	
Source	SS	df	MS	Number of obs	1100
Model	4689.80416	9	521.089351	F(9, 1090)	849.16
Residual	668.883568	1090	0.613654649	Prob > F	0.0000
Total	5358.68772	1099	4.87596699	R-squared	0.8752
				Adj R-squared	0.8741
				Root MSE	0.78336

LNrealprice	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
LNdisttoFl~f	2.240162	0.3585123	6.25	0.0000	1.536709	2.943614
erfsize	0.0005608	0.0000496	11.31	0.0000	0.0004636	0.0006581
LNproperty~e	-0.6867367	0.0599007	-11.46	0.0000	-0.8042705	-0.569203
bathrooms	0.1707143	0.0510395	3.34	0.0010	0.0705676	0.270861
LNclinic	-0.4053357	0.0489571	-8.28	0.0000	-0.5013965	-0.3092748
school	0.0001602	0.0000453	3.53	0.0000	0.0000713	0.0002491
LNpolice~n	1.252253	0.0669204	18.71	0.0000	1.120946	1.38356
LNretailce~e	-1.699042	0.0664799	-25.56	0.0000	-1.829485	-1.568598
racialcomp~n	0.0062598	0.0708934	0.09	0.9300	-0.1328431	0.1453627
_cons	4.046914	2.781751	1.45	0.1460	-1.411279	9.505107

Figure 30: Suburb Model - Regression Output; 1100 Observations (Source: Authors Own)

Figure 30 depicts the summary regression output of the three suburbs of Meadowlands East Zone 1, Orlando West and Florida. The ANOVA table on the top right corner of the figure indicates the goodness of fit of the overall regression model. The figure depicts that 1100 housing units were used or observed in the regression. The regression is statistically significant with an adjusted R^2 of 0.8741 (87%). This means that 87% of the variation in the purchase price of a housing unit is explained by the explanatory variables that have been selected in the regression. The explanatory variables are statistically significant with a p-value (depicted as P>t in the figure) less than 0.05, thus indicating that the coefficients have a 95% confidence level that the selected independent variables have some effect on the purchase price of a property. The explanatory variable bedroom has been omitted in this regression as it did not add nor retract from the goodness of fit of the model

4.2. Model 2: Model by Construction Time

The second model in this study will be running regressions by the time before the construction of the integrated residential development in comparison to post-construction of the integrated residential development. Data acquired from Lightstone Property was divided into two pre-construction of the integrated residential development (2001-2010) and post-construction of the integrated residential development (2011-2017). This is done to test for the impact of the integrated residential development of property values to see the level of impact after the development of the integrated residential development. This is done in an effort to understand the impact of the development over time and whether time-honoured

residents' concerns are valid or not. The model also used the log-log functional form as depicted in Eq. 3.

4.2.1. Descriptive Statistics

Figure 31 depicts the descriptive statistics of the second model. The figure describes the basic descriptions of the data used in this model. The figure depicts the summary statistics for $\ln(\text{realpurchase})$, $\ln(\text{realpurchase})$, erfsize, bathrooms, bedrooms, clinic, $\ln(\text{clinic})$, school, $\ln(\text{school})$, $\ln(\text{policestation})$, $\ln(\text{policestation})$, retailcentre, $\ln(\text{retailcentre})$ and $\ln(\text{racialcomposition})$. Significant differences may be seen for variables such erf size which includes residential properties in both low income suburbs and high income suburbs.

Pre-Construction: In this model 877 residential properties were used in the regression between the periods of 2001 to 2010. The average purchase price of properties in this model was R362 949.10 with the minimum property price at R222.63 and maximum at R6 624 090.00 considering that properties were selected in all three suburbs.

Post-Construction: This model used 223 total properties in its regression with properties between the periods of 2011 to 2017. The average property price of properties used in the regression model was R728 445.10 with the maximum value at R4 942.58 and maximum value at R4 730 561.00.

	Pre-Construction (2001-2010)					Post-Construction (2011-2017)				
Variable	Observations	Mean	Standard Deviation	Minimum	Maximum	Observations	Mean	Standard Deviation	Minimum	Maximum
Dependent Variable										
Realpurcha~E	877	362949.1	483883.3	222.63	6624090	223	12.85756	1.643195	8.505643	15.36955
Lnrealpurc~E	877	11.25395	2.216084	5.405511	15.70622	223	728445.1	569879.9	4942.58	4730561
Structural Attributes										
Erfsize	877	489.2406	555.8745	21	3267	223	725.0045	679.0133	69	3267
Bathrooms	877	1.309008	0.502572	1	3	223	1.41704	0.5859283	1	4
Bedrooms	877	2.441277	0.7169075	1	6	223	2.573991	0.8068657	1	6
Locational Amenities										
Clinic	877	6919.344	5909.578	1164	122199	223	3771.808	2263.057	1193	12906
Lnclinic	877	8.564176	0.7708814	7.059618	11.71341	223	8.119635	0.4367591	7.084226	9.465448
School	877	1451.111	753.4913	39	4200	223	1815.213	697.5689	56	3408.571
Lnschool	877	7.091235	0.7133978	3.663562	8.34284	223	7.42033	0.4541129	4.025352	8.134049
Policestat~N	877	2625.189	1280.479	162	6058.714	223	3571.213	1094.003	1154.778	6008.571
Lnpolicest~N	877	7.738199	0.5432521	5.087596	8.709253	223	8.1308	0.3279868	7.051663	8.700942
Retailcentre	877	4889.395	2592.035	330.5654	8814	223	3102.733	1534.03	454.7776	7629
Lnretailce~E	877	8.303984	0.6733129	5.800805	9.084097	223	7.93485	0.4537791	6.119809	8.939712
Neighbourhood Characteristics										
Racialcomp~N	877	0.6567845	0.4750536			223	0.6547085	0.4765329		

Figure 31: Descriptive Statistics - Model by Construction Time (Source: Authors Own)

4.2.2. Multicollinearity

	Pre-Construction		Post-Construction	
Variable	VIF	1/VIF	VIF	1/VIF
LNretailce~e	3.26	0.306505	4.87	0.205422
racialcomp~n	2.26	0.442611	4.32	0.231327
LNclinic	2.16	0.463492	3.92	0.255419
LNschool	1.89	0.529085	3.39	0.295102
LNpolicest~n	1.85	0.540081	2.26	0.442681
bathrooms	1.61	0.620444	1.81	0.552261
bedrooms	1.61	0.621955	1.8	0.554776
erfsize	1.6	0.624613	1.77	0.564019
LNdisttoFl~f	1.16	0.864386	1.08	0.926436
Mean VIF	1.93		2.8	

Figure 32: Testing for Multicollinearity using VIF (Source: Authors Own)

Figure 32 depicts the VIF of the data according to the different time frames. Based on the rule of thumb as depicted in figure 23, the mean VIF of the pre-construction and post-construction are between 1 and 4 which indicates that there is no multicollinearity, confirming that the data is reliable and may be used to run regressions. A correlation matrix figure C – Pre-Construction (2001-2010) Correlation Matrix of Explanatory Variables - and figure D – Post-Construction (2011-2017) Correlation Matrix of Explanatory Variables –of the explanatory variables according to the different time frames is attached in the appendix. It details the correlation between the explanatory variables against each other, further confirming that there is no collinearity between the variables.

4.3. Regression Analysis by Construction Time

Figure C and D (attached in the appendix), the correlation matrix attached in the appendix shows a preliminary investigation of the explanatory variables which gives a basic understanding of the relationship between the explanatory variables and dependent variable (purchase price). This section depicts the multivariable regression output of 2001-2010 (pre-construction) and 2011-2017 (post-construction) with an interest in the explanatory variable distance to Fleurhof.

4.3.1. Pre-Construction of the Integrated Residential Development

Source	SS	df	MS	Number of obs	877
				F(9, 867)	623.27
Model	3726.1428	9	414.0159	Prob > F	0.0000
Residual	575.91967	867	0.664267	R-squared	0.8661
				Adj R-squared	0.8647
Total	4302.0624	876	4.91103	Root MSE	0.81503

LNrealpurc~e	Coef.	Std. Err.	T	P>t	[95% Conf. Interval]	
LNdisttoFl~f	1.428326	0.410245	3.48	0.001	0.6231367	2.233515
erfsize	0.0004645	6.27E-05	7.41	0.000	0.0003415	0.0005875
bathrooms	0.1128957	0.069562	1.62	0.105	-0.0236332	0.2494246
bedrooms	-0.156658	0.048705	-3.22	0.001	-0.2522523	-0.0610638
LNclinic	-0.333211	0.05247	-6.35	0.000	-0.436194	-0.230228
LNschool	0.1668353	0.053067	3.14	0.002	0.0626804	0.2709902
LNpolice~n	1.465826	0.068975	21.25	0.000	1.330449	1.601202
LNretailce~e	-1.82553	0.073873	-24.71	0.000	-1.97052	-1.68054
racialcomp~n	-0.202120	0.08713	-2.32	0.021	-0.37313	-0.0311108
_cons	6.191663	3.276326	1.89	0.059	-0.2387952	12.62212

Figure 33: Pre- Construction (2001-2010) Regression Output; 877 Observations (Source: Authors Own)

Figure 33 depicts the summary regression output of the time period prior to the construction of the integrated residential development, between the years of 2001 to 2010. 877 properties were used in this regression all located in the suburbs of Meadowlands East Zone 1, Florida and Orlando West. The regression model is statistically significant with an adjusted R^2 of 86% and a p-value of 0.0000. P-values for the explanatory variables are statistically significant with a p-value less than 0.05 as depicted by the figure.

4.3.2. Post-Construction of the Integrated Residential Development

Source	SS	df	MS	Number of obs	223
				F(8, 214)	127.53
Model	495.488939	8	61.9361173	Prob > F	0.0000
Residual	103.930747	214	0.485657698	R-squared	0.8266
				Adj R-squared	0.8201
Total	599.419686	222	2.70008868	Root MSE	0.69689

LNrealpurchasep~e	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]
LNdisttoFleurhof	-0.7445704	0.6986385	-1.07	0.288	-2.1217 0.6325239
erfsize	0.000446	0.0000915	4.87	0.000	0.0003 0.0006263
bathrooms	0.1537622	0.0929636	1.65	0.100	-0.0295 0.3370038
LNclinic	-2.217285	0.222855	-9.95	0.000	-2.6566 -1.778013
school	0.0006265	0.0001251	5.01	0.000	0.0004 0.000873
LNpolicestation	0.7692013	0.2864468	2.69	0.008	0.2046 1.33382
LNretailcentre	-0.9389716	0.2246277	-4.18	0.000	-1.3817 -0.4962054
racialcomposition	0.1751513	0.1472638	1.19	0.236	-0.1151 0.4654247
_cons	35.82118	5.652795	6.34	0.000	24.6789 46.96347

Figure 34: Post- Construction (2011-2017) Regression Output; 223 Observations (Source: Authors Own)

Figure 34 depicts the summary regression output of the year's post construction of the integrated residential development between the years 2011 and 2017. This regression observed a total of 223 residential properties located in the suburbs of Meadowlands East Zone 1, Orlando West and Florida. This regression output is statistically significant with a p-value less than 0.05 at 0.000. The model is also considered statistically significant as the adjusted R^2 is 82%, which indicates that about 82% of the variation in the purchase price of a residential property located in the investigated suburbs is explained by the explanatory variables that have been selected in the regression. The selected explanatory variables (erfsize, LNclinic, school, LNpolicestation, and LNretailcentre) are statistically significant with a p-value less than 0.05.

4.4. Conclusion

This chapter presented the preliminary findings and the regression outputs of the two models (the suburb model and the construction time frame of the housing development). The correlation matrixes helped with a basic understanding of the explanatory variables alone and the explanatory variables with the independent variables and also testing for the reliability of the data before running regressions. The next chapter will interpret each of the summary regression models output considering the variable of interest the distance of Fleurhof in an effort to test for the hypothesis.

Chapter 5:

Results of the hedonic price analyses of the integrated residential development of Fleurhof

5.1. Introduction

This chapter presents the findings obtained from the regression results of model 1 and model 2 as presented in the previous chapter. The chapter begins with an interpretation of model 1: regressions by suburbs results then followed by model 2: regressions by the period of construction of the subsidised affordable housing development, Fleurhof results.

5.2. Model 1: Regressions by Suburbs

This model ran regressions according to the different suburbs (Florida, Meadowlands East Zone 1 and Orlando West) that were selected in the study. In this section, each of explanatory variables according to the suburb will be explained in detail in an effort to unpack the variables impact on the dependent variable purchase price. After each suburb has been interpreted the overall model which includes all the suburbs will be interpreted.

5.2.1. Florida

Figure 27 depicts the summary regression output of 585 residential properties all located in the affluent suburb of Florida, Roodepoort. The explanatory variables presented in the regression offered the following output;

Structural Attributes: all the structural attributes (erf size, property's age, bathrooms and bedrooms) in this figure had positive coefficients, which indicates that these attributes have a positive relationship with the dependent variable. This is not surprising as Oloke *et al* (2013) agree as they state that a residential property's structural attributes particularly the number of bedrooms increases the value of a property.

Locational Amenities: figure 27 depicts a positive coefficient to amenities such as schools and the police station. This positive coefficient essentially indicates that properties located further away from these amenities have a higher property value in comparison to properties located right next to these amenities. This suggests that residential properties see amenities such as the clinic and the police station negatively thus deeming them as dis-amenities. This may be because these amenities may not be in the best condition meaning that they may appear unattractive to residents who thus may consider living further away from these amenities is better for their property value. Additionally, the close proximity of these amenities means an increase in noise and traffic which may be another reason why residents

of Florida may prefer living further away from these amenities. Furthermore, the quality of schools in the area may not be the best which also decreases a property's value.

Figure 28 also depicts a negative coefficient for the distance to the clinic and the shopping centre. This indicates that properties located right next to these amenities have an increased property value. This is expected as it goes in line with the literature. As according to the location theory the more accessible a location is to positive elements, in case the shopping centre and the clinic the more valuable the property is (Jordaan *et al.*, 2004).

Neighbourhood Characteristics: racial composition in figure 28 is depicted with a positive coefficient which indicates a positive relationship with the dependent variable purchase price. The positive coefficient specifies that with every increase of black people into the neighbourhood the purchase price of a property increases holding all other factors constant. This goes against Metz (2016), who stated in his study that the movement of black individuals into a neighbourhood decreases the value of properties situated in that neighbourhood. However, Metz (2016) study has a different racial composition backdrop in comparison to this study as Florida is largely made up of black individuals. Thus, an increase of black individuals into the area will not impact property values as the area already has a significant number of black individuals.

The variable of interest *distance to Fleurhof* shows a positive coefficient with a beta value of 0.25. This, therefore, indicates that the residents of Florida perceive the integrated residential development of Fleurhof negatively as the further away a property is from the housing development the higher a property's value. This negative impact towards property values aligns with Cummings and Landings (1993) findings, as these authors discovered that the development of subsidised affordable housing impacts property values negatively. This negative impact may be because of the overall negative perception residents of Florida have towards subsidised affordable housing and the negative spill-overs that the development may bring such as an increase in crime and traffic (Cummings and Landings, 1993).

5.2.2. Meadowlands East Zone 1

Figure 28 depicts the summary regression output of 329 residential properties all located in the suburb of Meadowlands East Zone 1, Soweto. The explanatory variables presented in the regression offered the following output:

Structural Attributes: the variables erf size and property age are depicted in the figure with a negative coefficient indicating a negative relationship with property value. For instance, a beta value of -0.00018 (erf size) indicates that for every increase in a property's size the purchase price of a property decreases holding all other factors constant. This is also the case for a property's age whereby every year that a property ages the purchase price of that property decreases in its value. The negative relationship between these variables is unexpected as common valuation theory as stated by (Dodds, 2010) states that an increase in these variables increases a property's value. According to Dodds (2010), properties with a larger erf size have a higher property value in comparison to properties with a smaller erf size. An increase in the size of a property may affect a property's value negatively because about 36% of the buyers of properties in Meadowlands are young adults to middle aged individuals who are not necessarily looking for larger homes as they require lock-up and go properties (Lightstone, 2017 and Clarke, 2017). Additionally, a property's age may have a negative impact in this suburb because the older the property gets the more dilapidated and old-fashioned the property may become, thus losing demand from potential buyers.

The explanatory variables bedrooms and bathrooms indicate a positive relationship with property value with a positive beta value. As a beta value of 0.22 (bathrooms) and 0.01 (bedrooms) depict that for every increase in the number of bedrooms or bathrooms the purchase price of a property increases holding all other factors constant. This goes in line with literature as Oloke *et al* (2013) state that an increase in the number of bedrooms or bathrooms increases a property's value.

Locational Amenities: the explanatory locational variables clinic (-0.078), school (-0.039) and retail centre (-1.61) are presented with a negative coefficient indicating that the further away a property is located from these amenities the more a property's value decreases. This shows that properties located in close proximity to these amenities have an increased property value. This goes in line with common property valuation and the location theory which states that properties located in close proximity to these amenities have an increased property value as the close proximity to these amenities is valuable (Jordaan *et al.*, 2004).

Distance to the police station, on the contrary, has a positive coefficient indicating that with every increase in the distance of a property from the police station a property's value increases. This shows that properties located right next to a police station have a lower property value than properties located further away from the police station. This goes against

the literature as properties located in close proximity to amenities such as a police station tend to have an increased property value as stated by Tamplin (2016). This may be because of the increased activity a police station may call which may be perceived as noise by residents thus residents would rather prefer to live further away from the police station.

Neighbourhood characteristics: racial composition is presented with a negative coefficient in the figure indicating that the more black people that move into the neighbourhood the more the property values will decline. This is surprising as the suburb of Meadowlands East Zone 1 is characterised with a high number of black residents. However, an increase of black people into the suburb may be perceived negatively by residents because an increase of more and more black people particularly of a lower socio-economic background into the neighbourhood may decrease the quality and the condition of the neighbourhood and may essentially increase crime in the neighbourhood.

Distance to Fleurhof: which is statistically significant with a p-value of 0.01 also has a positive coefficient as seen previously in the regression model for the suburb of Florida. The positive coefficient indicates that the housing development of Fleurhof also impacts property values of properties located in Meadowlands East Zone 1 negatively. As the further away a property is located from the housing development the more a property's value increases. This shows that the residents of Meadowlands East Zone 1 also perceive the housing development negatively. This may be because of the perceived potential spill-overs the subsidised affordable housing development may bring into the neighbourhood such as an increase level of crime, increased noise levels or traffic or a change in the environment or characteristic of the neighbourhood.

5.2.3. Orlando West

Figure 29 depicts the summary regression output of 186 residential properties all located in the suburb of Orlando West, Soweto. The explanatory variables presented in the regression offered the following output:

Structural Attributes: the variables property age and number of bedrooms are presented with a negative coefficient indicating a negative relationship with property value. Property age which has a negative beta value of -0.63 indicates that that for every year a property ages the purchase price of that property decreases in its value. This may also be seen with the number

of bedrooms which indicates that for every increase in the number of bedrooms in a property the purchase price of a property decreases holding all other factors constant. The negative relationship of these variables contradicts common property valuation as it states that an increase in the number of bedrooms results in an increase in property value. The negative relationship with property age may be because new residential property buyers may prefer newer residential properties than older properties because they may be modern with open-plan living styles and may be more aesthetically attractive than older homes.

The explanatory variable erf size indicates a positive relationship with property value with a positive beta value of 0.0014. This indicates that for every increase in a property's size the purchase price of a property increases holding all other factors constant. This goes in line with literature as Oloke *et al* (2013) states that an increase in a property's size results in an increase in a property's value.

Locational Amenities: the explanatory locational variables clinic, school and retail centre are presented with a negative coefficient indicating that the further away a property is located from these amenities the more a property's value decreases. This shows that properties located in close proximity to these amenities have an increased property value. The goes in line with common property valuation which states that properties located in close proximity to these amenities have an increased property value.

Distance to the police station, on the contrary, has a positive coefficient indicating that with every increase in the distance of a property from the police station a property's value increases. This shows that properties located right next to a police a lower property value than properties located further away from the police station. This may be because of the increased activity a police station may call which may be perceived as noise by residents thus residents would rather prefer to live further away from the police station.

Neighbourhood characteristics: racial composition is presented with a negative coefficient in the figure indicating that the more black people that move into the neighbourhood the more the property values will decline. An increase of black people into the suburb may be perceived negatively by residents because an increase of more and more black people particularly of a lower socio-economic background- into the neighbourhood may decrease the quality of the neighbourhood and increase crime

The variable of interest *distance to Fleurhof* also has a positive coefficient as seen previously in the regression model for the suburb of Florida. The positive coefficient indicates that the housing development of Fleurhof also impacts property values of properties located in Orlando West negatively. As the further away a property is located from the housing development the more a property's value increases. This negative impact aligns with the findings of Cummings and Landings (1993), who found that the development of subsidised affordable housing have a negative impact on bonded property values. This negative impact may be because of the potential spill-overs the development may bring to the neighbourhood.

5.2.4. Overall Model

Figure 30, which depicts the summary regression output of 1100 residential properties located in all 3 suburbs (Meadowlands East Zone 1, Orlando West and Florida). As mentioned previously the individual p-values in this model were statistically significant as they hold a p-value less than 1%. The explanatory variables presented the following output;

Structural Attributes: Figure 30 presents a negative coefficient or a negative relationship between the age of a residential property and property value. A beta-value of -0.68 indicates that with every year a residential property increases in age the purchase price of the property decreases by 0.68 units holding all other factors constant. The negative relationship of a properties age towards the dependent variable (purchase price) may be because of the concern of the state or the condition of the property (as many of the properties selected in this study were built 27 years ago) as an older residential property may be perceived as old fashion and dilapidated. This therefore decreases the property's value additionally; many home buyers prefer newer built homes which are in style with current trends (Clarke, 2017). Positive coefficients such as bathrooms (0.17) and erf size (0.00) have an overall positive relationship with purchase price essentially providing that these variables increase a residential property's value. However, this positive impact towards a property's value is significantly small. Positive coefficients, on the contrary, indicate a positive relationship with the dependent variable. Variables such as erf size and bathrooms indicate that with every increase in the number of bathrooms or an increase in a property's size, the purchase price of a property increases. This is expected as Tse and Love (2000) in the literature state that an increase in a property's structural characteristics increases a property's value.

Locational Amenities: the distance to amenities such as schools and the police station are depicted with a positive coefficient indicating that with every 1 metre increase in the distance to schools (specifically primary schools) or the police station a property's value increases. This shows that a property located right next to a police station or a school have a lower property value than a property located further away from these amenities. This is unexpected as common property valuation theory states that the close proximity of schools, for instance, increases a property value (Dodds, 2010). However, one of the reasons the proximity to schools is considered to decrease a property's value is that the schools surrounding the suburbs selected in this study are not the best quality schools.

Further, figure 30 depicts a negative coefficient for the distance to the clinic and the shopping centre. This shows that with every one-metre increase in the distance of a property from a shopping centre or clinic the purchase price of the property decreases. This reveals that residential properties right next to a shopping centre have an increased property value, which is in alignment with Oloke *et al* (2013) who state that the distance to amenities such a shopping centre increases a property's value.

Neighbourhood Characteristics: figure 30 illustrates a positive coefficient for the explanatory variable racial composition with a beta value of (0.006) which indicates that with every increase of black people into a neighbourhood the purchase price of a property increases holding all other factors constant. This is surprising as according to Metz (2016) an increase of black people into a neighbourhood means a decline in property value. However, as mentioned earlier Metz (2016) study is considered in white neighbourhood. The positive beta value may be because the suburbs used in the study have more black people residing in the neighbourhoods than any other race. Consequently, the increase of black people into the neighbourhood has no impact towards property values.

The explanatory variable of interest *distance to Fleurhof* shows a positive coefficient with the dependent variable purchase price. As the coefficient reads that with every one-metre increase in the distance of a property from the housing development of Fleurhof, a property's purchase price increases by 2.24. The beta value of 2.24 is statistically significant with a p-level below 0.05. This positive coefficient, however, indicates that the further away a property is from the housing development of Fleurhof the higher a property's price. Essentially, providing that the housing development of Fleurhof is perceived negatively the closer one's property is located to the housing development. As mentioned earlier this

negative impact towards property values may be because of perceived (by the residents surrounding the housing development) potential spill-overs the development may bring to the suburbs selected in this study.

5.3. Model 2: Regressions by period of construction of Fleurhof

Model 2 is made up of two summary regression results; a regression pre-construction (2001 – 2010) of the integrated residential development and the regression results post-construction (2011 – 2017). This section will interpret the results according to the different construction time frames of the housing development in an effort to understand whether the construction of the development (post-construction period) impacted property values in comparison to when the development was in its planning phase (pre-construction period).

5.3.1. Pre-Construction (2001-2010)

Figure 33 depicts the summary regression output of 877 residential properties located in the suburbs of Meadowlands East Zone 1, Florida and Orlando West between the time periods of 2001-2010. The explanatory variables presented in the regression depicted in figure 33 presented the following output;

Structural Attributes: the variables erf size and bathrooms are depicted with a positive coefficient indicating a positive relationship with property value. This indicates that for every increase in a property's size the purchase price of a property increases holding all other factors constant. While an increase in the number of bathrooms indicates an increase in a property's value. This aligns with the literature as Oloke *et al* (2013) who states that an increase in a property's size results in an increase in a property's value.

Whilst, the number of bedrooms variable is depicted with a negative coefficient with a beta value of -0.15. This shows that for every increase in the number of bedrooms in a residential property the purchase price of a property decreases holding all other factors constant. The negative relationship of this variable contradicts common property valuation theory as stated by Dodds (2010) as it states that an increase in the number of bedrooms would essentially result in an increase in property's value. The negative relationship between the number of bedrooms and purchase price may be because extra bedrooms in the selected suburbs between 2001 and 2010 were not demanded by consumers thus affecting property values negatively.

Locational Amenities: the explanatory locational variables clinic and retail centre are presented with a negative coefficient indicating that the further away a property is located from these amenities the more a property's value decreases. This shows that properties located in close proximity to these amenities have an increased property value. This goes in line with common property valuation theory as stated by Dodds (2010) which states that properties located in close proximity to these amenities particular a shopping centre have an increased property value. The ease of access to these amenities consequently makes the property attractive to consumers and therefore increases such a property's value.

Distance to the police station and schools; on the contrary, have a positive coefficient indicating that with every increase in the distance of a property from the police station or a school a property's value increases. This shows that properties located right next to a police station or schools have a lower property value than properties located further away from the police station. This may be because of the increased activity a police station may call which may be perceived as noise by residents thus residents would rather prefer to live further away from the police station.

Neighbourhood characteristics: racial composition is presented with a negative coefficient in the figure indicating that the more black people that move into the neighbourhood the more the property values will decline. An increase of black people into the suburb may be perceived negatively by residents because an increase of more and more black people particularly of a lower socio-economic background- into the neighbourhood may decrease the quality of the neighbourhood and increase crime

The variable of interest *distance to Fleurhof* also has a positive coefficient. The positive coefficient indicates that the housing development of Fleurhof also impacts property values negatively. As the further away a property is located from the housing development the more a property's value increases. This, however, would mean that properties located right next to the land proposed for the integrated residential development would have had a negative property value.

5.3.2. Post-Construction (2011-2017)

Figure 34 depicts the summary regression output of 223 residential properties located in the suburbs of Meadowlands East Zone 1, Florida and Orlando West between the time periods of

2011-2017. The explanatory variables presented in the regression depicted in figure 33 presented the following output;

Structural Attributes: the variables erf size and bathrooms are depicted with a positive coefficient indicating a positive relationship with the dependent variable purchase price as seen with the previous regression figure 32. This indicates that for every increase in a property's size the purchase price of a property increases holding all other factors constant. While an increase in the number of bathrooms indicates an increase in a property's value.

Locational Amenities: the explanatory locational variables clinic and retail centre are presented with a negative coefficient indicating that the further away a property is located from these amenities the more a property's value decreases. This shows that properties located in close proximity to these amenities have an increased property value. This goes in line with common property valuation which states that properties located in close proximity to these amenities particular a shopping centre have an increased property value.

Distance to the police station and schools; on the contrary, have a positive coefficient indicating that with every increase in the distance of a property from the police station or a school a property's value increases. This shows that properties located right next to a police station or schools have a lower property value than properties located further away from the police station.

Neighbourhood characteristics: racial composition is presented with a positive coefficient in the figure indicating that the more black people that move into the neighbourhood the more the property values will increase. This goes against Metz (2016) who states that an increase in the number of black people in a neighbourhood will result in a neighbourhood which witnesses a decline in property values.

The variable of interest *distance to Fleurhof* also has a negative coefficient. The negative coefficient indicates that the integrated residential development of Fleurhof impacts property values positively. As the further away a property is located from the housing development the more a property's value decreases. This means that the housing development is viewed positively.

5.4. Discussion of the Results

The aim of this study was to investigate the impact of the integrated residential development on surrounding property values. Therefore, this discussion focuses on the variable of interest the distance of each property to the integrated residential development of Fleurhof. The first Model one's summary regression output depicted the explanatory variable *distance to Fleurhof* with a positive coefficient essentially indicating a negative relationship with property values. The general perception of the subsidised affordable housing development is negative with many residents preferring to be located further and further away from the development. Residents are therefore willing to pay more to be located further away from the subsidised affordable housing development. The negative perception of the housing development shows that NIMBY homeowner perceptions are prevalent towards the housing development in Fleurhof. This negative perception in relation to the development has in turn resulted in a decline in property values in surrounding neighbourhoods. This is because the development of the integrated residential development which has raised homeowner fears about the potential negative spill-overs that the development may bring into the neighbourhoods such an increased level of crime, more traffic and noise, consequently changing the character of their neighbourhoods. Additionally, this study shows that the subsidised affordable housing development does not necessarily boost the property values of depressed neighbourhoods such as Orlando West and Meadowlands East Zone 1.

Model 2 in comparison to model 1 presented different output in the sense that the post-construction regression presented a negative coefficient for the variable of interest *distance to Fleurhof*. The negative coefficient indicates that the property value of properties after the development witnessed an increase in property value in comparison to property values of properties sold before the housing development formerly began construction. This shows that after the announcement that the integrated residential development was to be constructed in 2009 property owners might have raised concerns about the possible negative externalities that the development may bring. However, once construction began the development was viewed positively and such concerns may have decreased as property values of properties located right next to the development had an increased property value. This may be because before the development began the land may have been used as a dump site which would change the environment of the neighbourhood thus impacting property values negatively.

Additionally, the study discovered that the presence of locational amenities such as a police station and a school in close proximity to properties impacts property values negatively. This may be because the quality of the schools in the selected suburbs may not be A grade schools, thus the schools may be seen as a dis-amenity rather than an amenity. Furthermore, the police stations may be perceived negatively by residents as they may increase noise and traffic into the area which is why people may prefer to be located further away from the police station.

Chapter 6:

Conclusion and Recommendations

6.1. Summary

Subsidised affordable housing plays a crucial role in providing affordable housing to many the marginalised citizens of South Africa. This study examined the impact of the integrated residential development of Fleurhof on surrounding property values. The integrated residential development of Fleurhof is a subsidised affordable housing development located between Soweto and Roodepoort. This study used the property values of bonded properties located in Meadowlands East Zone 1 and Orlando West which are located in the township of Soweto and Florida which is located in Roodepoort.

The study area of Fleurhof was considered in this study as it is in the urban core whereby urban amenities are easily accessible to the residents of the subsidised affordable housing development. Whereas previous subsidised affordable housing developments were located on the periphery, fundamentally, increasing the apartheid-eras spatial planning. The introduction of the IRDP as a delivery tool of subsidised affordable housing may be considered a critical tool for the government as it adheres to all the requirements of the delivery of subsidised affordable housing according to the BNG policy. As housing provided in accordance to the programme is sustainable and located in the urban core achieving better social and economic opportunity accessibility.

The programme is focused on the delivery of quality housing with better infrastructure rather than the delivery of mass housing. Moreover, the delivery of subsidised affordable housing through the IRDP decreases poverty concentration in one locality as the programme allows residents who are able to purchase property in the open private property market to build their own homes in the development. Thus, promoting the integration of individuals from different socio-economic backgrounds.

This study employed a hedonic price analysis to analyse the impact of the subsidised affordable housing development from the period 2001 to 2017. The study applied a log-log functional form as it provides better interpretation of the coefficients. The dependent variable was logged and regressed against 10 explanatory variables (some of which were also logged) which fall under the categories of structural attributes, locational amenities and neighbourhood characteristics. The data used in this study is secondary data gathered by Lightstone Property.

Although the results of this study may not be generalised and may not be easily adapted to other subsidised affordable housing developments across South Africa as the study is focused on Fleurhof. As, literature dictates that minor differences in the neighbourhood such as the locality of the housing development and the type of housing development which is the case of other housing developments in South Africa as they are located on the periphery with increased densities may change the results of the impact of the housing development on property values (Woo, 2014). The study may help with the understanding of how to improve the implementation of subsidised affordable housing developments and also a change in the general perspective of subsidised affordable housing developments by the public may eventually see a change in the impact on property values. This chapter concludes on the findings of the study and suggests policy recommendations which help deter the negative perception of subsidised affordable housing developments and their impact on property value.

6.1. Impacts of the Subsidised Affordable Housing Development of Fleurhof on Property Values

This study examined the impact of the integrated residential development of Fleurhof which is an integrated subsidised affordable housing development located between Soweto and Roodepoort on surrounding property values with the use of the HPM. Major findings are summarised in figure 35.

Model		Property Values
Suburb Model	Meadowlands East Zone 1	Negative
	Orlando West	Negative
	Florida	Negative
	All Suburbs	Negative
Construction Time	Pre-Construction (2001-2010)	Negative
	Post-Construction (2011-2017)	Positive

Figure 35: Summary of Results on Property Values (Source: Authors Own)

Based on the results of the suburb model which showed that the integrated residential development of Fleurhof had a negative impact on property values. The subsidised affordable housing development had a negative impact on surrounding house prices in the all the suburbs however, at varying levels, indicating subsidised affordable that the housing development impacts different neighbourhoods differently. For instance, Meadowlands East Zone 1 had a higher impact in comparison to Florida with a lower impact. This may be because of the difference in the socio-economic standing of the two suburbs as Meadowlands East Zone 1 is a lower income suburb than Florida which is more affluent. Furthermore, the

suburb of Florida may have taken more measures such as building higher fences and hiring more security companies around their houses and in the neighbourhood in an effort to keep themselves safe from potential perceived negative externalities that the residents may have thought the subsidised affordable housing development may bring such as an increase in crime.

The negative impact indicates that the hypothesis stated in chapter one is rejected as the subsidised affordable housing development affects bonded property values negatively. Furthermore, the negative impact of the housing development suggests that bonded property homeowners perceive subsidised affordable housing development as an undesirable development rather than an instrument for poverty deconcentration and housing assistance for the marginalised citizens of South Africa. Additionally, as seen with LIHTC developments in America, the negative impact of the development towards property values indicates that the development is built in a prosperous housing market. Because of the increased NIMBY concerns preeminent about the subsidised affordable housing development, the development faces residential segregation with many of the residents preferring to be located further away from the development and disagreeing with a mix of income backgrounds in one neighbourhood. The negative perspective of the housing development in turn reflects negatively on the property values of bonded properties surrounding the development.

The results of this study displayed that the property values of properties in the selected suburbs are uniquely impacted by the explanatory variables selected in the study, for instance the distance to the locational amenities such the police station and the clinic proved to decrease a property's value the closer a property was to that amenity. Additionally, an increase of black people into a neighbourhood proved to impact a property's value positively indicating that it may not be black people moving into a neighbourhood which raises concerns but rather the socio-economic background of the individuals moving into the neighbourhood as seen with the distance to Fleurhof who bring a different socio-economic into the neighbourhood.

However, the results of the second model specifically post construction (2011-2017) of the subsidised affordable housing development results indicate that the neighbourhoods may have witnessed increased property values despite the fact the subsidised housing development of Fleurhof was being constructed. This shows that as the development was being constructed (and still in the process of completion) residents have grown accustomed to the development

and have realised that the development does not hold the characteristics of older subsidised affordable housing developments such as the construction poor quality of housing structures. The properties used in this model may have seen this development as a neighbourhood revitalisation project rather than a deterioration of the neighbourhood.

6.2. Policy Implications

The results of this study raise concerns about the response of the entrance of subsidised affordable housing developments in the urban core next to bonded properties. However, the entrance of subsidised affordable housing developments may bring about improvement in a neighbourhood by transforming an unsightly piece of land and essentially, bringing about a positive change in in a neighbourhood. According to Woo (2014), the integrating of individuals of different socio-economic backgrounds in a neighbourhood means a filtering down of the pre-existing socio-economic background in the neighbourhood.

Many subsidised affordable housing developments in South Africa are located on the periphery fundamentally worsening poverty concentration by locating the marginalised on the outskirts distant from economic opportunities and continue the apartheid era's spatial planning. The locality of previous subsidised affordable housing developments exacerbate disparity in social and economic opportunities for the previously marginalised by pushing them into the vicious circle of residential segregation and inequality (Woo, 2014).

The results in this study suggest that the entrance of subsidised affordable housing developments into the urban core need to be perceived by property owners around the development differently and requires that these residents consider that the development as more about building communities which assist all and not only those that can afford to be located in the urban area but those that cannot afford to also. In order for this to happen efficiently the implementation of programmes designed to ease the transition of new residents into the neighbourhood in an effort to let residents grow familiar with their new neighbours need to be applied. Cities need to monitor that the development of such housing developments are well maintained and kept in good condition ensuring that they remain in good condition.

For planning policy purposes the following recommendations may be considered in an effort to change the overall perception of subsidised affordable housing and the way in which the

subsidised affordable housing development functions must be transformed in an effort to change the impact of the development on property values;

Revitalisation: subsidised affordable housing developments should aim to revitalise the neighbourhood in which they are to be located. Galster, Santiago, Smith and Tatian (1999) state that subsidised affordable housing developments should endeavour to rehabilitate vacant and poorly maintained land or buildings to the extent possible. As this in turn reflects positively towards surrounding property values. Additionally, post the construction of the development, the newly constructed buildings and houses need to be managed and maintained effectively so that the positive impact towards property values persists and is not short-lived.

Introduction of educational programmes: before potential residents may move into the subsidised affordable housing developments, residents should be provided with educational programmes by the government which are centred on helping these residents learn how to maintain their households. This is done in an effort to help these residents maintain the upkeep of their homes, to prevent their homes from dilapidating and also understand the behavioural conditions of the housing developments. Additionally, borrower education or financial literacy programmes should be provided for these residents in order to help residents understand and obey financial (particularly subsidised rental housing residents) conditions of the housing developments. This is done in an effort to ensure that perceived negative spill-overs of subsidised affordable housing developments such as the fact such developments bring about crime into neighbourhoods may be prevented (Galster *et al.*, 1999; Moss, 2012). These educational programmes may also happen at a scholar level, whereby financial literacy and the maintenance and upkeep of one's home is taught as part of Life Orientation during one's schooling years.

Maintenance and monitoring of housing developments: once the residents of subsidised affordable housing developments are residing in the development, housing authorities must ensure that the development is maintained in an effort to confound negative perceptions about the development. For instance, regular inspections of the buildings, housing units and public open spaces may be done to guarantee adequate maintenance of the development.

Additionally, initiatives aimed at changing the perceptions of property owners and the public about subsidised affordable housing developments must be made, these initiatives include;

Educating and information: educating the property owners surrounding the development and the general public subsidised affordable housing developments may help in overcoming the negative perceptions of the development (Housing Trust Fund, 2012). The provision of information may help dispel negative perceptions of such housing developments essentially extinguishing NIMBY protests. Some neighbourhoods may require information of crime rates to accept such developments while other neighbourhoods may require information about the necessity of such developments in their areas (*ibid*, 2013).

6.3. Recommendations for Further Studies

Additional research is needed in order to better understand the conditions to which subsidised affordable housing developments may help or hurt bonded property values. As according to Woo (2014), “the Broken Windows Theory states that the individual perception on the physical dilapidation stems from visual cues in communities”. This theory indicates that the physical or the visual design of subsidised affordable housing developments may in fact be one of the reasons that subsidised affordable housing developments affect surrounding bonded property values. Therefore, qualitative research analyses may be implemented, in an effort to understand to what extent the physical design of subsidised affordable developments surrounding people’s properties affects their overall perception or attitude towards subsidised affordable housing developments.

Additionally, more research may be done on the impact of subsidised affordable housing and potential perceived spill-overs that these developments may have on surrounding properties. For instance, such a research study may consider, whether the construction of these housing developments increases the crime rate in a neighbourhood. Furthermore, other research studies may consider the way in which South Africa’s subsidised affordable housing developments affect a surrounding neighbourhood’s stability and the impact that such developments have towards the housing turnover of bonded properties surrounding the housing development.

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8. Appendix

	LNreal purcha se price	LNdist to Fleurh of	erf size	LNpro perty age	bathro oms	bedroo ms	year	clinc	LNclini c	school	LNsch ool	police station	LNpoli ce station	retail centre	LNreta il centre	racial compos ition
LNreal purchase price	1.0000															
LNdist to Fleurhof	-0.1683	1.0000														
erf size	0.4989	-0.1375	1.0000													
LNproperty age	-0.5455	0.3201	-0.0702	1.0000												
bathrooms	0.2273	0.0642	0.4350	0.0903	1.0000											
Bedrooms	0.1664	-0.0800	0.4424	0.0932	0.5898	1.0000										
Year	0.3313	-0.1115	0.1800	-0.1122	0.0735	0.0755	1.0000									
Clinic	-0.6509	0.1481	-0.2988	0.3843	-0.1357	-0.1052	-0.2762	1.0000								
LNclinic	-0.7126	0.1103	-0.3274	0.3723	-0.1497	-0.1002	-0.2974	0.8279	1.0000							
School	0.5411	-0.2518	0.2854	-0.4027	0.1163	0.1006	0.1477	-0.3370	-0.2455	1.0000						
LNschool	0.5638	-0.2605	0.2657	-0.4472	0.0830	0.0739	0.1611	-0.4107	-0.3540	0.8963	1.0000					
police station	0.5763	-0.2855	0.3251	-0.4011	0.1361	0.1238	0.2631	-0.3424	-0.2384	0.7742	0.6968	1.0000				
LNpolice station	0.6151	-0.3015	0.3315	-0.4266	0.1337	0.1200	0.2801	-0.3846	-0.2890	0.7081	0.6740	0.9639	1.0000			
retail centre	-0.8879	0.1444	-0.3977	0.4521	-0.1758	-0.1396	-0.3431	0.6329	0.7616	-0.4112	-0.4661	-0.3556	-0.4345	1.0000		
LNretail centre	-0.8133	0.0972	-0.3407	0.4105	-0.1467	-0.1095	-0.2908	0.5906	0.7424	-0.2956	-0.3579	-0.1950	-0.2727	0.9680	1.0000	
racial composition	-0.5315	-0.0297	-0.0894	0.3161	0.0003	0.0051	0.4399	0.5332	-0.1673	-0.2242	-0.0777	-0.1412	0.6746	0.6863	-0.0894	1.0000

Figure A: Suburb Model Correlation Matrix (Authors Own)

	LNdist~ f	erfsize	LNprop ~e	bathro~ s	bedroo ms	clinc	LNclini c	school	LNscho ol	police~n	LNpoli~ n	retail~e	LNreta ~e	racial~n
LNdisttoFl~f	1.0000													
erfsize	-0.1375	1.0000												
LNproperty~e	0.3201	-0.0702	1.0000											
bathrooms	-0.0642	0.4350	0.0903	1.0000										
bedrooms	-0.0800	0.4424	0.0932	0.5898	1.0000									
clinc	0.1481	-0.2988	0.3843	-0.1357	-0.1052	1.0000								
LNclinic	0.1103	-0.3274	0.3723	-0.1497	-0.1002	0.8279	1.0000							
school	-0.2518	0.2854	-0.4027	0.1163	0.1006	-0.3370	-0.2455	1.0000						
LNschool	-0.2605	0.2657	-0.4472	0.0830	0.0739	-0.4107	-0.3540	0.8963	1.0000					
policestat~n	-0.2855	0.3251	-0.4011	0.1361	0.1238	-0.3424	-0.2384	0.7742	0.6968	1.0000				
LNpolicestat~n	-0.3015	0.3315	-0.4266	0.1337	0.1200	-0.3846	-0.2890	0.7081	0.6740	0.9639	1.0000			
retailcentre	0.1444	-0.3977	0.4521	-0.1758	-0.1396	0.6329	0.7616	-0.4112	-0.4661	-0.3556	-0.4345	1.0000		
LNretailcentre	0.0972	-0.3407	0.4105	-0.1467	-0.1095	0.5906	0.7424	-0.2956	-0.3579	-0.1950	-0.2727	0.9680	1.0000	
racialcomp~n	-0.0297	-0.0894	0.3161	0.0003	0.0051	0.4399	0.5332	-0.1673	-0.2242	-0.0777	-0.1412	0.6746	0.6863	1.0000

Figure B: Suburb Model Correlation Matrix of the Explanatory Variables (Authors Own)

	LNdist~f	erfsize	LNprop~e	bathro~s	bedrooms	clinc	LNclinic	school	LNschool	police~n	LNpoli~n	retail~e	LNreta~e	racial~n
LNdisttoFl~f	1.0000													
Ersize	-0.1384	1.0000												
LNproperty~e	0.3343	-0.0872	1.0000											
bathrooms	-0.0310	0.4339	0.1256	1.0000										
Bedrooms	-0.0494	0.4284	0.1149	0.5780	1.0000									
Clinic	0.1393	-0.2989	0.3845	-0.1265	-0.0935	1.0000								
LNclinic	0.0966	-0.3382	0.3719	-0.1463	-0.0913	0.8129	1.0000							
School	-0.2772	0.2376	-0.4351	0.0554	0.0429	-0.3450	-0.2652	1.0000						
LNschool	-0.2719	0.2341	-0.4709	0.0387	0.0261	-0.4009	-0.3562	0.8989	1.0000					
policestat~n	-0.3233	0.2698	-0.4438	0.0599	0.0557	-0.3260	-0.2235	0.7471	0.6723	1.0000				
LNpolicestat~n	-0.3272	0.2971	-0.4557	0.0811	0.0697	-0.3553	-0.2615	0.6868	0.6436	0.9665	1.0000			
retailcentre	0.1227	-0.4391	0.4571	-0.1894	-0.1489	0.5957	0.7339	-0.4565	-0.4781	-0.3682	-0.4285	1.0000		
LNretailce~e	0.0719	-0.3983	0.4117	-0.1748	-0.1341	0.5602	0.7208	-0.3510	-0.3804	-0.2199	-0.2790	0.9697	1.0000	
racialcomp~n	-0.0207	-0.2606	0.3388	-0.1051	-0.0911	0.4804	0.5792	-0.2943	-0.3141	-0.1932	-0.2319	0.7458	0.7355	1.0000

Figure C: Pre-Construction (2001-2010) Correlation Matrix of Explanatory Variables (Authors Own)

	LNdisttoFl~f	erfsize	bathro~s	bedrooms	clinc	LNclinic	school	LNschool	police~n	LNpoli~n	retailcentre	LNretailce~e	racialcomp~n
LNdisttoFl~f	1.0000												
Erfsize	-0.0660	1.0000											
bathrooms	-0.1414	0.4146	1.0000										
Bedrooms	-0.1570	0.4649	0.6157	1.0000									
Clinic	0.0287	-0.2282	-0.1367	-0.1224	1.0000								
LNclinic	0.0133	-0.1683	-0.0907	-0.0667	0.9678	1.0000							
School	-0.0484	0.3576	0.2766	0.2625	0.0080	0.1942	1.0000						
LNschool	-0.0825	0.3275	0.2369	0.2624	-0.1495	0.0447	0.9026	1.0000					
policestat~n	0.0165	0.4036	0.3490	0.3238	-0.0239	0.1562	0.8555	0.7807	1.0000				
LNpolicestat~n	0.0053	0.3868	0.3230	0.3168	-0.1207	0.0804	0.8048	0.8061	0.9664	1.0000			
retailcentre	0.0883	-0.0899	-0.0188	-0.0025	0.8831	0.8730	0.1483	-0.0058	0.2406	0.1305	1.0000		
LNretailcentre	0.0851	0.0288	0.0684	0.0929	0.7741	0.8063	0.2802	0.1490	0.4204	0.3461	0.9548	1.0000	
racialcomp~n	-0.0686	0.4567	0.3567	0.3421	0.3562	0.4198	0.3569	0.2822	0.4366	0.3868	0.5074	0.5710	1.0000

Figure D: Post-Construction (2011-2017) Correlation Matrix of Explanatory Variables (Authors Own)

**SCHOOL OF ARCHITECTURE AND PLANNING
HUMAN RESEARCH ETHICS COMMITTEE**

CLEARANCE CERTIFICATE
PROTOCOL NUMBER: SOAP40/06/2017

PROJECT TITLE: The impact of the Integrated Residential Development Programme on surrounding property values: Fleurhof, Johannesburg

INVESTIGATOR/S: Nontokozo Mnisi (Student no #710422)

SCHOOL: Architecture and Planning

DEGREE PROGRAMME: Master of Development Planning (MScDP)

DATE CONSIDERED: 1 September 2017

EXPIRY DATE: 1 September 2018

DECISION OF THE COMMITTEE: APPROVED

CHAIRPERSON 
(Professor Daniel Irurah)

DATE: 05-09-2017

cc: Supervisor/s: Aly Karam/Prisca Sibangeni

DECLARATION OF INVESTIGATORS

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to endure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.


Signature

6 September 2017
Date

Formal Consent Form: Lightstone Company

Pseudonym number, _____ Date, _____

Researcher's signature, _____ Date _____

PLEASE TICK:	YES	NO
I understand what this research is about through the 'Participant Information' sheet provided by the researcher	☒	☐

I E. MARK. hereby give permission to the student to get access to the secondary data requested.