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Investigating diversity in the function of shelter

by

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Declaration

I, the undersigned, hereby confirmed that the attached treatise is my own work and that any sources are adequately acknowledged in the text and listed in the bibliography.

I accept the rules of the University of Pretoria and the consequences of transgressing them.

This treatise is submitted in partial fulfilment of the requirements for the degree of MSc Real Estate at the University of Pretoria. It has not been submitted before for any other degree or examination at any other university.

Signature of acceptance and confirmation
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Date: 4 December 2015

Abstract

Resilience is the capacity of a system to absorb disturbance and reorganise while undergoing change so as to retain essentially the same function, structure, identity and feedback. As a concept, resilience is used by various disciplines to analyse ecological, social and social-ecological systems. This has facilitated a variety of interdisciplinary studies in areas of science, urban planning and engineering, to name a few. Resilience theory presents a foundation for understanding why these changes occur and what their consequences are over time. Ongoing research has shown that the main challenge regarding urban resilience is to broaden its scope by including societal aspects, in this case shelter. This study seeks to lay a foundation for understanding why diversity is important in the function of shelter in a typical South African city.

Diversity is one of the attributes for building resilience in social-ecological systems, increasing their capacity to adapt to change. Diversity spreads risks, creates buffers and plays an important role in the reorganisation and renewal processes of disturbed systems. This dissertation explores diversity in the function of shelter in the Tshwane urban system and how this diversity has changed over time. One of the key functions of an urban social-ecological system is to provide shelter. Understanding diversity in the function of shelter would have positive effects on current housing interventions and perhaps also assist in giving a deeper meaning to the challenges faced in the delivery of housing in South Africa.

A historical comparative study method using qualitative analysis is used in this study. A comparative analysis investigates how the function of shelter has changed in three areas in the City of Tshwane in the last eight to ten decades. Primary and secondary data is analysed to look at how this diversity has changed by looking at physical, financial and tenure-based typologies. By closely examining the history of Pretoria, the study established that diversity increased and decreased intermittently in some areas in Soshanguve, Mooikloof and the inner city. This illustrates the Tshwane urban system's ability and capacity to absorb successive transformations without losing its essential structure, i.e. its resilience.

The overall objective aims to contribute to an evolving understanding of shelter as a function in South Africa, and why diversity is important within this function. By defining the different financial, physical and tenure based typologies, the study develops a framework to explore diversity in shelter in South Africa. This framework then offers a practical basis for analysing how diversity manifested in the function of shelter in the Tshwane urban system. Defining

typologies of shelter is important because it paints an explicit picture about the areas within shelter where there is little diversity across different spectrums (low-middle income, public-private). This then assists policy makers in directing interventions where there is a need or low diversity. In analysing the change across time, one is able to determine where and when diversity increased (why it increased) as well as when it decreased (why it decreased). Very limited research has been conducted to investigate the relationship between housing and the greater urban resilience perspective. Furthermore very little work has also been conducted on which factors can contribute to more sustainable housing from a resilience perspective. This study starts to address this gap and therefore adds value to the very limited South African debate.

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List of acronyms

ANC	African National Congress
CBD	Central Business District
CRUP	Community Residential Units Programme
CSIR	Council for Scientific and Industrial Research
EPHP	Enhanced People's Housing Process
FAO	Food and Agriculture Organisation
GIS	Geographic Information Systems
IHSP	Individual Housing Subsidy Programme
IRDP	Integrated Residential Development Programme
NRF	National Research Foundation
PHP	People's Housing Process
RDP	Reconstruction and Development Programme
SACN	South African Cities Network
SHP	Social Housing Programme
SHRA	Social Housing Regulatory Authority
NDP	National Development Plan
UISP	Upgrading of Informal Settlements Programme
UN	United Nations
USN	Urban Sector Network

List of Keywords

Urban resilience
Ecological resilience
Spatial resilience
Social-ecological systems
Diversity
Shelter
Urban system
Typologies

CHAPTER 1: INTRODUCTION TO THE STUDY

1.1. Introduction

Cities are social-ecological systems (Du Plessis, 2008) and, as such, they are affected by trends of urbanisation and economic structural change in many different ways (Lange, 2011). Some cities find it easy to adapt to these changes, while others go through many forms of decline when structural change occurs (Elmqvist, Ernstson, Van der Leeuw, Redman, Meffert, Davis & Alfsen, 2009). Resilience theory presents a foundation for understanding why these changes occur and what their consequences are over time. Ongoing research has shown that the main challenge regarding urban resilience is to broaden its scope by including other societal aspects (Wikström, 2013), in this case, shelter. This study seeks to understand the importance of diversity in the function of shelter in a typical South African city by looking at how diversity is distributed within this function and furthermore how diversity manifests. Housing diversity is delivered through the provision of a range of physical dwelling types, a range of tenure options and a range of finance typologies, the selection of the artefactual species used to explore diversity in shelter were based on this. This chapter will give background to the study as well as introduce the research problem, research method and finally, the section on the structure of the study will serve as the conclusion of this chapter.

Diversity provides a source for options which enables a system to respond to change and perturbations in various ways, thereby increasing the resilience of that system. Although the study looks at diversity as a construct of a resilient system, it is important to first outline the different theories of resilience. Theories of resilience include the concepts of the panarchy and the adaptive cycle. Panarchy is used to define the interacting set of hierarchically structured scales and the interactive dynamics of a nested set of adaptive cycles (as shown in figure 1 below) (Pisano, 2012). Panarchy also refers to how precariousness, resistance and latitude are influenced by states and dynamics of subsystems at scales; above and below scales of interest (Pisano, 2012).The notion of an adaptive cycle was developed by Holling in 1973 (Folke, 2006). He identified four phases (as shown in Figure 2 below) of the cycle: the exploitation phase, the conservation phase, the release phase and the reorganisation phase. In the first phase, a rapid colonisation of a disturbed site by one or more species best able to exploit the change follows a disruption (Folke, 2006; Berkes et al., 2003). This rapid change is followed by a period of slower change conservation; energy is accumulated in this phase (Gunderson, 2000). At this point, the system is still very vulnerable and a small disturbance could result in a moment of release in which change may suddenly

flow through the system, which leads to a process of reorganisation (Folke, 2006; Berkes et al., 2003). Change can follow different possible courses and relatively small influences may direct a system onto one course or another (Gunderson, 2000). The following section will look at some of the definitions that were used in this study.

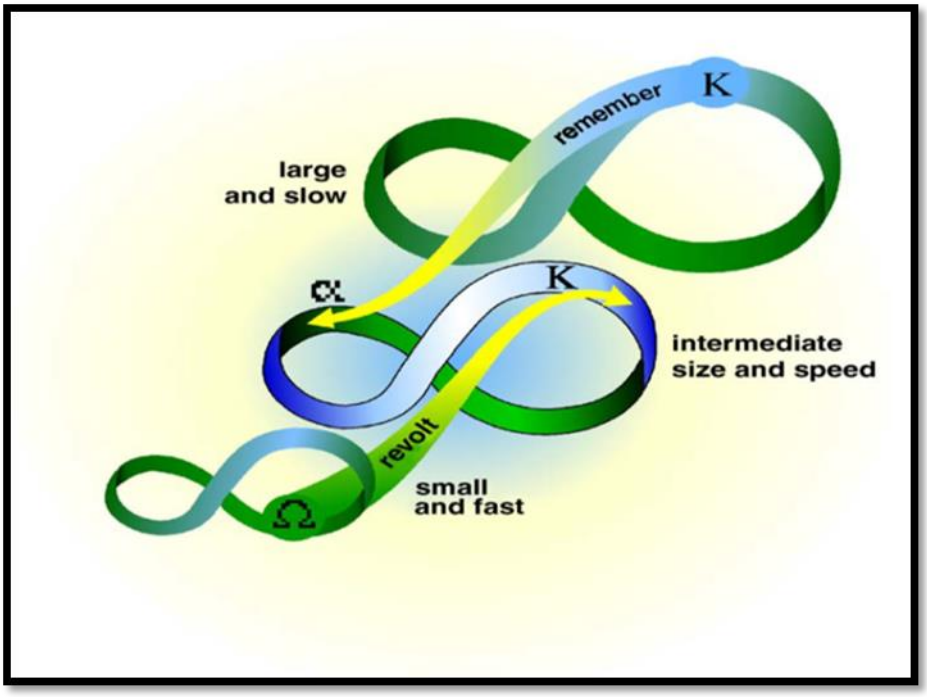


Figure 1: "Panarchy represents a heuristic model of nested adaptive renewal cycles emphasising cross-scale interplay" (Gunderson & Holling 2002:75)

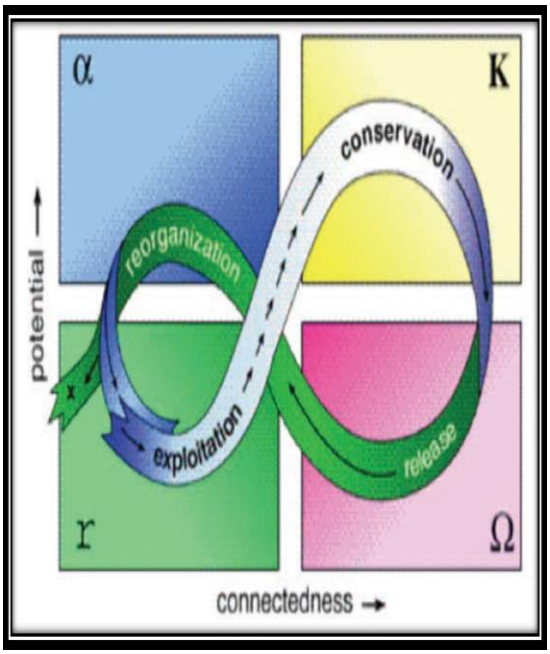


Figure 2: An adaptive cycle (Holling 2001:394)

1.1.1. Definitions

Shelter

Shelter is a place of refuge that provides cover or protection from weather and danger. Adequate shelter refers to suitable security of tenure, basic infrastructure, space, privacy, security, physical accessibility and accessible location to areas of employment and basic facilities (Sheuya, Howden-Chapman & Patel, 2007). The term 'housing' will be used throughout this study to define a formal dwelling structure.

Urban system

An urban system is a way of defining a city by considering its spatial expansions and its components. The interconnections between the components of an urban system are vital to its functioning. It is important to note that these components are not only interconnected, but they are interdependent too. The structure of an urban system is therefore determined by the arrangement and the connection of its components. Bretagnolle, Pumain and Vacchiani-Marcuzzo (2009) state that the organisation of an urban system can be divided into the following categories:

- The micro level, which represents elementary units that reside together in a city
- The meso level, which represents the geographical entity of the city and the way the city corresponds with itself
- The macro level, which represents the system of cities, and consists of a large number of towns and cities that interact under unified control.

Social Ecological Systems

A social-ecological system is an organisation of an ecological and social life form in a spatially determined geophysical setting (Halliday & Glaser, 2011).

Artefactual Species

Artefactual species are constructed artefacts and are a term that will be used in this study to define the typologies that will be used to illustrate how shelter is distributed in South Africa. Physical typologies form part of the biophysical sphere while finance and tenure based typologies from the neurospheric sphere.

1.2. Background to the study

Urbanisation is a global process that manifests itself through various changes in human population dynamics (Elmqvist et al., 2009). These changes are often rapid and it is difficult to grasp the consequences. (Elmqvist et al., 2009). It is therefore important to understand all the processes that are at play within a city and how these processes can be used to analyse and understand change (Chelleri & Olazabal, 2012).The city is an agglomeration of contested spaces that generate a wide range of urban services, such as transport, housing, jobs and education (Elmqvist et al., 2009). All of these services that a city has to provide are linked to ecological processes. Through patterns of land use, these ecological processes are intertwined with social processes within the city and hence socio-ecological processes are conceived. Therefore, a normative governance approach, which will ensure that ecosystem functions are integrated within the social dynamics of a city, is necessary (Andersson, 2006). This is important because it ensures that cities are governed and managed towards more sustainable development (Chelleri & Olazabal, 2012).

In 2011, the South African Cities Network (SACN) published a State of the Cities Report entitled *Towards resilient cities*. In the report, it is highlighted that resilience thinking is paramount to understanding all the transitions that are currently taking place in South Africa (Turok et al, 2011:11). The report refers to the spatial, social and economic challenges and changes that are evident in nine of the South African municipalities that were studied, and how a resilience perspective can be used as an analytical framework for addressing these challenges (Turok et al, 2011:11).

The State of the Cities Report (Turok et al, 2011) gives a more holistic foundation for applying resilience thinking in the Tshwane urban system. The report draws on the mandate placed by the South African Constitution (section 24b) (South Africa, 1996) on local government. The mandate states that all municipalities need to ensure that development follows an ecologically sustainable route (Turok et al, 2011:12). This has to be done parallel to promoting economic and social development. The report further highlights that, due to the socio-economic challenges cities face, ecological sustainability does not take precedence (as it ought to) in development practices. Due to a low learning capacity, interactions between social and ecological systems are often not understood. Hence, perturbations are accompanied by undesirable effects when they occur.

Turok et al. (2011) suggests that the concept of resilience can provide a foundation to understand these interactions by connecting all the different elements that make up urban

systems. In this report, resilience is defined as the capacity of a place to anticipate, respond and adapt successfully to challenging conditions, such as global recession, environmental threats or pressures of population growth (Turok et al, 2011:12). Resilience thinking provides a practical framework for understanding how cities accommodate multiple, interacting sources of social, economic and physical change, and position themselves for the future. Resilience also captures the reality of being connected to an increasingly uncertain and volatile world through, for example, trade, migration and foreign investment. The State of the Cities Report classifies resilience according to four sustainability factors within the South African context. These factors are summarised below:

- **Economic:** In this sense, resilience is the ability of city economies to adjust to difficult economic circumstances and emerge from the transition in a more advantageous position. This may involve adapting existing skill sets, technology, knowledge and fixed assets to new opportunities. This aspect explores whether local economic agents are sufficiently versatile and resourceful to adjust to altered conditions (Turok et al, 2011:13).
- **Environmental:** In this context, resilience is the ability of the physical systems of cities to withstand environmental changes and hazards. This aspect also looks into whether investment in the built environment and infrastructure is avoiding path dependence and facilitating new development pathways based on more efficient resource use and low-carbon technologies. It explores whether the reliance on motor vehicles is being reduced and higher density, mixed-use development is being encouraged (Turok et al, 2011:13).
- **Social:** Social resilience describes whether disadvantaged groups remain marginalised from opportunities, and reflects on the level of inclusivity or exclusivity of the urban system. It also refers to the ability of urban systems to tolerate and assimilate migrant populations from rural areas and other countries without conflict. This has an effect on the capacity of diverse communities to interact and build trusting relationships that realise the creative potential of cultural diversity in urban areas (Turok et al, 2011:13).
- **Governance and institutions:** In this sense**,** resilience concerns the capabilities of local governments to anticipate and adapt to shifting conditions over time through learning and innovation. It also concerns the quality of leadership and the strategic powers and resources of local governance structures, as well as their level of astuteness in terms of their judgement of the situation, future threats and their appropriate response. This aspect considers whether governments are able to stand up to other tiers of government and pressure from vested interests, and the extent

and strength of their internal and external networks and relationships with other organisations (Turok et al, 2011:13).

In 2012, the City of Tshwane released the Tshwane 2055 vision. The main purpose of this policy document was to articulate the city's plans for the future by setting out a bold vision that will ensure that the city is liveable, resilient and inclusive (City of Tshwane Metropolitan Municipality, 2012). The plan also reflects the aspirations the city has in contributing to the vision of the National Development Plan 2030 (City of Tshwane Metropolitan Municipality, 2012). In its vision 2055 strategy, the City of Tshwane refers to resilience by stating that Tshwane will be resilient and resource-efficient (City Tshwane Metropolitan Municipality, 2012). This is one of its six outcomes under the section "Realising the vision of the capital city". The report unfortunately limits resilience thinking to climate change and pulse perturbations, and it does not clearly outline the benefits that resilience thinking can have on all the dynamics and processes that occur within the Tshwane urban system.

Alberti and Marzluff, (2004) argue that ecological resilience applies in an urban context. They note that urban ecosystems evolve over time and space as the outcome of dynamic interactions between socio-economic and biophysical processes operating over multiple scales. An ecology in which humans are the dominant agents emerges from these complex interactions (Grimm, Grove, Pickett & Redman, 2000; Alberti & Marzluff, 2004). Cities are complex adaptive systems (Gunderson, 2000). As such, patterns at higher levels emerge from localised interactions that act at lower levels (Levin, 1998). Cities are good examples of emergent socio-economic and ecological phenomena (Alberti et al., 2003). Patterns of traffic congestion, pollution and sprawl, for example, are the outcome of multiple local interactions and feedback mechanisms between human decisions and ecological processes in urban systems (Alberti & Marzluff, 2004).

Cities are urban social-ecological systems and according to Du Plessis (2008) they are the most coupled systems that combine elements of human and nature. Understanding cities as social-ecological systems acts as a foundation for further research and engagement in the study of urban sustainability. In understanding cities as social-ecological systems four critical aspects are noted by Du Plessis (2008), she proposes that cities should be understood as: (1) complex adaptive systems that are (2) integrated across spheres of matter, life and human social and cultural phenomena, (3) are structured as nested systems that allows interaction across scales and levels of organisation, and (4) that social-ecological systems are different from other types of ecosystems due to the introduction of abstract thought and

symbolic construction that allows for novelty, communication of ideas across time and space and which leads to learning and reflexive thinking in understanding complex systems.

One of the key features of complex systems is their non-linearity, which leads to multiple possible outcomes of their dynamics (Levin, 1998). Urban systems have multiple steady and unstable states. Urban sprawl leads to a shift in these states, from a natural steady state of abundant and well-connected natural land cover to a second steady state of greatly reduced and highly fragmented natural land (Grimm et al., 2000; Alberti & Marzluff, 2004). The form of the natural steady state depends on natural disturbance regimes. The sprawl state is a forced equilibrium that relies on incomplete information regarding the full ecological costs of providing human services to low-density development (Alberti & Marzluff, 2004). Sprawl is an unstable state because it is based on importing ecosystem services from other areas (Alberti & Marzluff, 2004). The state of an urban ecosystem is likely driven between natural and sprawl states by the amount of urbanisation (Grimm et al., 2000; Alberti & Marzluff, 2004).

As urbanisation increases, the system shifts from the natural vegetation attractors to sprawl attractors (Alberti & Marzluff, 2004). The system moves away from the natural vegetation attractor towards the sprawl attractor and beyond, until increasing urbanisation reduces ecological systems' ability to support the human population (Alberti & Marzluff, 2004). Furthermore, Alberti and Marzluff (2004) note that the replacement of ecosystem services with human services in urbanising regions over the long term eventually reaches a threshold when it drives ecosystems to collapse (Alberti & Marzluff, 2004). This process drives the system back towards the natural vegetation attractor if ecosystem collapse reduces settlement to the point that substantial natural vegetation can regrow (Grimm et al., 2000; Alberti & Marzluff, 2004). Many large human settlements have collapsed in the past, possibly because the local environment was extensively degraded or the ecological carrying capacity changed in response to large-scale climatic shifts (Grimm et al., 2000; Alberti & Marzluff, 2004).

Acevedo-Garcia and Osypuk (2010) state that urban systems perform certain key functions and services. Ferreira and Du Plessis (2013) note that the urban environment's users and resources determine these functions and services. Different functional groupings, such as business and commerce, social amenities, industrial, infrastructure, green users and residential groupings, can be recognised (Ferreira & Du Plessis, 2013). These services and functions also characterise the urban area from the perspective of aspects such as location and physical environment, policies, economic status, or historical experience and traditions

(Acevedo-Garcia & Osypuk, 2010). According to Acevedo-Garcia and Osypuk (2010), the key features of an urban system are to provide the following:

- **A residence service**: Urban systems provide shelter for human beings.
- **Function of space for trade and mobility of goods and services:** Urban systems provide infrastructures that make the interchange of goods and services possible, which results in population mobility, as well as goods and services transportation. The existence and combination of certain economic, historical, political and geographical factors allow the performance of these functions. Moreover, it determines a range of urban characteristics in relation to population, supply and demand of services, and the strategic location of these systems at regional, national or global level.

Elmqvist, Folke, Nyström, Peterson, Bengtsson, Walker and Nyström (2003) suggest that the diversity of responses to environmental change among species contributing to the same ecosystem function can strongly influence ecosystem resilience. The same notion is applicable to urban systems (Leslie & McCabe, 2013) because the range, prevalence, and spatial and temporal distributions of different responses may be crucial to the resilience or the transformation of these urban systems (Leslie & McCabe, 2013). Diversity in the function of shelter refers to a housing supply that can cater to different types of residents (Acevedo-Garcia & Osypuk, 2010) and offer a broad array of choices, from non-market housing to multi-family units and single-family homes (Acevedo-Garcia & Osypuk, 2010).

Housing diversity is delivered through the provision of a range of dwelling products and sizes, a range of tenure options and a range of funding mechanisms (Acevedo-Garcia & Osypuk, 2010). The provision of a diverse range of dwelling styles and densities also provides housing choice and meets the housing needs of residents at different stages in life. Increasingly diverse household types (e.g. young families, professionals, retirees and those with disabilities) are provided (Acevedo-Garcia & Osypuk, 2010). By providing greater housing and lifestyle choice, a more diverse range of people are attracted to a location (Acevedo-Garcia & Osypuk, 2010).

1.3. Research problem

The diversity of responses to change within an urban system appears to enhance its resilience and the capacity it has to adapt to change. The ability to withstand a perturbation or disturbance is improved when there is a range of reactions to change within a specific function. Although a growing body of research focuses on the interactions between humans and ecological systems, changes in the critical functions that urban systems provide and how

they affect the system state of these urban systems are yet to be fully explored. This study investigates diversity in the function of shelter by exploring the changes in this function over time in three areas of the Tshwane urban system, by looking at how diversity is distributed within this function and furthermore how this diversity manifests.

1.3.1. Research questions

- Which typologies can be used to explain how diversity is distributed in the function of shelter in South Africa?
- How did diversity manifest in the function of shelter in the Tshwane urban system?

1.4. Research method

1.4.1. Research approach

Engaging and mapping patterns of change is a central objective of this study. To analyse these patterns of change, a comparative historical research approach is used. Since this is a desktop study, written literature in the form of professional and academic journals, as well as books were sourced. The research also made use of electronic media such as internet sites, geographic information systems (GIS) data and aerial photographs. Interviews were also conducted with specific individuals to obtain more knowledge on how shelter has grown and evolved in the City of Tshwane.

1.5. Structure of the study

This chapter served as an introduction to the study. Chapter 2 will focus on identifying a theoretical framework by looking at cities as socio-ecological systems and defining resilience thinking. Chapter 3 outlines the research method and steps that will be used to conduct the research. In Chapter 4, diversity in the function of shelter for the Tshwane urban system is discussed by looking at how shelter is provided in South Africa. This informs another section within this chapter, which will look at the different typologies that underpin shelter, both informally and formally. Chapter 5 begins by looking at the different historical eras and a brief history of Tshwane in the context of larger changes. The information sourced from the historical study and time lines is then used to map the changes in the diversity of the function of shelter. This is followed by Chapter 6, which looks at diversity in each of the case study areas: the Pretoria inner city, Soshanguve and Mooikloof. Chapter 7 will serve as the conclusion.

1.6. Conclusion

This chapter focused on providing an introduction and general orientation to the study. This specific focus was on the following: introduction, background to the study, clarification of key definitions, rationale for the study, research problem formulation, research method and approach, research objective and questions and finally the content plan of the research report. The next chapter will provide the theoretical background of the concepts that were used in the study.

CHAPTER 2: THEORETICAL BACKGROUND

2.1. Introduction

Cities are social ecological systems and can be described as a panarchy with a nested set of neighbourhoods, urban nodes and metropolitan regions (Harrison et al. 2014). The approach of viewing cities as complex systems in an aggregate system has shifted to understanding cities as evolving systems and the big role that ecological resilience plays in this analysis (Batty, 2009). Du Plessis et al. (2014:4) suggest that understanding the city as a social-ecological system makes it conducive for an ecological resilience approach to the development of sustainability strategies. This chapter unpacks the theory behind the concepts that are used to define how diversity has manifested in the Tshwane urban system by looking at resilience in detail and its determinants.

2.2. Resilience

The use of the resilience perspective offers a narrative that can be used in defining and understanding the dynamics of change and development in social-ecological systems (Folke et al., 2010; Folke, 2006). Walker, Holling, Carpenter and Kinzig (2004) define resilience as "the capacity of a system to absorb disturbance and reorganise itself while undergoing change so as to essentially retain the same function, structure, identity and feedback". Resilience has different levels of meaning (Carpenter, Walker, Anderies & Abel, 2001). Carpenter et al. (2001) note three levels as they apply to different disciplines: as a metaphor, which is related to sustainability science; as a property of dynamic models; and as a quantifiable property that can be analysed in the field of socio-ecological systems. Resilience is quantified by the degree of disturbance that a system can withstand without faltering (Carpenter et al., 2001). Another definition of resilience focuses on the ability of a system to resist disturbance and the rate at which it returns to equilibrium after a disturbance (Carpenter et al., 2001). These definitions present a contrast in terms of how resilience is quantified. Carpenter et al. (2001) point out that the complementary aspect of persistence in defining resilience is important, i.e. the amount of external pressure needed to produce a given amount of disturbance in a system.

Gunderson and Holling (2002) argue that, although resilience has different levels of meanings, the more commonly used definition, which is termed "engineering resilience", considers that ecological systems exist close to a stable steady state. Thus, resilience is the

ability to return to a steady state after a perturbation (Gunderson & Holling, 2002). Ecological resilience is used to define or emphasise conditions that are far from being stable or steady and perturbations can flip a system into another regime of behaviour (Gunderson & Holling, 2002). Resilience is measured by the magnitude of disturbance that can be absorbed before the system modifies its structure by changing the variables and processes that control its behaviour (Gunderson & Holling, 2002). The difference between these two concepts of resilience can be found in the aspect of stability or a steady state. In ecological resilience, the focus is on maintaining the existence of a function, while, in engineering resilience, the focus is on maintaining the efficiency of a function (Gunderson & Holling, 2002). The latter also tends to explore the behaviour of a system near a known stable state. Ecological resilience, on the other hand, tends to examine alternative stable states and the properties of boundaries between states (Gunderson & Holling, 2002). Table 1 illustrates the various concepts and interpretations of the resilience theory.

Table 1: various interpretations of resilience theory (Folke 2006:259)

Resilience concepts	Characteristics	Focus on	Context
Engineering resilience	Return time and efficiency	Recovery and constancy	Vicinity of a state of equilibrium
Ecological and social resilience	Buffer capacity, withstanding shock, maintaining function	Persistence and robustness	Multiple equilibria, stability landscapes
Socio-ecological resilience	Interplay disturbance and reorganisation, sustaining and developing	Adaptive capacity transformation, learning innovation	Integrated system feedback, cross-scale, dynamic interactions

Holling introduced the concept of resilience in 1973 (Folke et al., 2010). Its introduction offered a way to unpack and understand the capacity of ecosystems (with alternative attractors) to persist in their original state subject to perturbations (Folke et al., 2010). The concept of resilience is now used within a wider scope of interdisciplinary work that explores the interactions between people and nature (Carpenter et al., 2001). Folke et al. (2010) argue that, in many disciplines, human actions are often viewed as external drivers of ecosystem dynamics. Through this narrative, human beings are viewed as external interveners in the resilience of ecosystems (Folke et al., 2010). Thus, ecosystems and social

systems are intricately linked, and the feedback loops within them imply that they are interdependent social-ecological systems (Folke et al., 2010).

Social-ecological resilience explores the interdependency between people and nature (Folke et al. 2010). Human activities and patterns of development have an effect on social-ecological systems and can tip this system out of its stability domain or into a different basin of attraction (Folke et al., 2010). Walker et al. (2004) define a basin of attraction as a region in state space in which the system tends to remain. Systems that incline towards an equilibrium maintain a state of equilibrium, which is defined as an attractor, and the basin of attraction creates all initial conditions that will tend towards that state of equilibrium (Walker et al., 2004). Adaptability and transformation are two important concepts that underpin how a system responds to change or transformation.

2.2.1. Adaptability

Folke et al. (2010) state that adaptability captures the capacity of a social-ecological system to learn, combine experience and knowledge, as well as adjust the way it responds to changing external drivers and internal processes. All this occurs while the system continues developing within a stability domain or basin of attraction (Folke et al., 2010; Walker et al., 2004).

Since human activities dominate in social-ecological systems, the adaptability of the system will, therefore, be the function of the social component, i.e. the actors involved in managing the system (Walker et al., 2010). The actions of those within the social component influence the system's resilience intentionally or unintentionally (Walker et al., 2010). Their success in prohibiting shifts into undesirable system regimes or managing to shift back into a desirable one depends on the capacity of groups or individuals to manage resilience (Walker et al., 2010). Walker et al. (2010) suggest that this can be done in the following ways:

- Altering the latitude
- Moving the current state of the system away or closer to the threshold and, therefore, altering the system's precariousness
- Making the threshold more difficult or easier to reach, and by so doing altering the system's resilience
- Managing cross-scale interactions to avoid or generate the loss of resilience at the largest and most disastrous scale

2.2.2. Transformability

Transformability is the capacity to create a primarily new system when ecological, social or economic structures make an existing system vulnerable (Folke et al., 2010; Walker et al., 2004). Transformational change is a change in the nature of the stability of a system (Folke et al., 2010). It is signified by the introduction of new defining state variables and the loss of others. It can be a deliberate force or it can be enforced by the alternating socio-economic or environmental conditions (Folke et al., 2010; Walker et al., 2004). The constructs of transformability include diversity across different structures and high levels of capital. Transformational change consists of shifts in awareness, the configuration of social networks, and shifts in patterns of interactions among individuals, especially leaders and those involved in the political landscape.

2.3. Characteristics of a resilient system

Harrison et al. (2014) outline guiding principles that could be implemented by local governments in building the resilience of governance systems and that of social and physical environments. The overarching aim of the principles, which are briefly outlined below, is to improve the adaptive capacity of urban systems in response to change.

2.3.1. The capacity to learn

The capacity to learn is very important in improving or building a system's adaptive capacity (Harrison et al., 2014). Improving learning capacity includes improving our abilities to acquire, absorb, retain and utilise knowledge. According to Harrison et al. (2014), cities need to instil a culture of learning, learning infrastructure and the skills that are required to maximise opportunities of learning. Learning is always accompanied by mistakes, but Harrison et al. (2014) suggest that these mistakes should be welcomed because they produce new learning, which feeds back into the system. The learning process should always involve trying, learning from doing and trying again (Harrison et al., 2014). It is also vital, as highlighted by Harrison et al. (2014), to create a culture that appreciates learning as a core value.

2.3.2. Redundancy

In ecological resilience, an increase in response diversity provides multiple redundancies to a specific function (Ferreira & Du Plessis, 2013). Therefore, the function would be stable and this would cause a decrease in its vulnerability to threats (Ferreira & Du Plessis, 2013). Redundancy refers to the duplication of critical components within a system to ensure that there is greater reliability if a malfunction should occur (Harrison et al., 2014). Urban systems are persistently confronted with unpredictable change and, if additional components are in place, this can lessen the impact that comes with that change (Harrison et al., 2014). Redundancy must therefore be built into all aspects of urban systems. These systems include the economy, shelter, transport options and infrastructure (Harrison et al., 2014).

2.3.3. Self-sufficiency and connectedness

Well-connected and self-sufficient urban systems can overcome and recover from disturbances at a faster rate (Harrison et al., 2014). Overly connected systems, however, risk incurring the rapid spread of disturbances across the entire system, which causes all its components to be affected because they are closely connected (Harrison et al., 2014). It is useful to ensure that a balance is managed in relation to all features of an urban system (Harrison et al., 2014). These elements include the functions of an urban system, such as shelter, the economy, spatial arrangements and infrastructure. Harrison et al. (2014) also suggest that it is very important to ensure that internal arrangements within an urban system are decentralised to different units and subunits. Decentralising units is important because, in the event that a perturbation occurs, the risk of having negative change flowing too quickly from one component to the next is reduced.

2.3.4. Diversity

Diversity is viewed as the primary source of urban vitality because it increases interactions among many urban components (Talen 2008:35). Talen (2008) further argues that urban planning ought to be a tool of promoting and maintaining closed grained diversity within cities. Diversity plays a vital role in an ecological system's response to disturbances. A system can also adapt to perturbations in various ways through diversity (Gunderson, 2009). When a particular species performs its functions in an ecological system, it enables all other species to perform their functions. Even though these functions may not seem linked, a lack of biotic diversity and redundancy limits options and reduces a system's capacity to respond to disturbances (Gunderson, 2009). A system's options can be increased by improving functional and response diversity. Functional diversity refers to the range of functional groups that a system relies on for its performance (Gunderson, 2009). Functional groups consist of

drivers and passengers. Drivers are the base functional groups and subgroups that control the future of a system, while passengers function within a system, but without altering it in a significant way (Gunderson, 2009). Response diversity refers to the different types of responses within each functional group that create its resilience. The interchange between disturbances and diversity, as well as their interaction with knowledge systems and self-organisation, is a vital connection for building resilience and the adaptive capacity of socio-ecological systems (Colding & Barthel, 2012).

In cities, diversity plays a major role in creating mechanisms for innovation, providing new ways to adapt to change, as well as generating knowledge and institutions to deal with challenges, opportunities and threats generated by change (Colding & Barthel, 2013). In the resilience discourse, diversity is considered a key construct of fostering resilience in complex adaptive systems (Colding & Barthel, 2013). Diversity spreads risks, creates buffers and is open to multiple strategies from which human beings can learn in situations when uncertainty peaks (Colding & Barthel, 2013).

Norberg and Cumming (2008) state that alternatives and options are vital requirements for change and that there can be no change or learning without them. However, options and alternatives come at a cost, and this becomes a stumbling block when considering which alternatives and options one must cater for to increase diversity (Norberg & Cumming, 2008). Even though this may be the case, they suggest that the diversity that is provided by these options and alternatives is important and a key requirement for the long-term functioning of biological and ecological systems.

Cities are complex urban social ecological systems and are critical in the functioning of societies. Existing theory on complex adaptive systems highlights that processes that occur within these systems are needed to sustain diversity, and therefore maintain options over time. Norberg and Cumming (2008) also suggest that diversity is a dynamic attribute of resilience and that understanding the processes that alter and maintain diversity is an important step in defining the possibilities of creating resilient social ecological systems. In understanding the importance of diversity in the resilience of social-ecological systems, Norberg and Cumming (2008) highlight the importance of focusing on the diversity of traits in a species community, as opposed to focusing on the species alone. This point is important because it is more trait diversity than species diversity, which is systematically related to the functioning of social ecological systems. Species diversity relevant (indirectly) when an increase in the number of species translates to an increase in the trait that is required for any social ecological system process.

When looking at functional diversity and the general characteristics of species and how these characteristics affect their ecological performance, Norberg and Cumming (2008) point out the following three attributes:

- What species are and what they do (their morphology and physiology)
- How they respond (the sensitivity of the morphology and physiology to external drivers)
- Whom they interact with (the resources and predators)

Given these factors, it becomes interesting to note how the diversity in the attributes of all species within an ecosystem that contributes to a particular ecosystem service affects the combined efficiency in sustaining it (Norberg & Cumming, 2008). Firstly, Norberg and Cumming (2008) note that, if species react differently to changes within their conditions, the changes will have a minimal effect on the performance of a group as a whole. Secondly, if there is a balance in the resources that species use, the performance of the group as a whole can increase when the degree of resource use is linked with the ecosystem service that is provided by these species (Norberg & Cumming, 2008).

2.3.5. Functional diversity

Functional diversity is used to relay the differences in the physiological and morphological traits, such as response traits and the resource use traits of species (Norberg & Cumming, 2008). Furthermore, they also note that functional diversity is used to illustrate complementarity in resource use. Functional diversity addresses parallel interactions (the use of different resources by species within the same trophic level) and serial interactions (trophic chains or particular morphologies and behaviours). Complementarity in functional diversity refers to species having partially coinciding contributions towards the functions of an ecosystem. This also means that they will have overlapping resource requirements (Norberg & Cumming, 2008). Therefore, if two species utilise different resources, one will not exhaust the other's resources below its minimal requirement. So, if the degree of complementarity is big, the degree of coexistence will be higher (Norberg & Cumming, 2008).

In the case of a city, these would be all the functions within a city that define and operate an urban system. Among other things, urban communities depend on a group of functions, including shelter, water supply, transportation, trade and manufacturing. According to Mori et al. (2013), functional diversity is the variation or dispersion of functional traits in an

assemblage. Furthermore, functional redundancy is the capacity of one species to functionally compensate for the loss of another (Elmqvist et al., 2003; Mori et al., 2013). As noted by Mori et al. (2013), a high diversity of species that are functionally similar enhance redundancy within functional groups, where the loss of any one species is potentially compensated for by the actions of another, thereby providing ecological insurance against uncertainty (Elmqvist et al., 2003; Mori et al., 2013). While functions that are performed by some species within a certain functional group may seem more essential than others (Folke, 2006), this does not insinuate that species that play a minor role are unimportant, because they become new drivers of that particular functional group as changes occur (Folke, 2006).

2.3.6. Response diversity

According to Mori et al. (2013) and Elmqvist et al. (2003), response diversity refers to the diversity of species within functional groups that collectively have a range of responses to disturbances or perturbations. Response diversity is also the range of reactions to environmental change among species contributing to the same ecosystem function (Elmqvist et al., 2003; Mori et al., 2013). Species that share essential and limited resources experience competition and affect each other's growth and fitness. As a result, species that have more dominant characteristics will be more successful in terms of competition (Norberg & Cumming, 2008). An important attribute of response traits noted by Norberg and Cumming (2008) is that traits for different types of disturbances may be correlated and the response capacity for one condition may be altered as a result of an alteration in another condition. Since response diversity is directly linked to the capacity of a system to respond to changing conditions without a decline in the functioning of a system, it follows that response diversity is determined by the kind of fluctuations that occur within an environment (Norberg & Cumming, 2008).

Response diversity is critical to resilience, especially during periods of ecosystem reorganisation (Elmqvist et al., 2003). As noted by Mori et al. (2013), high response diversity within functional groups contributes to the resilience of an ecosystem by increasing a group's capacity to maintain its function in the face of change (Mori et al., 2013). In urban systems, a resilient system will have different ways of performing its critical functions. This research looks at the importance of diversity in one of the key functions of an urban system (providing shelter) and it shows how the different typologies of the shelter function are important for a resilient system. On a species level, diversity is determined by the diversity in genetics (Elmqvist et al., 2003; Mori et al., 2013). Response diversity can also differ within species, depending on differences in life history (Elmqvist et al., 2003; Mori et al., 2013). Response

diversity is influenced by species distribution (and their traits) and the scales at which species within groups operate (Elmqvist et al., 2003; Mori et al., 2013).

2.3.7. Diversity in an urban context

Current research suggests that diversity is vital for the resilience of social-ecological systems (Berkes et al., 2003). Traditional definitions of resilience did not accommodate all aspects of biodiversity that are relevant to social-ecological systems (Colding & Barthel, 2012). New concepts of viewing and defining resilience have been formulated and give a better view on why diversity plays a great role in the resilience of social-ecological systems (Berkes et al., 2003). Response diversity, which this study refers to, is the difference between responses to environmental change among species of a particular community (Mori et al., 2013).

Diversity is one of the key attributes for building resilience in complex adaptive systems (Berkes et al., 2003). Diversity spreads risks, creates buffers and is open to multiple strategies from which humans can learn in situations when uncertainty peaks (Colding & Barthel, 2012). In addition to functioning as insurance, diversity also plays an important role in the reorganisation and renewal processes of disturbed systems (Berkes et al., 2003) or events that require change in social–ecological systems by creating a frame for creativity and adaptive capacity to deal with change in constructive ways (Berkes et al., 2003). Diversity is thus seen as key for dealing with disturbance and change in productive ways, with self-organisation and the capacity for learning and adaptation constituting important resilience characteristics (Colding & Barthel, 2012).

The critical role of diversity and redundancy has been examined in many systems, e.g. genetic, human engineered, complex adaptive, ecological, agro-eco and governance systems (Elmqvist et al., 2003. In biological systems, diversity facilitates functional redundancy. Other species that provide the same function in the system can continue to provide this function (Colding & Barthel, 2012). Hence, the management of many species within a single functional group promotes resilience by reducing the risk of a specific ecosystem function being entirely lost in a biological community or ecosystem (Elmqvist et al., 2003). Moreover, diversity in ecosystems promotes response diversity.

According to Sayyar and Marcus (2011), cities are one of the greatest complex systems that exist with an unusually large set of interrelated variables. Although the application of

ecological resilience in an urban context has been studied extensively, there are still facts that are either unknown or unclear (Sayyar & Marcus, 2011). Unpacking more facts and research is important because it can expand existing knowledge regarding patterns and relations on different scales of cities, as well as shed more light on the fundamental variables in cities, such as diversity (Sayyar & Marcus, 2011). In the last five decades, diversity has gained recognition as an essential factor for liveability, economic growth and the general attractiveness of cities (Sayyar & Marcus, 2011). Many years later, diversity is still presented as the most pivotal requirement for urban and regional growth in the knowledge economy, as well as in the information society (Sayyar & Marcus, 2011).

Diversity has a multiplicity of meanings in urban literature (Fainstein, 2005). In an urban design context, it refers to mixing building types. In urban planning, it means mixed uses or class and racial-ethnic heterogeneity. In a sociological and cultural context, it focuses on racial-ethnic heterogeneity. Though somehow different, all meanings of diversity within an urban context stress its importance in the sustainability of cities. Landman (2013) notes that socially and spatially mixed developments can support the call for place diversity and contribute to safer and more sustainable human settlements. Landman (2013) provides a more comprehensive definition of diversity by stating that place diversity is a form of diversity that exists within a setting of day-to-day activities where socially diverse people share the same neighbourhood. The kind of diversity that exists in such a setting is a result of a mix in income levels, races, ethnicities, ages and family types (Landman, 2013).

Diversity can also be used as a tool in promoting objectives of urban policy, such as stimulating growth and achieving equity (Fainstein, 2005). This premise is based on the human capital that diversity attracts by encouraging innovation, and ensures fairness and equal access to a variety of groups (Fainstein, 2005). As noted by Landman (2012), areas with low diversity are accompanied by a lack of housing for all income groups, class and racial segregation, and job-housing imbalances that eventually lead to increased traffic, congestion and pollution (Landman, 2012). This is very evident in South African cities, where housing shortages and congested roads are prevalent. Cities exhibit a low-density sprawl and this translates to, as noted by Landman (2012), speculative sprawl, the development of low-cost housing schemes on urban peripheries and illegal squatting.

The four conditions for city diversity as suggested by Jacobs (1961) are the following:

- The city or district in question must serve more than one primary function. These functions must ensure the presence of people who go outdoors on different

schedules and are in place for different purposes, but who are able to use many facilities in common.

- Street blocks must be short. Streets and opportunities to turn corners must be frequent.
- The city or district must mix buildings that vary in age and condition, including a good proportion of old ones, so that there is a variation in the economic yield that they produce.
- There must be a sufficiently dense concentration of people, especially in areas of residence.

Jacobs further submits that, given these conditions, cities will produce a diversity equivalent to one another. All four conditions are necessary to generate city diversity and the absence of any one of the four frustrates a city's potential to maintain its diversity (Jacobs, 1961). She also identifies two forms of diversity. The first form of diversity, which she terms primary uses, are those which, in themselves, bring people to a specific place because they are ports of entry. Examples of primary uses are office blocks, factories, shelter, recreational and educational facilities (Jacobs, 1961). A single primary use is ineffectual on its own in generating city diversity, it needs to be combined with another primary use, which will bring people in and out of an area and put them on the street at different times. Once these conditions have been met, an environment that is conducive to secondary diversity is created.

Secondary diversity is a term used to define the different enterprises that grow in response to the presence of primary uses to serve the population that primary uses draw. It thrives when it serves a mixture of primary uses (Jacobs, 1961). The more intricately mixed the uses are, the more efficient the pool of users and the more services and shops there can be to sift their clienteles from all sorts of the population (Jacobs, 1961). If secondary diversity flourishes, it can become a primary use itself (Jacobs, 1961) because it will draw more people based on the uses it offers. If it is to have staying power as a primary use, it must retain its foundation of mixed primary uses, i.e. people spread through time of day because of fixed reasons (Jacobs, 1961).

Density is also an important factor to consider in determining urban diversity and sustainable urban forms (Jabareen, 2006; Fainstein, 2005 Landman, 2012). Density is the ratio of people or dwelling units to land in a given area. The relationship between density and the character of an urban system is also based on the concept of viable thresholds (Jabareen, 2006). Thus, at certain thresholds, the number of people within a given area becomes sufficient to

generate the interactions needed to make an urban function (in this case shelter) viable. The sustainability of cities is linked to density (Jabareen, 2006) because dwelling types affect sustainability through differences in the consumption of energy, materials and land for housing, as well as through transportation and urban infrastructure. High-density and integrated land use not only conserves resources, but also provides for compactness, which encourages social interaction (Jabareen, 2006).

If urban policies could promote higher densities in cities, city centres would be strengthened and would subsequently extend the proportion of a city that has inner-area land use (Jabareen, 2006). High densities also enable better transit options by advocating for the production of mass rail transit options. Residents in high-density areas are more likely to commute by public transit and walking, as opposed to using private cars (Jabareen, 2006). Landman (2012) submits that, in South Africa, the National Housing Programme endorses the application of mixed- and medium-density housing to address the challenge of segregated spatial patterns that the country faces.

2.3.8. Importance of diversity in the function of shelter

Landman (2012) notes that mixed neighbourhoods can contribute to place diversity and the development of safer and more sustainable human settlements. Landman (2013) defines place diversity as the diversity that describes everyday activities. It can be defined as the phenomenon of social heterogeneity, where people from various social backgrounds share the same neighbourhood. The diversity that will be evident in this instance is a mix in income levels, races, ethnicities, ages and family types (Landman, 2013). Furthermore, Landman (2012) notes that two key design factors, socio-spatial mix and high densities, stand out when looking at increasing diversity. Socio-spatial mix translates to factors such as historical, economic and social, policy-related and physical or location factors (Landman, 2012). Higher densities, as noted by Jacobs (1968), stimulate the co-location of diverse uses that may exist within the same vicinity, and place diversity aims to create more opportunities for a multiplicity of individuals in closer proximity.

Landman (2012) notes that the lack of diversity in a development leads to unattractive, monotonous urban landscapes, a shortage of housing for all housing groups, imbalances between areas of employment and areas of residence, which lead to heavy traffic, congestion and air pollution (Landman, 2012). In South Africa, low diversity or the lack of diversity has led to low-density sprawl, fragmentation and separation (Landman, 2012). The current pattern of growth in South African cities, which was a result of urban sprawl, led to

speculative sprawl, low-cost housing projects on the urban edges and illegal squatting (Landman, 2012). Separation manifested in patterns of separation of land uses, races and income groups, while fragmentation was caused by a cellular development in cities.

According to Landman (2013), although there seem to be diverging views in the international debate on what makes up a diverse neighbourhood or shelter, some inferences can be made. Based on results from ongoing research, it is clear that diversity refers to both spatial and social diversity. However, Landman (2013) notes that spatial diversity is evident in a mix of housing unit types and facilities or amenities in townhouse complexes. Social diversity relates to the presence of diverse people in a neighbourhood or townhouse complex. In this case, the diversity is determined by a mix in the income groups, races, ethnic groups, ages and family types of residents (Landman, 2013). In a typical South African city, the concepts of diversity and integration are often applied broadly without any reference to how it applies in practice (Landman, 2013).

The absence of specific guidelines on how diversity applies in practice in the function of shelter makes it difficult to conclude what it really means to describe neighbourhoods as being diverse (Landman, 2013). Landman (2012; 2013) suggests that it is not only important to define the meaning of diversity in a typical neighbourhood in South Africa, but also to understand how people's perceptions could be influenced by this meaning (Landman, 2012; 2013).

2.4. Ecological resilience and diversity

The relationship between diversity and the functions performed by ecological systems has become important to understand due to the intensification of the anthropogenic transformation of the earth (Holling, Peterson & Allen, 1998). This is because the distribution and abundance of species has been drastically changed in conjunction with the changes in land uses. This has resulted in the loss of endemic species, while the expansion of global transportation networks has led to the spreading of other species (Holling et al., 1998). Maintaining the ecological services that sustain human and ecological life during this extensive and fast-paced ecological reorganisation needs further understanding as to how ecological interactions among species produce resilient ecosystems (Holling et al., 1998). Species perform many diverse and varied ecological functions in an ecological system. As noted by Holling et al. (1998), species may regulate biogeochemical cycles, alter disturbance regimes, modify the physical environment or regulate ecological processes indirectly through trophic interactions. A variation in the number of functions that a species can perform is often

limited. Hence, studies in ecology suggest that increasing functional diversity within a system causes an increase in ecological stability.

According to Holling et al. (1998), Darwin (1859), MacArthur (1955) and May (1973) were among the first authors to propose that species richness produces ecological stability. In recent research, it has also been demonstrated that, in small systems, increased species richness increases efficiency and the stability of some ecosystem functions, while decreasing the stability of the population. In order to illustrate and describe how an increase in species richness increases stability, Holling et al. (1998) use four models. These models are species diversity, idiosyncratic, rivets, and drivers and passengers. These models will be described briefly below and will be used to show the role of diversity in the function of shelter.

2.4.1. Species diversity

Holling et al. (1998) note that an area is more ecologically stable if it is occupied by a large number of species than when it is occupied by a smaller number of species. The addition of species to an ecosystem increases the number of ecological functions, which increases the stability of the ecosystem. As noted by Holling et al. (1998), increasing species richness increases the stability of ecological function. As species accumulate, they occupy the multidimensional ecological function space. This is illustrated in Figure 3 below (Holling et al., 1998). This model assumes that the function space is empty and that species can be continually added to a community without saturating it.

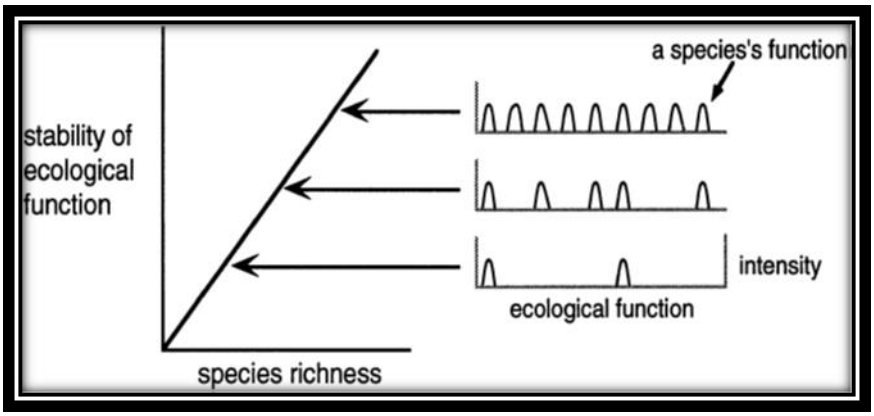


Figure 3: A representation of the species diversity model (Holling et al., 1998:7)

2.4.2. Idiosyncratic

This model represents a complementary model of the relationship between species and ecological function (Holling et al., 1998). It states that the contribution of each species to ecological function is strongly influenced by interactions among species (Holling et al., 1998). Thus, the effects of the introduction of species to or removal of species from an ecosystem can either be insignificant or major (shown in Figure 4 below). It all depends on the characteristics of the species that has been added or removed (Holling et al., 1998). It also proposes that strong ecological interactions among species results in an ecosystem that is adaptable, and that the degree of stability within a community depends distinctively on the types of species that are present. Based on the roles that different species play, Holling et al. (1998) note that ecosystem function is contingent on the ecological history of interacting species. This does not mean, however, that ecosystems are products of historical contingency.

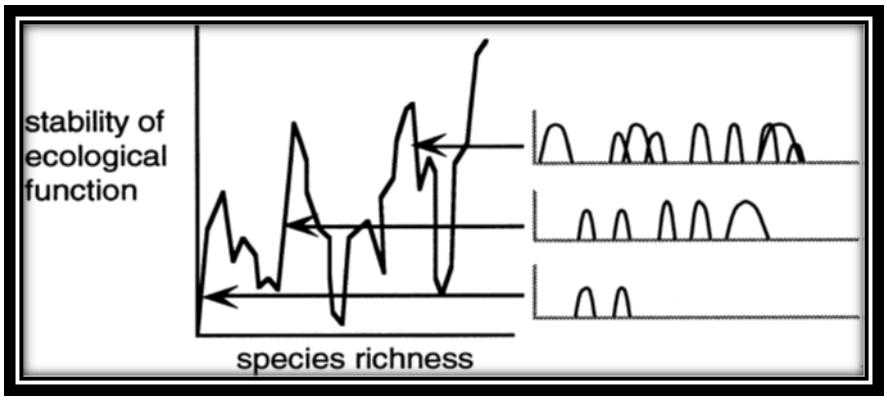


Figure 4: A representation of the idiosyncratic model (Holling et al., 1998:8)

2.4.3. Rivets

According to Holling et al. (1998), the rivet model of ecological function assumes that the ecological function space is relatively small and, as species are added to an ecosystem, their functions begin to overlap or complement each other. This is illustrated in Figure 5 below. This overlap allows ecological function to continue despite the loss of a limited number of species, since species with similar functions can compensate for the removal or decline of other species. This compensation masks the degradation of the ecosystem, because while a degraded system may function in the same way as an intact system, the decline in redundancy decreases the system's ability to withstand perturbations or further species removal. In the history of Pretoria, and especially the inner city, the diversity within the typologies (physical, tenure and financial) and their functions begin to overlap and

complement each other. Hence, as diversity steadily increased in the different typologies, it allowed the urban system to continue carrying out its function of shelter despite a loss of subtypes within a typology. For example, when beer halls (proceeds from the sale of alcohol were used to build and maintain shelter) were demolished in Soshanguve in 1976, funding for building new houses continued due to private sector involvement and the home loans that were introduced.

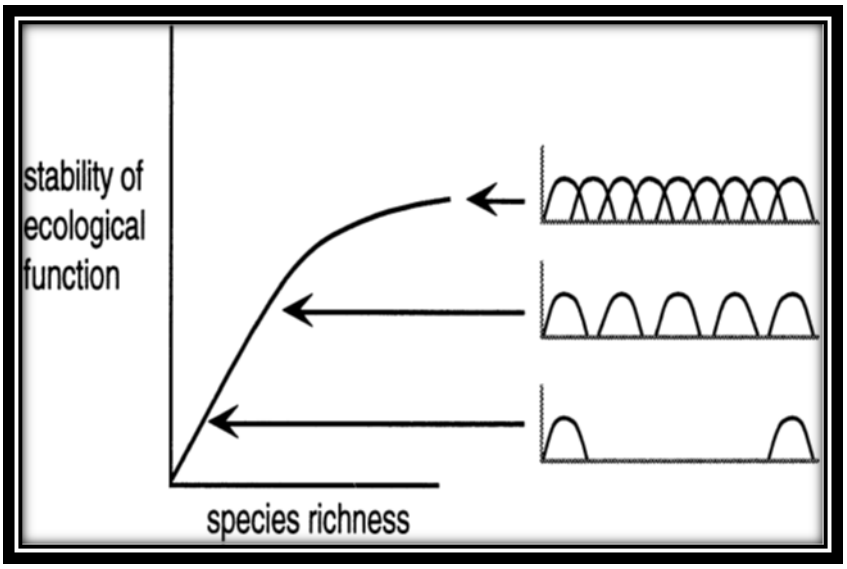


Figure 5: a representation of the rivet model of ecological function (Holling et al., 1998:8)

2.4.4. Drivers and passengers

Holling et al. (1998) state that Walker's drivers and passengers' model of redundant ecological function suggests that ecological function is unevenly distributed among species, as illustrated in Figure 6. As defined by Walker, a driver is a species that has a strong ecological function and is responsible for the structure of an ecosystem (Holling et al., 1998). Passenger species are those that have minor ecological impact (Holling et al., 1998). It is noted by Holling et al. (1998) that, since most ecological functions are the responsibility of the driver species, due to their strong influence, the presence or absence of the driver species determines the stability of an ecosystem's ecological functioning (Holling et al., 1998). The diversity of drivers and the number of passengers (which are potential drivers) determine the resilience of an urban system, and the diversity of functional groups maintains this diversity.

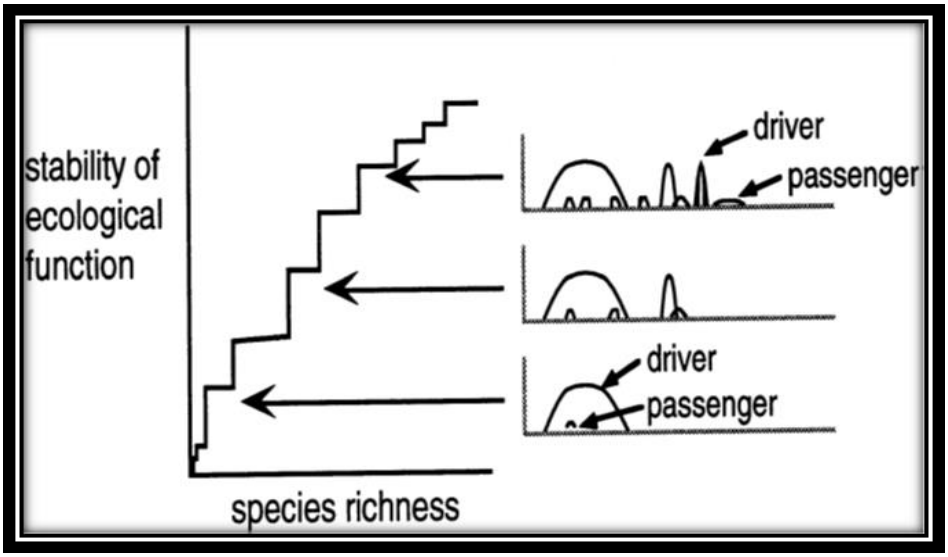


Figure 6: Walker's drivers and passenger's model (Holling et al., 1998:9)

From the models described above, Holling et al. (1998) developed a model to illustrate the relationship between stability and species richness (shown in Figure 6 above). They proposed that the relationship between stability and species richness varies with the degree of overlap that exists between the ecological functioning of different species and the amount of variation in the ecological impact of species' ecological functioning (Holling et al., 1998). The rivet model submits that ecological function is evenly separated among species, while the drivers and passengers model assumes that there are large differences between drivers that have strong ecological functions and passengers (illustrated in figure 7), which lack strong ecological functions (Holling et al., 1998). The distribution of functional diversity within and across scales enables regeneration and renewal to take place after a perturbation. While diversity increased in finance, physical and tenure-based typologies in the Tshwane urban system, it did not occur across scales and it was not evenly distributed spatially.

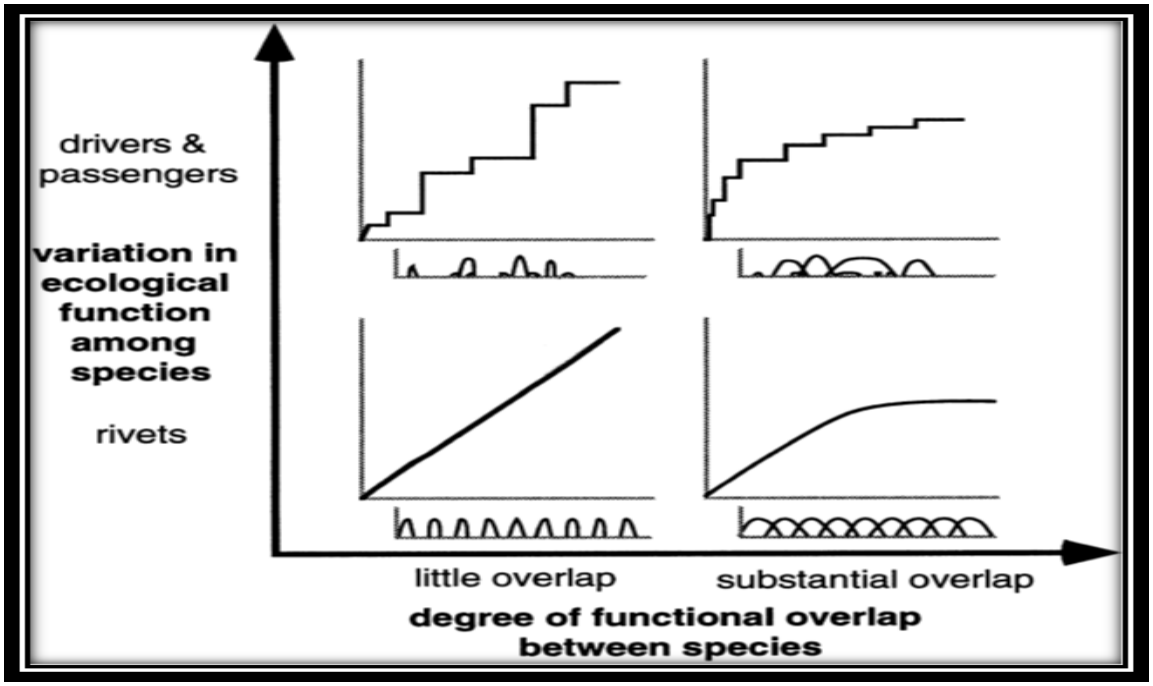


Figure 7: Model to illustrate the relationship between stability and species richness (Holling et al., 1998:10)

2.5. Urban resilience

Cities are urban social-ecological systems and, therefore, they are affected by trends of transformation and the process of economical structural change (Lange, 2011). Martin-Breen and Anderies (2011) support this notion by stating that cities are large systems and they contain smaller systems. These smaller systems include transportation networks, buildings, weather, infrastructure and shelter (Martin-Breen & Anderies, 2011). While some cities adapt and survive these transformations, others will experience multiple levels of urban decline. Urban resilience offers a way of thinking that makes it possible to understand why change happens and how the transformations that accompany change differ per urban system (Lange, 2011). Urban resilience, as a concept in urban planning, continues to expand from its ecological origins (Weakley, 2013). Although there is limited literature on social and urban resilience, there is evidence that an interest in social and urban resilience is growing (Weakley, 2013).

In South Africa, the first evidence of a policy document that has adopted the concept of resilience is the State of the Cities Report, entitled *Towards resilient cities* (Turok et al, 2011). The report was compiled by the South African Cities Network, a non-profit organisation set up by the Minister of Provincial and Local Government (Weakley, 2013). Its main mandate is to give guidance on the exchange of information and best practices on

urban development and city management in South Africa (Weakley, 2013). The report promotes the idea of urban resilience as “the capacity of a place to anticipate, respond and adapt successfully to challenging conditions such as global recession, environmental threats or pressures of population growth” (Weakley, 2013). South Africa faces multiple societal, economic and political challenges, and the report uses the resilience concept as a central thread to tie these challenges together (Weakley, 2013).

2.5.1. Resilient urban form

The concept of urban form is used to describe the physical components and the layout of urban systems (Harrison et al., 2014). Urban form needs to be viewed across different spatial scales. Harrison et al. (2014) note that this means that urban form needs to be considered from individual buildings to neighbourhoods, streets and street networks, public and open space, to an entire city. As mentioned in prior sections, cities are urban systems with different functions and components. The resilience of these components and the connectedness between the different parts of the city affect the resilience of the entire system (Harrison et al., 2014).

Urban systems go through changes and transformation over time. Through these processes, the urban form of these cities can either maintain its structure and stability or it can change and adapt to encounter different needs and circumstances (Harrison et al., 2014). In cities, this change and adaptation can manifest in physical transformation and growth or a change in how the urban system functions (Harrison et al., 2014). The urban form is constantly going through different processes of change, transformation and restructuring. According to Harrison et al. (2014), these processes include “shifts in the way that space, land and buildings are used, as well as changes in the demographics of people who inhabit the city, fluctuations and movements of people and goods in and out of the city, and how all these elements are shaped by economic, social and cultural dimensions, formal and informal forces and more”.

A system that deals with change while continuing to develop and thrive is resilient. Harrison et al. (2014) suggest that this can be achieved by responding to unexpected change and anticipating change and restructuring for measured, positive development when possible. So, rather than avoiding change, it is important to embrace change, adaptation and flexibility in cities.

2.5.2. Spatial resilience

Cumming (2011) highlights that almost all elements, relationships and regimes within an urban system have spatial locations and spatial attributes. He further notes that the exact details of the role that space and spatial variation has in the resilience of urban system is synthesised by the concept of spatial resilience. The concept of spatial resilience was formulated because through of various academic meetings and colloquiums within the Resilience Alliance (Cumming, 2011).

Cumming (2011) defines spatial resilience as the different ways in which spatial variation in relevant variables influences the resilience of a system across multiple spatial and temporal scales. Spatial resilience has features that are internal and external to the external system (Cumming, 2011). The primary internal elements consist of the spatial arrangement of the system components and interactions. These include system size and shape, as well as the number and nature of system boundaries (Cumming, 2011). An integral component of spatial arrangement within a system also includes spatial variation in internal phases (Cumming, 2011). These include a successional stage that influences system resilience and unique system properties that are a function of location in space (Cumming, 2011).

The primary external features of spatial resilience include spatial surroundings that are defined at the scale of analysis, connectivity and the subsequent spatial dynamics (Cumming, 2011). The internal and external features of spatial resilience must be viewed in light of other aspects of system resilience. These aspects, as suggested by Cumming (2011), are the following:

- The quantity and nature of components and interactions
- The capacity of the system to undergo, change and maintain its identity, system and memory
- The potential inherent in the system for adaptation and learning

Cumming (2011) argues that spatial resilience can be viewed as a relationship between the spatial attributes of the system at different scales. If resilience is defined as a system's ability to maintain its identity while going through change, then spatial resilience has an impact on identity (Cumming, 2011). Focusing on identity builds on existing mechanisms relating to how management goals and resilience thinking can be linked (Cumming, 2011). Spatial resilience is vital in this regard because it forms a narrative of applying some of the spatial principles and concepts that have been developed in landscape ecology to economic, social

and geographic contexts. Spatial resilience is also important in identifying generalities and synergies between different ways of looking at complex systems that are superficially diverse (Cumming, 2011).

2.5.3. Resilient housing

The biggest shortfall in sustainability interpretations, as noted by Nicol and Knoepfel (2014) is that it places much emphasis on the environmental, social and economic consequences of activities under normal circumstances, and disregards the eventuality of sudden, catastrophic disruptions (Nicol & Knoepfel, 2014:229). If sustainable development defines a process of creating and maintaining viable options for fruitful social and economic development, then only resilient systems can be considered as sustainable (Nicol & Knoepfel, 2014:229). Although resilience and sustainability are two different concepts, the institutional regime approach in studying housing sustainability would conceivably apply to the study of resilient housing (Nicol & Knoepfel, 2014). Housing can be resilient if institutional conditions governing any one of its disparate uses account for and adapt to changes in any other of its uses (Nicol & Knoepfel, 2014).

Ongoing research on sustainable shelter covers a broad spectrum of environmental, economic and social concerns, and promotes the construction of housing as a regional or national economic catalyst (Nicol & Knoepfel, 2014). Little research has been conducted on the concept of resilient housing as it relates to the built environment (Nicol & Knoepfel, 2014). The most prominent research on resilient housing rather focuses on the resilience of individual households and how they can be better prepared for natural hazards and disasters (Nicol & Knoepfel, 2014).

2.5.4. Functions of an urban system

Olazabal, García, Abajo, Herranz, Alonso, Feliú, Izaola, Aspuru, Coloma (2008) and Archibugi (1998) state that services and functions of urban systems are those that largely characterise an urban area (shown in figure 8). These comprise of aspects, such as location and physical environment, policies, economic status or historical experience and traditions (Olazabal et al., 2009). The key urban system functions as defined by them are the following:

- ***Residence service:*** Urban systems need to provide shelter for human beings.
- ***Space for relationship service:*** Urban systems provide a space where relationships among human beings are promoted.

- ***Function of space for trade and mobility of goods and services:*** Urban systems provide infrastructure that makes it possible for the interchange of goods and services to take place. The direct result of this is population mobility, as well as the transportation of goods and services.

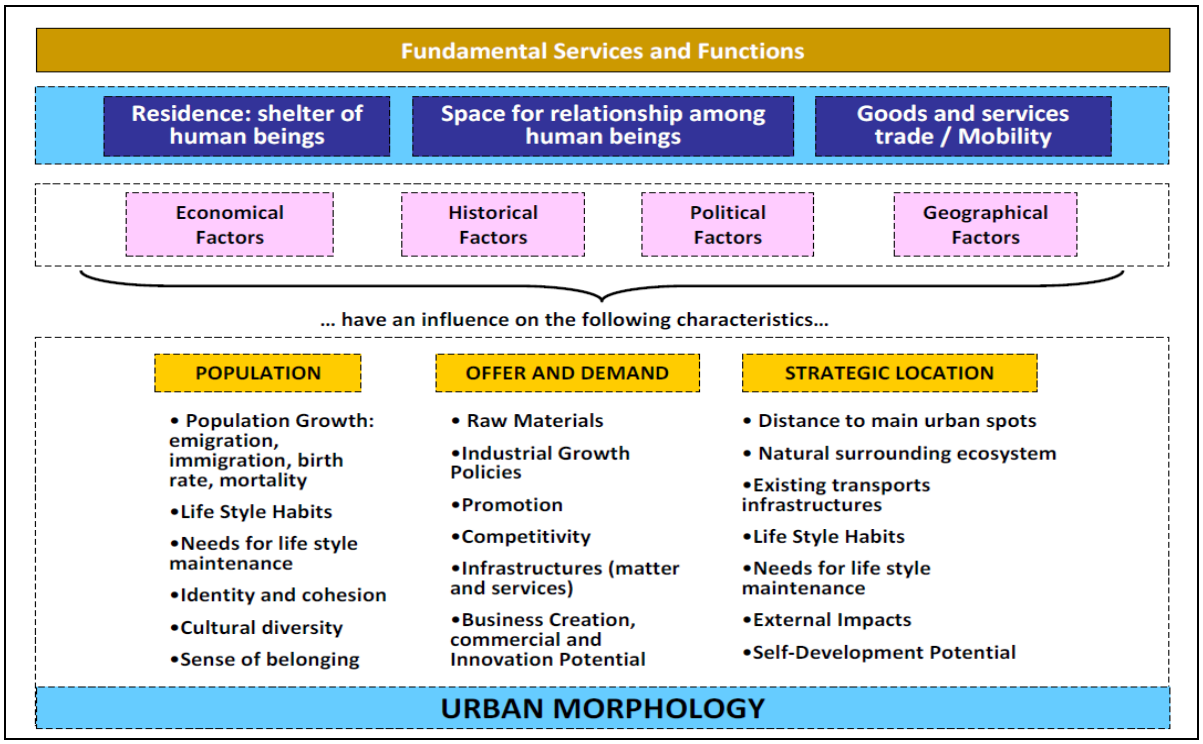


Figure 8: Fundamental services and functions (Olazabal et al., 2009:187)

The presence and amalgamation of certain economic, historical, political and geographical factors allow the performance of the abovementioned functions to grow and change constantly (Olazabal et al., 2009). These factors also determine a range of urban characteristics in relation to an urban system's population, supply and demand of services and the strategic location of these systems at local, provincial and national levels of government (Olazabal et al., 2009).

Cities can also be providers or receptors of goods and services, such as raw materials or products, food, telecommunications or mail services, energy and water (Olazabal et al., 2009). These services are grouped under consumption, supply, distribution and production functions (shown in figure 9). This is because urban systems consume imported goods and services. The consumption is determined by factors, such as population needs and habits (Olazabal et al., 2009). The city's capacity to produce goods and services is also determined by its infrastructure, the occupational training levels of its population and the available raw matter, among other things (Olazabal et al., 2009). The capacity will then be enhanced by the city's strategic opportunities, geographic location and transportation levels.

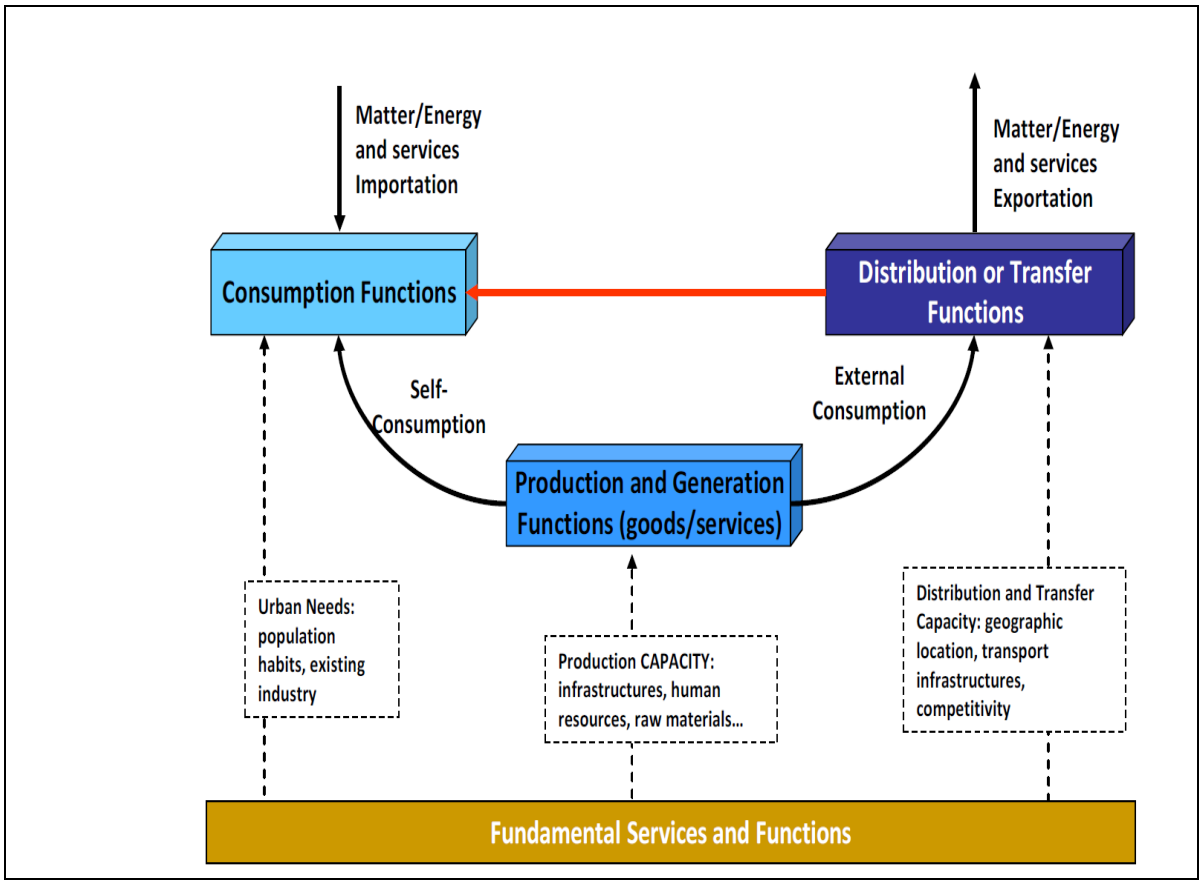


Figure 9: Consumption, production and distribution services and functions (Olazabal et al., 2009:187)

An urban system also performs self-development functions (Olazabal et al., 2009). These functions (shown in figure 10) are linked to the transforming processes of functional and spatial subsystems within the limits of the urban system (Olazabal et al., 2009). These functions encompass processes such as urban regeneration and urban sprawl. With all these processes taking place within an urban system, a balance is required. The functions that facilitate this balance are called regulating functions, and these are carried out by natural and ecological processes among the soil, atmosphere, biomass and water bodies.

Urban systems are complex and the regulation functions that they are subjected to include legislation, land-use planning, urban management, population habits and urban policies (Olazabal et al., 2009). Characteristics, such as cultural diversity, education, social relationships, traditions and cultural heritage, are underpinned by cultural functions (Olazabal et al., 2009). Cultural functions also underpin behavioural patterns that exist among people (shown in figure 11).

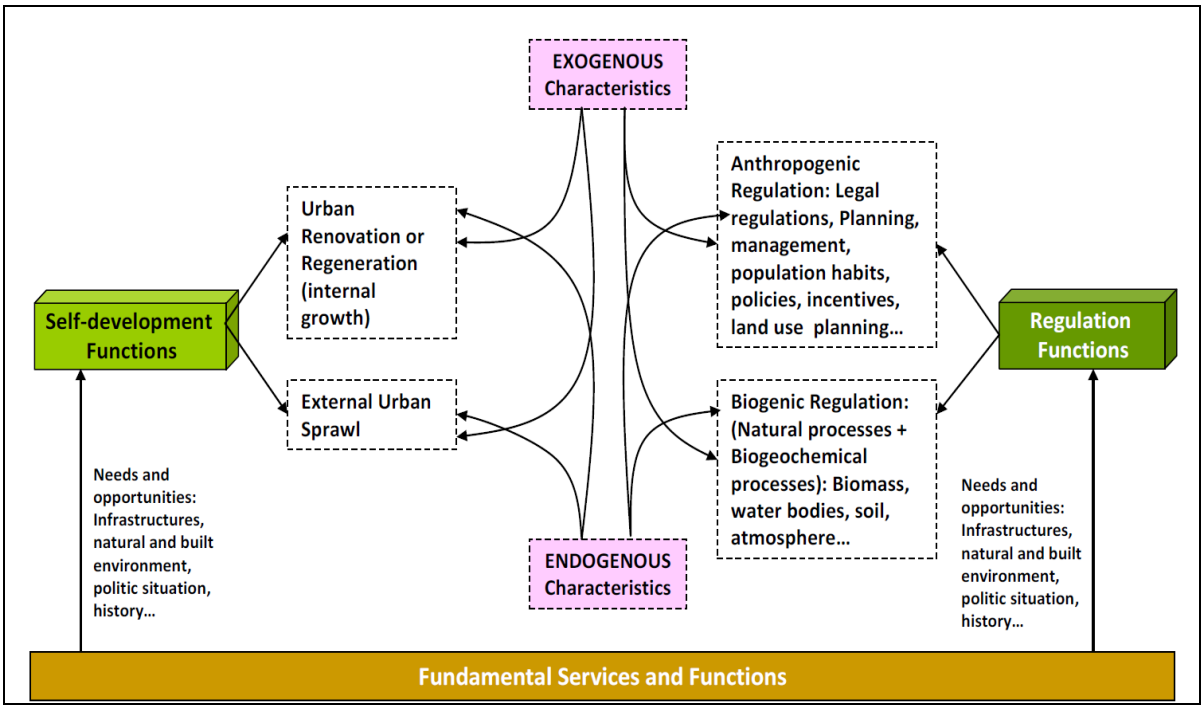


Figure 10: Self-development and regulation functions and services (Olazabal et al., 2009:188)

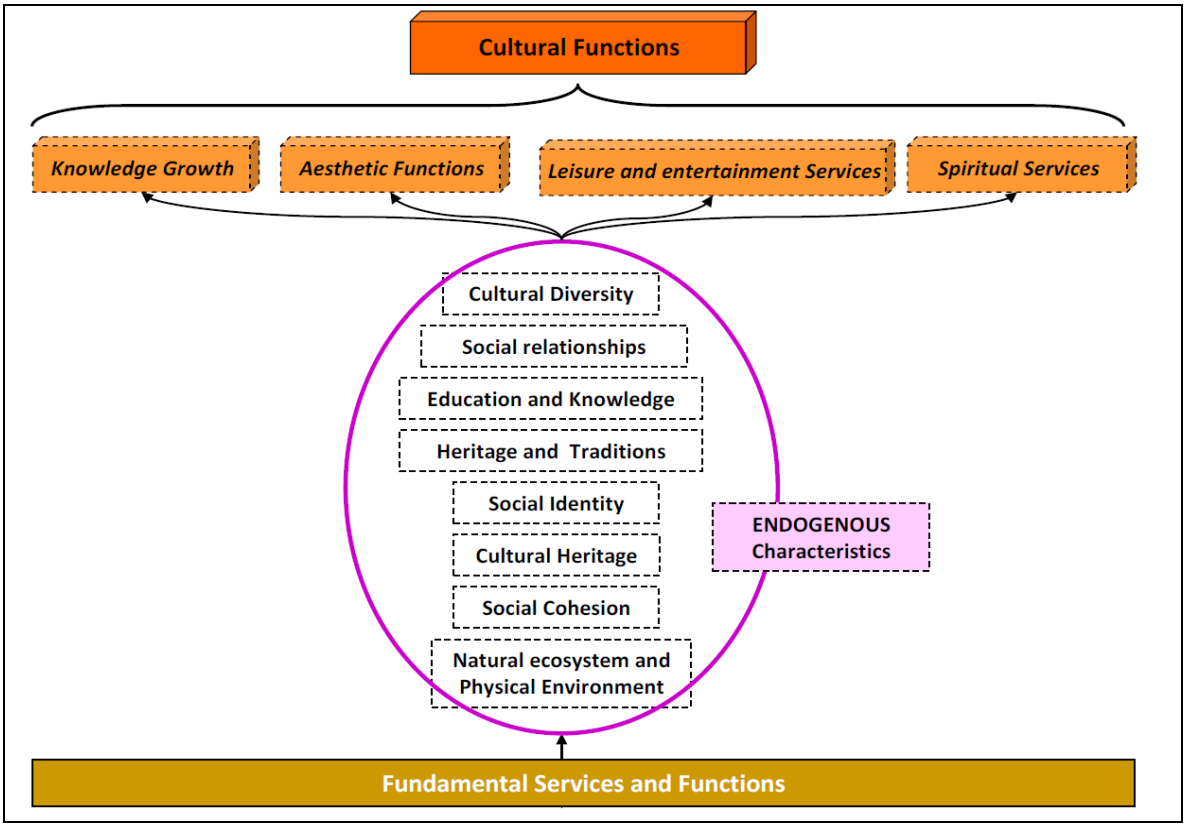


Figure 11: Cultural services and functions (Olazabal et al., 2009:189)

2.6. Shelter

According to United Nations (UN)-Habitat, a shelter is a place that covers, protects and provides safety. All human beings need shelter to shield them from harsh extremes of cold and very hot weather, as well as from rain and strong winds (UN-Habitat, 2013). The very first forms of shelter that human beings created were made from stones, wood, animal skin and grass (UN-Habitat, 2013). Modern shelter is constructed from bricks, steel, concrete, aluminium and glass. The types of shelter that people live in are based on what they can afford (UN-Habitat, 2013). Housing is a subset of shelter, although, in a South African context, housing is a term that is used to define low-cost houses provided by the state for underprivileged people.

In its fact sheet on adequate housing rights, UN-Habitat (2013) states that the right to adequate housing does not require the state to physically build houses for the entire population. It also states that the right to adequate housing does not mean that people who do not own houses can automatically demand a house from the state (UN-Habitat, 2013). While most governments offer low-cost housing programmes, the right to adequate housing does not oblige the government to construct a nation's entire housing stock (UN-Habitat, 2013). The right to adequate shelter ought to measure the need that exists in preventing homelessness, prohibiting forced evictions, addressing discrimination, focusing on the most vulnerable and marginalised groups, and ensuring security of tenure to all (UN-Habitat, 2013).

2.6.1. Hierarchy ladder for households

Economist Hernando de Soto once sought to shed light on the nature of housing as an asset and how it is perceived in developing countries. As quoted by Rust (2007), he writes:

> Poor people save, but they hold these resources in defective forms: houses built on land whose ownership rights are not adequately recorded and unincorporated businesses with undefined liability, because the rights to these possessions are not adequately documented, these assets cannot be readily turned into capital, cannot be traded outside of narrow local circles where people know and trust each other, cannot be used as collateral for a loan and cannot be used as a share against an investment.

De Soto's observation as noted by Rust (2007) is based on the assumption of an increasing hierarchy (ladder) for households, where the nominal value of a house increases over time with the corresponding appreciation in the property market. In a case where individuals purchase houses by means of a mortgage loan and eventually pay off their loans, their equity in the housing assets increases (Rust, 2007). If they decide to sell their houses, they can make a profit and buy a higher-valued house. If they sell the higher-valued house, proceeds from the sale can be used to fund their lifestyle at a later stage when they no longer have an income (Rust, 2007). Rust (2007) notes that the "ladder" assumption can be applied to the South African context as follows: If an individual receives a unit from the Reconstruction and Development Programme (RDP), the title deed he or she receives gives him or her "ownership" of a housing asset that he or she can improve at a later stage or sell. If an individual sells his or her RDP house, the proceeds from the sale can be utilised as a deposit when applying for finance for his or her next house. In this way, individuals start climbing the housing ladder and maximise their asset value (Rust, 2007).

The notion of the housing ladder when applied to South Africa's subsidised housing programme does not always follow the process outlined above. Rust (2007) notes that given all the financial challenges that beneficiaries of this subsidy face, not many of them will have money to improve their houses and use the proceeds from the sale of their house to fund a bigger and better house. The government's "good intentions" become a stagnant and ineffective measure, and housing becomes a consumptive rather than a productive good (Rust, 2007). There is also a failure by the South African government to acknowledge the linkage between low-income housing and middle- to high-income housing. Because such housing is viewed as a division of low-cost dwellings provided for poor people, it excludes the rest of the population that does not fall into this group. De Soto's theory on the housing ladder is not applicable to the low cost dwellings provided by the South African government because beneficiaries of RDP houses are not given access to the title deeds for their properties and often when they sell these houses, they do so illegally and at a very low price.

If the South African government's housing policy has so far not succeeded in realising its goal of promoting shelter as an asset for subsidy beneficiaries, a different approach needs to be implemented (Rust, 2007). Rust (2007) notes that the first point of departure in promoting shelter as an asset is highlighting that the nature of shelter is not one-dimensional. According to Rust (2007), shelter assets have three components: social assets, financial assets and economic assets. Figure 12 below gives a representation of these components and briefly describes what each component encompasses.

Social asset: Family safety net, citizenship-building, neighbourhood consolidation

Financial asset: Inheritance, household wealth and equity potential, access to finance

Economic asset: Sustainable livelihoods through income generation, home-based enterprises and backyard rentals

Figure 12: The three components of a housing asset (Rust, 2007:46)

Understanding that shelter is an economic asset can assist households in learning how they can enhance the performance of their homes so that the income-earning potential of their homes is increased (Rust, 2007). It is important to understand the financial component because it provides the background to how a household can climb the housing ladder (shown in figure 13 below) by improving the condition of its house (Rust, 2007). The social component speaks to the social asset value where the dwelling is located and how this provides the household with a safety net and sense of belonging (Rust, 2007).

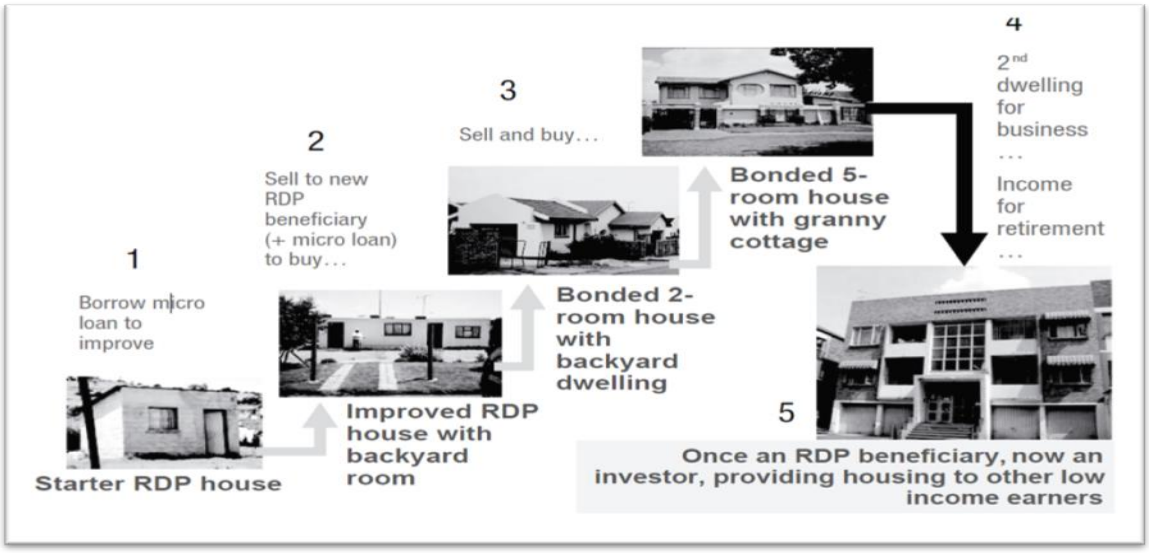


Figure 13: The ideal South African housing ladder (Rust, 2007:51)

2.6.2. Housing In South Africa

The Government of South Africa is mandated by Section 26 of the Constitution of the Republic of South Africa (Republic of South Africa, 1996) to ensure that every citizen has access to adequate housing. Housing, as understood in South Africa, is a subcategory of shelter and is provided for people within the low-income group through public funds. Government also has an obligation to undertake reasonable means to ensure that this requirement, as set in the Constitution is met (Financial and Fiscal Commission, 2013). The *Intergovernmental Fiscal Reviews* (National Treasury, 2011) attributes housing as one of the key functions that South African cities need to perform. In this regard, the report highlights the importance of ensuring that cities are adequately supported at a national, provincial and local level to perform this function (National Treasury, 2011). While the Constitution enlists housing as a right, it does not outline the measures that need to be applied to ensure that the state fulfils the right to housing. This effectively means that government's role in fulfilling the right to housing is flooded by many interpretations and expectations in South Africa (Financial and Fiscal Commission, 2013).

The first step in outlining how housing is provided entails understanding what housing means to individuals based on their needs and financial standing (Tissington, 2010; Financial and Fiscal Commission, 2013). In addition to this, factors such as land, services and the physical aspect of the dwelling also need to be understood in the broader sense (Financial and Fiscal Commission, 2013). There are three types of individual housing needs in South Africa: individuals who cannot afford housing, individuals who are able to make a contribution towards their housing needs, and individuals who can afford housing through their own financial means (Tissington, 2010; Financial and Fiscal Commission, 2013; Tissington, 2011).

2.7. Conclusion

This chapter has outlined existing literature on resilience thinking and the role of diversity in the resilience of a system. By looking at urban resilience and ecological resilience, the use of resilience as a metaphor to understand change in urban systems was explained in detail. The different applications of resilience and the manifestation of diversity in an urban context were highlighted. The characteristics of a resilient urban system and a resilient urban form, as outlined in this chapter, showed the importance of connectedness and the capacity to

learn to maintain stability in the face of change. The chapter highlighted that urban systems ought to be able to adapt and learn from unexpected change. The concept of shelter was also introduced in this chapter and it was highlighted that the hierarchy ladder for households, is used to illustrate that the ownership of property by individuals can serve as capital for building or buying better dwelling units. This chapter has given a theoretical background on the concepts that will be used in the study. The following chapter will discuss the methods used in conducting this research.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1. Introduction

The purpose of this chapter is to present the methods that were employed in conducting this research, as well as to introduce the research strategy. As complex systems, cities present different urban patterns and spatial dynamics with diverse and multiple characteristics. Cities are also urban systems that change and reorganise themselves according to the diverse outcomes of economic globalisation (Cruz, Costa, de Sousa & Pinho 2013:53). This is based on population data, but with a secondary reference to trends in economic growth and restructuring. Consequently, economic growth and restructuring that is a result of globalisation creates certain population dynamics and mobility patterns that influence the reorganisation of urban spaces (Cruz et al., 2013:53).

The reorganisation of urban space, which is strongly influenced by the adaptation strategies of cities to global processes and endogenous capacities, takes various forms (Cruz et al., 2013:53). Urban systems are also linked to concepts such as diversity, interconnection and interdependence. Diversity in complex systems refers to different functions performed within the system and the variety of groups that exist within the same system (Cruz et al., 2013:54). The system is made up of multiple components, and these reinforce and protect it against disturbances and external forces. Diversity is important because it facilitates redevelopment when the system is faced with abrupt disturbances or changes that occur over time (Cruz et al., 2013:54). Thus, urban patterns that possess mixed uses in multiple nodes tend to be less vulnerable. The vulnerability is also decreased by the interconnections and interdependences between the different components in the system (Cruz et al., 2013:54).

3.2. Research approach

3.2.1. The comparative historical research approach

Understanding the spatial dynamics and patterns of change in the functions that a city provides is a central objective of this study. To understand these patterns of change, the different ways in which shelter can be provided will be explained and how these subsequently changed. Neuman (2010) observes that long-term social change is best explored by a historical comparative research method. This is because field research and surveys are best suited for small-scale settings in the present, and because it is impossible

to employ these two experimental methods where changes in a society have occurred over a long period. Thus, historical comparative research brings better clarity as to why a society (the Tshwane urban system in this case) operates in a certain way by unravelling processes that occur over long periods (Neuman, 2010).

Comparative historical research is defined in part by the analysis of sequences of events that occur within cases (Neuman, 2010). One of the objectives of this study is to investigate how diversity manifests in the function of shelter in the Tshwane urban systems and this was done by analysing the sequence of events over four epochs and how diversity changed within each of those epochs. Informally, analysts have long recognised that this kind of "process analysis" facilitates causal inference when only a small number of cases are selected (Neuman, 2010). The contribution of recent methodological work has been to help these analysts more formally understand how process analysis achieves this goal. Process analysis generates leverage in part by allowing researchers to examine the specific mechanisms through which an independent variable affects a dependent variable (George & Bennett, 2005). Using this approach, the analyst starts with an observed association and then explores whether the association reflects causation by looking for mechanisms that link cause and effect in particular cases.

Lange (2013) suggests that comparative historical analysis has four main defining elements, two of which are methodological. This is because works within this research approach employ win-case and comparative methods (Lange, 2013). Comparative historical analysis is also defined by epistemology. Therefore, comparative historical research or works pursue social scientific insight and accept the likelihood of gaining insight through comparative historical analysis and other methods (Lange, 2013). The unit of analysis employed will therefore be a defining element, with comparative historical analysis focusing on more aggregate social units (Lange, 2013). The units of analysis used in this study were a defining element of how diversity changed across in three typologies in all the study areas.

3.2.2. Features of comparative historical analysis

Mahoney and Rueschemeyer (2003) state that comparative historical analysis embodies the following three features:

- Firstly, comparative historical analysis is concerned with defining and identifying casual configurations that produce major outcomes of interest (Mahoney & Rueschemeyer, 2003). Any argument that is presented is central to analysis. Hence, propositions to be

tested are carefully selected (Mahoney & Rueschemeyer, 2003). Study areas that describe historical patterns are important to comparative historical analysis. This is because it attempts to locate the causes of substantively important outcomes (Mahoney & Rueschemeyer, 2003).

- Secondly, comparative historical research seeks to analyse historical sequences and consider the unfolding processes of events over time (Mahoney & Rueschemeyer, 2003). If one considers that events are located in time, comparative historical analysis is ideal because it consider the effects of the timing of these events relative to one another (Mahoney & Rueschemeyer, 2003).
- Thirdly, it allows researchers to engage in systematic and contextualised comparisons of similar and contrasting cases (Mahoney & Rueschemeyer, 2003).

3.2.3. The goals of comparative research

The emphasis of comparative research on diversity (especially the different patterns that may exist with a specific set of cases) and familiarity with each case make this approach especially well-suited for the goals of exploring diversity, interpreting cultural or historical significance and advancing theory. The main objective of this study is to explore diversity as it manifests in shelter in the Tshwane urban system. In order to assess the diversity across time, three typologies were used to determine how diversity changed in the three study areas from the pre-colonial epoch up to and including the post-apartheid epoch. This then enabled the researcher to determine how diversity has manifested in shelter in the Tshwane urban system across time. Historical comparative research is a powerful method for addressing research objectives which are time specific and it is well suited for examining the combinations of social factors that produce a specific outcome. Information gathered from this study can contribute to the greater housing debate in South Africa and perhaps offer a way forward for policy makers with regard to housing delivery.

3.3. Research design

3.3.1. Research problem

The diversity of responses to change within an urban system appears to enhance its resilience and the capacity it has to adapt to change. The ability to withstand a perturbation or disturbance is improved when there is a range of reactions to change within a specific function. Although a growing body of research focuses on the interactions between humans and ecological systems, changes in the critical functions that urban systems provide and how

they affect the system state of these urban systems are yet to be fully explored. This study investigates diversity in the function of shelter by exploring the changes in this function over time in three areas of the Tshwane urban system, by looking at how diversity is distributed within this function and furthermore how this diversity manifests.

3.3.2. Research aim

The aim of this research is to understand diversity in the function of shelter as it manifests in a typical South African city.

3.3.3. Research questions

- Which typologies can be used to explain how diversity is distributed in the function of shelter in South Africa?
- How did diversity manifest in the function of shelter in the Tshwane urban system?

3.3.4. Research objective

- To determine which typologies give a holistic view on the distribution of diversity in shelter within a South African context.
- To investigate how diversity manifests in the function of shelter in the Tshwane urban system.

3.3.5. Research strategy

A comparative historical analysis of three areas in the City of Tshwane in South Africa, was performed. Secondary data was used to assess changes in the function of shelter across time in the three study areas. These changes were assessed over four epochs; pre-colonial, colonial, city development during apartheid and as well as the post-apartheid epoch. To assess spatial changes, observations and a spatial analysis tool was used. The research strategy is summarised in figure 14.

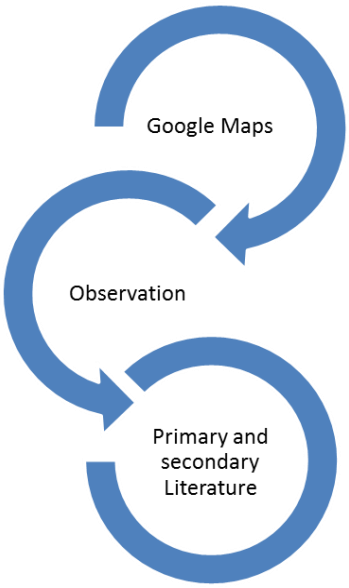


Figure 14: Triangulation method used in this research as an approach to increase the accuracy in the findings

3.4. Case study areas selection

The three areas examined in this study are the Pretoria inner city, Soshanguve and Mooikloof in the east of Pretoria. All three areas are located in the City of Tshwane, which is one of the metropolitan municipalities in the Gauteng province in South Africa (shown in appendices b). These three areas provide a point of reference to the spatial, economic and social characteristics of the City of Tshwane. The inner city, Mooikloof and Soshanguve are especially relevant, as they have medium to large residential nodes that are different or unique to each area. Using these three areas as case studies would make it possible to showcase how diversity in shelter has changed and how it is distributed per area. The City of Tshwane Metropolitan Municipality is a metropolitan municipality, located in the northern part of Gauteng. It was established in the year 2000 and during that period it was made up of 13 former city and town councils. Tshwane Metropolitan Municipality is divided into seven planning regions. The three areas chosen for this study; Pretoria inner city, Mooikloof and Soshanguve fall in region 3, region 6 and region 1 respectively. Pretoria inner city is located in Region 3 of the City of Tshwane Metropolitan Municipality (as shown in figure 15 below). Pretoria inner city is unique for its grid pattern and lack of alternative structure. Density levels are high because, apart from being a business district, it also has a commercial corridor structure and the use of land is compact. These characteristics of the inner city contribute to a higher demand for residential property due to the number of people that live in the city

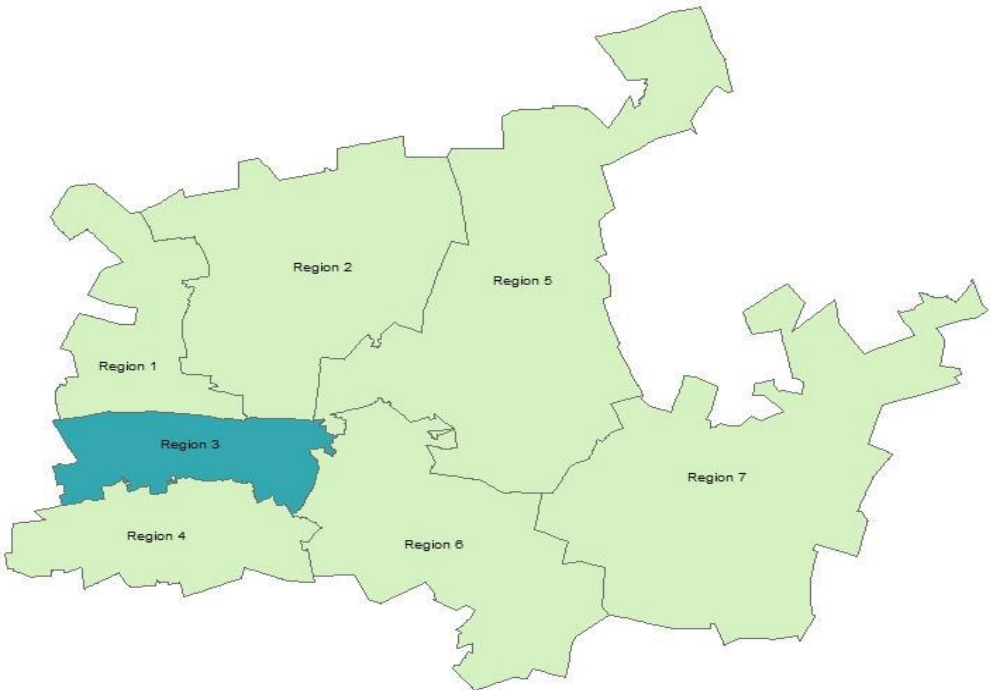


Figure 15: The position of Region 3 in Tshwane (City of Tshwane Metropolitan Municipality, 2013b:2)

Mooikloof is located in Region 6 of the City of Tshwane Metropolitan Municipality (as shown in figure 16 below). Mooikloof is one of the middle- to high-income residential areas in the east of Pretoria. City of Tshwane Metropolitan Municipality (2013), states that the majority of people within Mooikloof are within the economically active group. Close to this area and near the Woodlands Boulevard shopping centre is an informal settlement called the Woodlane Village informal settlement (Peres & Du Plessis, 2013). There is a clear distinction between the northern and the southern parts of region 6. The northern part of this region is less developed and thus has limited economic opportunities. The southern part of this region (in direct contrast to the northern section) is a rapidly developing area, with a significant business and retail activity.

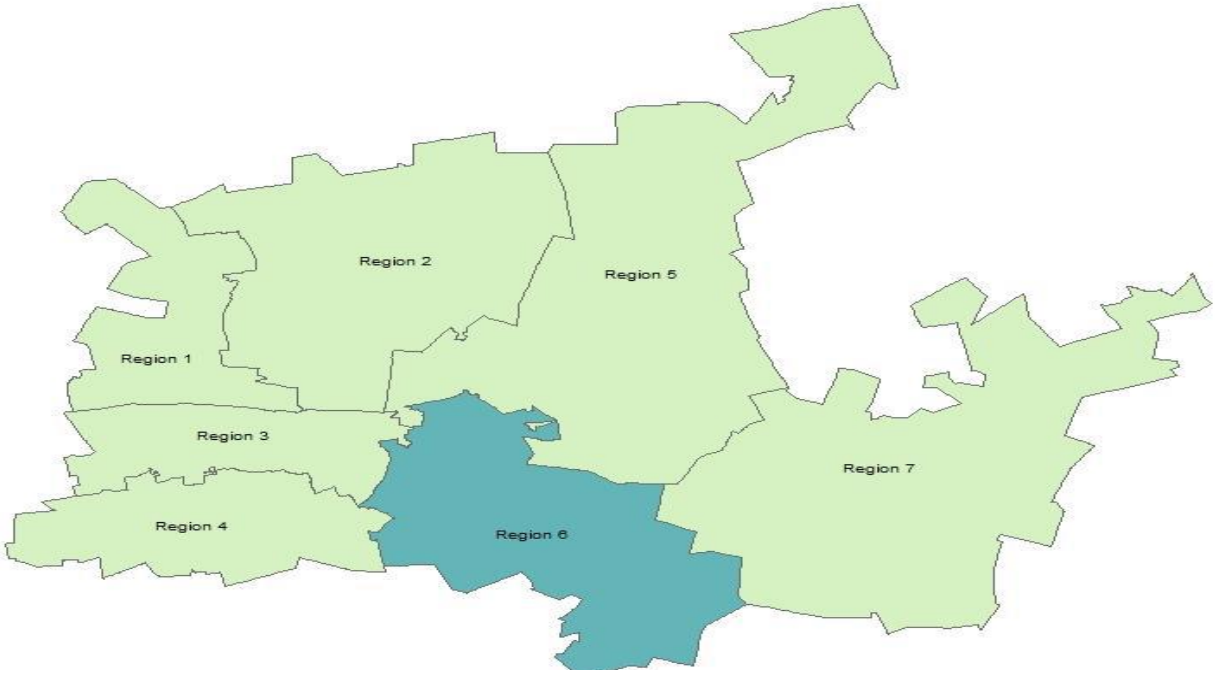


Figure 16: The position of Region 6 in Tshwane (City of Tshwane Metropolitan Municipality, 2013:12)

Soshanguve is located in Region 1 of the City of Tshwane Metropolitan Municipality (as shown in figure 17 below). City of Tshwane Metropolitan Municipality (2013), notes that there are approximately 127 000 households in the broader Soshanguve area. 34% of the youth in Soshanguve is employed in low skilled occupations. The average age in Soshanguve is 38 years. 41% of the residents in the area earn between R5 000- R10 000 per month with an average household income of R9 500.

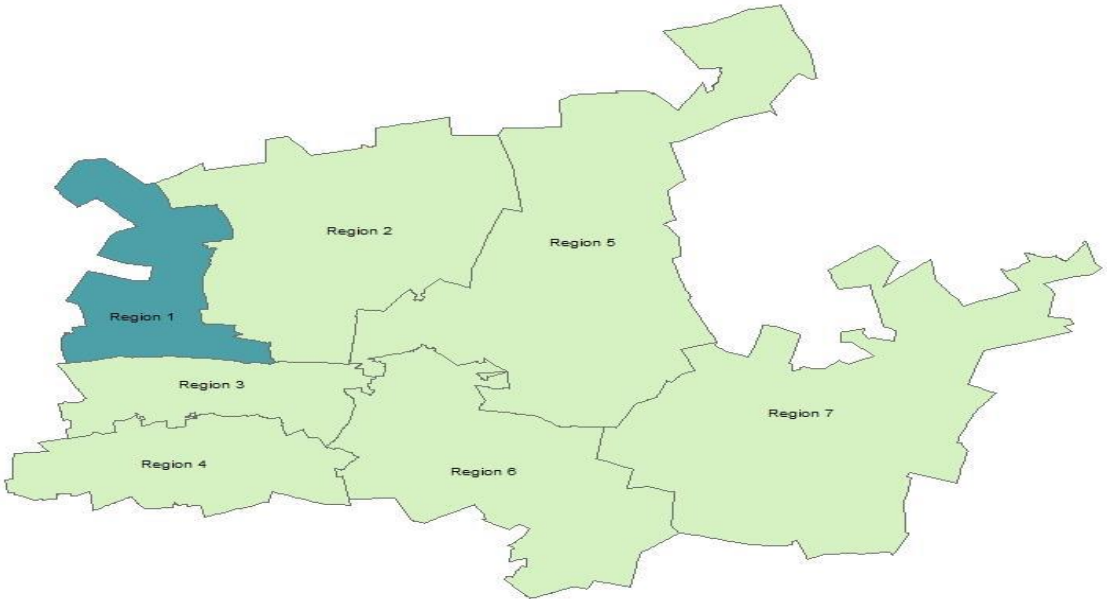


Figure 17: The position of Region 1 in the City of Tshwane (City of Tshwane Metropolitan Municipality, 2013:6)

3.5. Research method

3.5.1. Data collection

Conducting research involves gathering data and analysing this data in a way that will offer insight into the phenomena that is being investigated. It follows then that data is the most central component of the research activity (Lange, 2013). As mentioned above, comparative historical research seeks to analyse historical phenomena, hence historical secondary data sources are mostly used. The Africana section in the University of Pretoria's main library was very instrumental in providing books, newspaper articles and pictures of the early city of Pretoria. These specific sources of data were studied in detail to determine how diversity changed in the function of shelter.

Apart from primary historical sources of data, literature in the form of professional and academic journals, books, and published and unpublished articles were used to define key terms and concepts. Interviews were conducted with specific individuals to determine the scope of shelter in the City of Tshwane.

1. In determining the different typologies, the researcher made use of secondary literature
2. To illustrate change across time, a historical review was performed by the researcher
3. To illustrate change spatially google earth, aerial photographs and historical images were used by the researcher

3.5.2. Data analysis

While there may be different ways of looking at the different responses in the diversity of shelter in the Tshwane urban system, the finance, physical and tenure based typologies provided a more thorough view on how diversity is distributed. These typologies were specifically chosen because they are more specific to how change occurs over time both in the private and public sphere. Housing diversity is delivered through the provision of a range of physical dwelling types, a range of tenure options and a range of finance typologies. To map out these changes and to show how diversity manifested in the Tshwane urban system, the researcher developed table 2 below. This table will be used in chapter 6 to map out the changes in all three typologies across time and spatially. Each symbol will further be broken down to type 1, 2, 3, and 4 (e.g. P1, P2, P3 or T1, T2 or F1, F2). This will articulate the levels of diversity within each typology by showing where there was an in increase and a decrease in diversity. These units of analysis will illustrate how diversity has manifested in the Tshwane urban system across four epochs.

Table 2: Tool for data analysis (Source: Author)

Typology		Symbol
Physical	Rondavel/hut	
	Shack/	
	Room in backyard	
	Single-detached government subsidised (RDP)	
	High-rise flats	
	Multi-storey walk ups	
	Attached row houses/town houses	
	Single-detached (middle-high income)	
Financial	Individual savings	
	Mortgage from bank	
	Government subsidised	
Tenure	Private ownership	
	Traditional ownership & communal ownership	
	Rental	
	Government owned	

3.5.3. Limitations

The changes within the function of shelter play out were studied across time and space, however the researcher could not perform a spatial series over time because there was very limited data to perform a spatial series.

CHAPTER 4: FRAMEWORK TO EXPLORE DIVERSITY IN SHELTER

4.1. Introduction

This chapter will look at three different typologies that underpin shelter in the South African context: physical, financial and tenure typologies. The aim of this chapter is to start addressing which typologies give a holistic view on the distribution of diversity in shelter within a South African context. Housing is a subcategory of shelter and it is easy to confuse the two. Hence, definitions of these two terms are outlined in this chapter. Defining and outlining these typologies across a formal, informal, private and public spectrum presents and develops a framework for exploring the diversity in shelter as a function. This chapter looks at how shelter is provided in South Africa and examines the different typologies in detail.

Before delving into the different typologies that underpin housing, it is important to define what typology means. Typology is a concept that allows the organisation of a group of elements, which are characterised by a related structure, within the same category (Casakin & Dai, 2002). Typology is a type of thinking that assists one to understand the complexity of domain objects through more simple objects (Casakin & Dai, 2002). In this instance, the subject of housing as a function is broken up to into a group of characteristics: physical, financial and tenure elements. These typological elements are considered as comprehensive because they are the most relevant characteristics of housing and they are descriptive, explanatory and prescriptive. Using type as a way of analysing concepts allows one to present and compare features in an even manner (Gren, 2006). In terms of housing typologies, this means that they can be evaluated and compared based on attributes of function, disposition and configuration (Gren, 2006).

4.2. Analysis of settlement typologies in South Africa

The National Development Plan (NDP) 2030 (National Planning Commission, 2012) includes strategic focus areas related to creating sustainable human settlements and improved household quality for the South African population (Du Plessis & Schmidt, 2013). Various agencies are involved in developing mechanisms that will ensure that these set ideals are met. However, there is still a need to develop functional settlement typologies in the South African context and their application to a rural and urban context (Du Plessis & Schmidt,

2013). Du Plessis and Schmidt (2013) also note that the lack of functional settlement typologies negatively impacts on the way in which inclusive housing policies are conceptualised and how national funds are allocated.

Du Plessis and Schmidt (2013) distinguish between settlement typologies based on four primary defined variables: administrative, demographic, morphological and functional boundaries. Administrative boundaries are used for classification purposes and can further be broken down into subunits, for example, rural and urban or private and public (Du Plessis & Schmidt, 2013). They do not consider cross-border flows, which are usually too great and diverse in character (Du Plessis & Schmidt, 2013). Morphological boundaries are based on urban form, such as a formal spatial structure, and their main advantage is that they offer continuity and comparability over time (Du Plessis & Schmidt, 2013). However, they have shortcomings in encompassing economic growth and social dynamics. Demographic typologies are more commonly used and are based on settlement size and density (Du Plessis & Schmidt, 2013). Their application per region cannot be the same, because of varying degrees of urbanisation, so it is difficult to use a generic boundary for every region (Du Plessis & Schmidt, 2013). Functionally defined typologies refer to how space is used and conceived.

In terms of transforming urban systems, Du Plessis and Schmidt (2013) submit that it is important to develop a fine and varied distinction in the typologies that are used in defining human settlements. In order for dynamic development patterns to be created for urban systems, alternative systems of classification that go beyond long-standing approaches need to be developed (Du Plessis & Schmidt, 2013). For example, Du Plessis and Schmidt (2013) argue that the vague definition of what constitutes urban or rural within an urban system leads to the misclassification of urban informal settlements and hides the extent of urban poverty (Du Plessis & Schmidt, 2013). By developing, the functional urban rural typology, the Council for Scientific and Industrial Research (CSIR) has contributed significantly towards the conceptualisation of settlement typologies within South Africa (Du Plessis & Schmidt, 2013). As typologies are based on equal size areas, the typologies formulated by the CSIR also make provision for spatial distortions (Du Plessis & Schmidt, 2013). These are used, in part, to inform the next section where physical, tenure and financial typologies will be looked at in detail.

4.3. Physical typologies

Gren (2006) highlights the importance of texture and the mixing of building types in residential areas in defining the characteristics of a city. This section will look at physical attributes of the different dwelling types that are prevalent in South Africa.

Table 3: A group of physical typologies (a)

Physical typology	Image
Open spaces that serve as shelter for the homeless: These are spaces in the open such as pavements or areas under trees that serve as short-term refuge for vulnerable or homeless people.	 https://photosbythapelo.wordpress.com/2014/09/29/homeless-pretoria-2014/
Shacks: Shacks are informal makeshift dwelling types that are built from scrap sheets of corrugated iron.	Image source: http://www.davidchancellor.com/docs/photos.php?id=2:1 
Room in backyard: Shapurjee and Charlton (2010) define backyard accommodation as dwellings where the landlord and owner of the property builds small dwellings on his or her	

plot and lets them out. In other words, it is the co-habitation of the tenant and property owner on the same plot (Shaprujee & Charlton, 2010; Gardner, 2010).	 Image source: Shaprujee & Charlton, 2010

Table 4: A group of physical typologies (b)

Physical typology	**Image**
Single standing government subsidised houses: RDP houses were introduced as a programme by the African National Congress to provide houses for financially and economically disadvantaged South African citizens, subject to individuals meeting the set requirements.	Image source: http://www.vocfm.co.za/21203/ 

Multi-storey walk-ups (perimeter block): These building types are typically three- to four-storey blocks that are configured as perimeter and as freestanding blocks (Gren, 2006). Access is through means of a staircase. Semi-private outdoor spaces are available on balconies or small patios. Communal facilities in this type of dwelling are usually open areas to play, a place designated for washing and drying laundry, parking spaces and small gardens at the back or in front of ground units.	Image source: http://www.setiaalam.com.my/depalma.aspx 

Table 5: A group of physical typologies (c)

Physical typology	Image
High-rise buildings: These buildings consist of six storeys or more and require an elevator. Private space is restricted to the inside of each dwelling unit and high densities are a common feature in these dwelling types. Ground spaces are always reserved for parking, which leaves little or no space at all for young children to play or for residents to interact. High-rise flats are expensive to construct and maintain, but developers usually save on infrastructure development costs, such as public transportation, roads and water (Gren, 2006).	 Image taken by authour
Attached, row or houses: These dwelling types usually have two or more houses in a row and share a wall with its adjacent unit. In this dwelling type, it is common to have units that have access on the ground level and can be accessed by private yards. The units are usually arranged as single or double back-to-back units or next to each other in a row (Gren, 2006).	(Source:http://zandwykproperties.co.za/boschenmeer-townhouses.html) 

Table 6 A group of physical typologies (d)

Physical typology	Image
Semi-detached house: Semi-detached houses are attached to one another and can be bonded together or be individual. They are sold as separate units in a sectional title development (Gren, 2006).	Image source: http://www.privateproperty.co.za/palm-lakes-estates-t372936.htm 

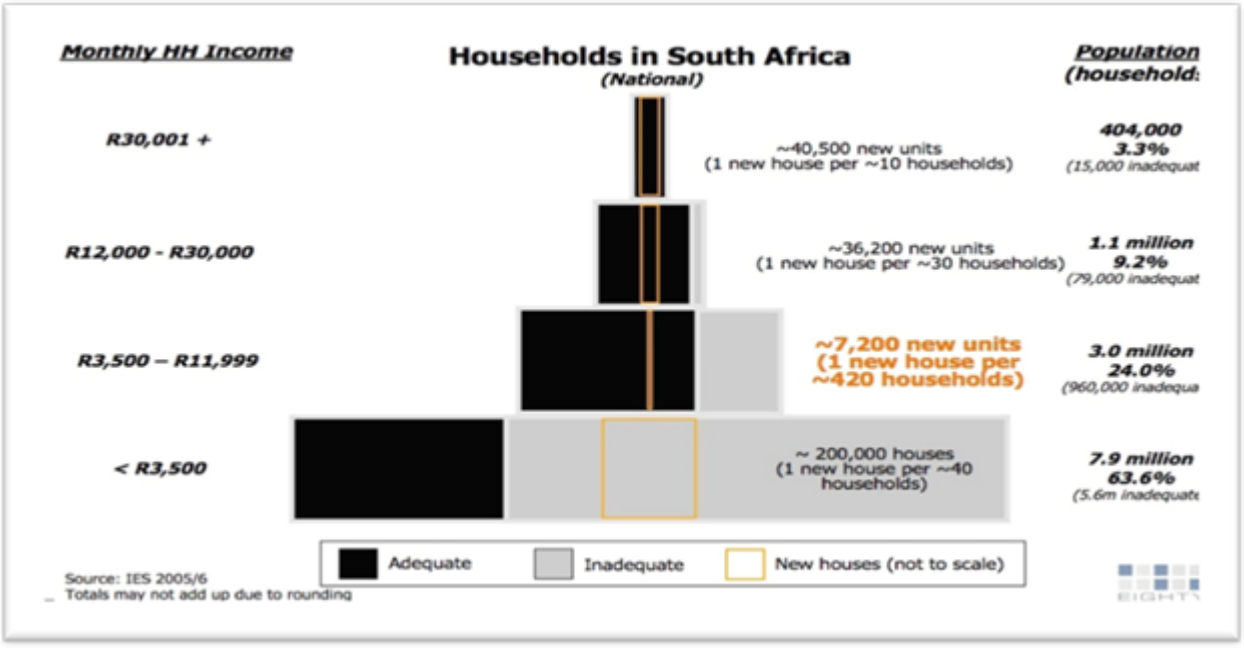
4.4. Financial typologies

According to the Financial and Fiscal Commission, there are three ways to fund housing in South Africa. It can be funded through household savings, through state funding and through private finance (Financial and Fiscal Commission, 2012; 2013). Household savings consist of money saved by individuals to either build a dwelling from scratch or to buy an existing dwelling. It can range from a shack that is built as a temporary or permanent structure, to a more formal house that is either built from scratch or is bought as an existing structure. State funding consists of municipal finance for infrastructure and subsidies to individuals who qualify. Private finance covers project finance for developers and end-user finance to households (Financial and Fiscal Commission, 2012; 2013).

The size of each funding source is based on specific elements, such as income levels, access to private finance, active property, land markets and the state's position towards funded housing (Financial and Fiscal Commission, 2012; 2013). South Africa has a well-defined formal property and mortgage finance market, which caters for the upper- and middle-income housing market, administered and granted by banks. The government, on the other hand, makes use of the grant system to fund housing needs for low-income groups. Both these funding mechanisms will be looked at briefly in the next section.

4.4.1. Private housing delivery instruments

Mortgage finance is granted predominantly to households that earn more than R15 000 per month. This income group accounts for 80% of private housing finance. The remaining 20% belongs to the income group that earns between R7 500 and R10 000. The figure below is a housing delivery pyramid that highlights housing delivery against specific income bands. As noted by Rust (2011), at the bottom end, data suggests that one new house is built for every 40 households in the subsidised market of households that earn less than R3 500 per month. At the top end, one new house is built for every 10 households that earn R30 000 per month. In the middle, for households earning between R12 000 and R30 000 per month, one new house is built for every 30 households. There is a huge gap in the bottom middle, where for households earning R3 500 to R12 000, one new house is built for every 420 households.



Housing delivery pyramid. Source: (Rust, 2011).

4.4.2. State finance housing instruments

In its quest to provide adequate housing, the South African government formulated its National Housing Programme (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012). The formulation of the National Housing Programme was guided by housing policy that existed at the time (summarised in appendix a) and can be described under four main headings. Each programme further has different subsidies or programmes that cater for individuals with different needs and circumstances. The current state delivery methods are summarised in appendices D-G.

4.4.3. Financial programmes

a) *Individual Housing Subsidy Programme (IHSP):* The main objective of this programme is to stimulate the secondary housing market. The policy envisages a funding arrangement for housing assistance to individual households who wish to acquire properties of their own choosing. It is mainly targeted for households who want to acquire an existing house or a vacant serviced stand, linked to a small to medium construction contract through an approved home loan, and those who have acquired stands before without state assistance and require a top-structure subsidy (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012).

b) *Enhanced Extended Discount Benefit Scheme:* The main objective of this programme is to stimulate and facilitate the transfer of public housing stock to qualifying occupants by using subsidisation up to the full prevailing individual housing subsidy amount (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012).

c) *Rectification Programme:* The main objective of this programme is to facilitate the improvement of state-financed residential houses that were developed through State Housing Programme interventions prior to 1994, which are still owned by the public sector (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012).

d) *Operational Capital Budget Programme:* The main objective of this programme is to provide a funding framework for the reservation and application of a percentage of the annual housing allocation to provincial governments. This facilitates the appointment of external capacity to support the implementation of the national and provincial housing programmes (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012).

e) *Finance Linked Individual Subsidy Program (FLISP)*: FLISP was developed by the department of human settlements to make it possible for South African citizens and legal permanent residents to purchase home. After a few hurdles and disagreements with the major South African banks, the programme was finally implemented in 2013. The programme is open to citizens and residents who earn between R3 501 and R15 000 per month. Individuals in these salary bracket are considered as 'high risk' by banks and often struggle to access bank loans to purchase houses. Their income bracket is also considered too high to qualify for the government's reconstruction and development programme (Department of Human Settlements, 2013. Applicants may use FLISP do one of the following:

- Buy and existing residential property
- Buy vacant serviced residential land, that is linked to an NHBRC registered homebuilder or build their residential property on a self-owned serviced residential stand
- The subsidy amount for FLISP ranges between R10 000 and R87 000, depending on what the applicant's monthly salary is.

4.4.4. Incremental housing programmes

a) *Emergency Housing Programme:* The main objective of this programme is to provide temporary assistance in the form of secure access to land or basic municipal services or shelter, in case of emergencies, for exceptional housing need through the allocation of grants to affected municipalities (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012).

b) *Integrated Residential Development Programme:* The main objective of this programme is to give outcomes on the objectives of the comprehensive plan for the development of sustainable human settlements (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012).

c) *Enhanced People's Housing Process:* The main objective of this programme is to deliver better human settlement outcomes based on community contribution, partnerships and the leveraging of additional resources through partnerships (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012).

d) *Upgrading of Informal Settlements Programme:* The main objective of this programme is to facilitate the upgrading of informal settlements in-situ to achieve complex and interrelated policy objectives (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012).

4.4.5. Social and rental housing programmes

a) *Institutional Subsidy:* The main objective of this programme is to facilitate the provision of affordable rental housing to the lower end of the market within specific urban restructuring zones (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012).

b) *Community Residential Units Programme:* The main objective of this programme is to ensure that low income-earning households (earning below R3 500 per month), who are unable to be accommodated in the formal private rental and social housing market, have access to housing (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012).

c) *Social Housing Programme:* The main objective of this programme is to give qualifying households near the top of the R3 500 per month category a chance access rental housing through registered social housing institutions (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012).

4.4.6. Rural housing programme

a) *Communal Land Rights Rural Subsidies:* The main objective of this programme is to facilitate project-based housing development on communal land for the benefit of beneficiaries of both old and new order land tenure rights. It is targeted at individuals living in rural areas where they enjoy functional security of tenure as opposed to legal security of tenure (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012).

b) *Farm Residents Programme:* The main objective of this programme is to facilitate a flexible tool that will promote access to adequate housing, including basic services and secure tenure to farm workers and residents in a variety of farming situations across South Africa (Tissington, 2011; Rust, 2011; Financial and Fiscal Commission, 2012).

4.4.7. Other housing programmes

The following housing programmes are also available:

- Housing guarantee scheme
- Rural Households Infrastructure Grant
- Rural Households Infrastructure Grant
- Housing Disaster Relief Grant

4.5. Tenure-based typologies

The Food and Agricultural Association of the United Nations (FAO) (2002) defines land tenure as the relationship (whether legally or customarily) among individuals or groups with regard to land. Thus, as noted by Payne and Durand-Lasserve (2012), tenure serves as a reflection of relationships between people and land. Understanding what land tenure is and what it encompasses, helps to set out rules that underpin how property rights to land are allocated in societies (FAO, 2002). These rules then define how access is granted in the control, use and transfer of land. It also sets out associated responsibilities and restraints with regard to land (FAO, 2002; Payne & Durand-Lasserve, 2012). To understand land tenure, it is important to distinguish how it differs from property rights (Payne & Durand-Lasserve, 2012). The different forms of tenure in South Africa are summarised in Table 7.

Property rights, as defined by Payne and Durand-Lasserve (2012:10), are the recognised interests in land or property vested in an individual or group. It can apply separately to land or to a development on it (e.g. houses, apartments or offices). Security of tenure is the certainty that an individual has that his or her right to land will be recognised by others and protected in the event that it (the right) is challenged or brought under scrutiny (FAO, 2002). Payne and Durand-Lasserve (2012:11-12) describe security of tenure as “the agreement between an individual or group to land and residential property, which is governed and regulated by a legal and administrative framework (the legal framework includes both customary and statutory systems)”. From both definitions, it is apparent that, without secure tenure, households are not protected from any form of removal against their will.

4.5.1. Tenure types in South Africa

a) *Private ownership*: This is the assignment of rights to a private party, which may be an individual, a married couple, a group of people or a corporate body, such as a commercial entity or non-profit organisation. For example, within a community, individual families may have exclusive rights to residential parcels, agricultural parcels and certain trees. Other members of the community can be excluded from using these resources without the consent of those who hold the rights (FAO, 2002).

Smit (2000), notes that ownership is the only form of tenure provided in new housing projects in South Africa. Since the advent of democracy, 83% of the subsidies that were provided by the South African government were allocated to the individual ownership of a housing unit and only 17% of these subsidies have been directed towards rental or co-operative tenure options (Smit, 2000). This is despite the fact that rental tenure options facilitate labour movement, which is an essential survival strategy for many low-income households (Smit, 2000).

b) *Communal ownership:* A right of commons exists within a community when each member has a right to use independently, the holdings of that particular community. For example, members of a community may have the right to graze cattle on a common pasture (FAO, 2002).

c) *Rental:* This is the rental of either a house or land at a fee agreed upon by the lessor and the lessee and made legal by lease agreement (Cousins& Hornby, 2005); (FAO, 2002).

d) *State or government:* These property rights are assigned to some authority in the public sector. For example, in some countries, forestlands may fall under the mandate of the state, whether at a central or decentralised level of government (Cousins& Hornby, 2005).

e) *Traditional ownership:* This is a system that traditional African communities adhere to in order to express order, ownership, possession and access to land. It also expresses the regulation and transfer of land in these communities (Cousins& Hornby, 2005).

4.5.2. Informal tenure types in South Africa

Urban poor households without formal tenure (although they may have certain rights in terms of legislation or verbal agreements) include the following households:

(a) *Informal settlements (settlements on unlawfully occupied land):* The de facto security of tenure can range widely, from settlements on public land that have a degree of formal recognition, to settlements on private land faced with the threat of eviction. The 2013 Census counted 13.6% South African households (about seven million people, using the average size of five people for African households) who lived in informal dwellings (Statistics South Africa, 2014; Urban Sector Network, 2004).

(b) *Irregular subdivisions:* Land that has informally been subdivided, serviced (often through illegal connections into service networks) and developed. No figures are available, but this is probably a fairly small number (Tissington, 2011).

(c) *Backyard structures:* This type of dwelling ranges from shacks to formal "flatlets" and overcrowded formal housing, e.g. renting or sharing a room in a house. Security of tenure can vary greatly. The 2013 Census counted 460 000 households (about 2.3 million people) in backyard shacks and 530 000 households (about 2.7 million people) in formal backyard structures and rented or shared rooms within houses (Statistics South Africa, 2014). This amounted to 990 000 households (about five million people) (Tissington, 2011).

(d) *"Unregistered" occupants of hostels:* Hostels were constructed during the apartheid era to accommodate migrant mine labourers.

(e) *"Street people":* These are homeless people who reside within cities, and sleep on pavements or under bridges.

(f) *Grey sector:* This sector includes households with tenure rights in the grey sector between formality and informality. Table 9 below gives a summary of the types of informal and formal tenures in South Africa.

Table 7: Forms of tenure in South Africa (Urban Sector Network, 2004)

Informal tenure	**Formal tenure**
• Informal settlement households • Informal tenants/sharers (backyard shack, room in house) • Irregular subdivision	• Individual owners • Tenants (renting a formal unit with a written rental agreement complying with the Rental Housing Act, Act No.

• Street people	50 of 1999) • Communal tenure
Grey sector	
• Unregistered owners • Subtenants • Domestic workers	

Table 8 shows a dwelling types according to the tenure and where one would expect to find in South Africa (detailed national statistics shown in appendix C). The table shows settlement types that are typically found within an area in the urban core and urban fringe respectively.

Table 8: A brief summary of locational typologies one would expect to find them in South Africa per area type (Urban Sector Network, 2004)

Type of area	Subtype of area	Description
Urban core	Inner-city high-rise flats	Areas comprising high proportions of medium- and high-rise rented and owned flats close to the Central Business District (CBD).
	Core townships	Formal mass-built settlements (old or new) within towns or cities, including backyard shacks, with short travelling distances to places of employment, e.g. the formal Alexandra township in Johannesburg, or a township adjacent to a small town.
	Core informal settlements	Previously or currently illegal, unplanned (often infill) settlements in towns or cities close to places of employment.
Urban fringe (<25 km from city centre)	Fringe townships	Planned, low-cost settlements, including 1960s townships, backyard shacks and flats, new starter housing, as well as sites and services with moderate distances to places of employment. There are typically collective dwellings within fringe townships (hostels and similar institutions that house single people or households who

Type of area	Subtype of area	Description
		rent from their employers or the municipality) and infill informal settlements on vacant land between formal developments.
	Fringe informal settlements	Freestanding, previously or currently illegal, unplanned settlements whose inhabitants commute moderate distances to places of employment.
	Fringe suburb	Low-density, low-rise areas of single houses or townhouses. Income group is usually medium to high income and these areas are often planned as neighbourhood units. Located at moderate to long distances from the inner city. Well connected due to rapid public transport In some suburbs, residential areas transform into mixed-use settlements as they develop.
Displaced urban settlements (>25 km from city centre)		Townships that are essentially completely urban or peri-urban informal settlements where the majority of residents commute to the urban area, former homeland border towns and townships (also known as “betterment settlements”), sometimes adjacent to industrial decentralisation points.

4.6. Conclusion

This chapter has identified the different typologies that underpin the function of shelter in South Africa and which will be used as artefactual species to illustrate how diversity is distributed in the function of shelter in the City of Tshwane. The three typologies that were selected to assess the changes in the distribution of diversity in the function of shelter across time and spatially were; physical, financial and tenure based typologies. With regard to financial typologies, there is visible diversity in public finance instruments that the South African government uses to provide housing. Various programmes within these instruments cater for individuals with different social and financial needs. Funding instruments for individuals who can afford to provide for their own housing needs are currently available

through mortgage bonds, which are financed by banks. There is also evidence of a visible diversity in the dwelling types that exist in South Africa, but from the literature it is not almost apparent how the diversity in the dwelling types is distributed spatially. While there are a few forms of land tenure in South Africa, the public sector only focuses on private ownership in 83% of its housing projects, despite the challenges that accompany this form of tenure. Again, there is no evidence that these forms of tenure are spatially distributed. Chapter 5 will use these typologies to look at the changes in the function of shelter during the pre-colonial, colonial, apartheid and post-apartheid periods in the study areas; Pretoria inner city, Soshanguve and Mooikloof.

CHAPTER 5: HISTORICAL ACCOUNT OF PRETORIA

5.1. Introduction

This study examines the importance of diversity in the function of shelter in the Tshwane urban system and what the distribution of diversity means for its resilience. Resilience theory provides a framework for understanding how urban systems, such as the City of Tshwane, respond to broad-scale changes (Bures & Kanapaux, 2011). Examining past perturbations and regime shifts is useful in this regard because it reveals historical patterns that have moulded modern trajectories of system change and transformation (Bures & Kanapaux, 2011). A historical perspective is important in the study of urban systems, because it provides a detailed way of examining the current issues that a city faces through a prism of the past. This chapter will identify the key epochs in the history of the City of Tshwane and how these can be used to map changes in the diversity of shelter. In addition to this, this chapter will also reflect how these changes are a response to local and larger-scale drivers.

5.2. Pre-colonial Pretoria

The history of the City of Tshwane can be traced back to the early 1850s. What is known as the City of Tshwane today began as a seat of government that was controlled by the Bakwena tribe. During the 17th century, the Bakwena tribe, a West Sotho group, lived in and governed what is known today as the area between the Apies, Pienaars and Crocodile rivers (Theron & De Wit, 2010). The Bakwena occupied rondavels or huts (as shown in table 9) in villages that were surrounded by stone walls in the area where Irene is today.

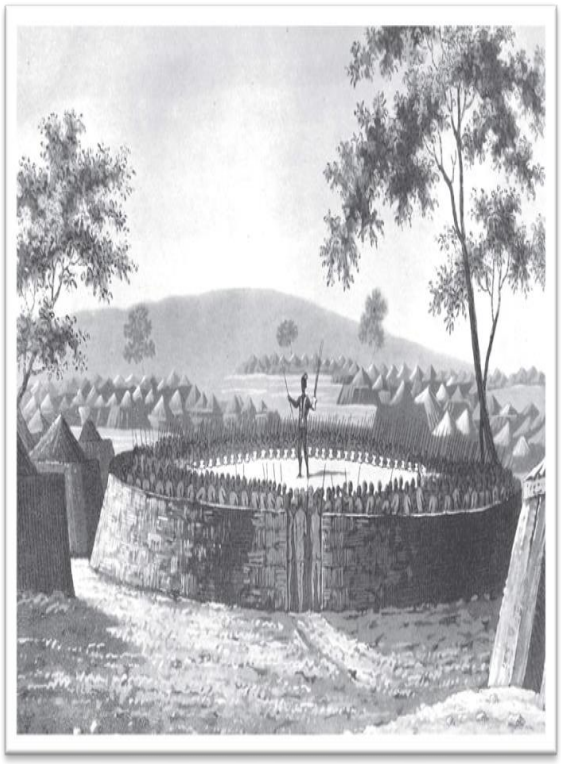
5.2.1. Mzilikazi's arrival 1823 to 1837

The area in which Pretoria (later the City of Tshwane) was to be established was initially occupied by the Southern Ndebele people, who were led by Chief Musi. In 1825 to 1837, this area went through a period of great strife, which is known as the Mfecane. The Mfecane began as a result of the movement of Nguni groups from KwaZulu-Natal to escape Zulu expansion (Pretoriana, 1978). After breaking away from the authority of King Shaka, Mzilikazi and his Khumalo followers entered the Transvaal region in about 1823. Not long after his arrival, Mzilikazi destroyed the Bakwena tribe which had been occupying the area for a number of years (Huffman, 2010; Pretoriana, 1978). He not only destroyed the Bakwena tribe, but also wiped out the Ba-Hurutsi. He yielded a path of destruction that stretched out as

far as the Orange River, overpowering all earlier inhabitants of the area (Huffman, 2010; Pretoriana, 1978).

Mzilikazi made Pretoria his home by building two military kraals (shown in table 9). He built the first one (enDinaneni) near the Apies River in the north-west of Pretoria (Huffman, 2010; Pretoriana, 1978) and the second one (enKungwini) along the Daspoort range of hills. He also occupied a place on the south side of Meintjieskop and later moved to a place he named emaHlahlandlela in the north of Magaliesberg range (Huffman, 2010; Pretoriana, 1978).

Table 9: Military kraals (http://www.sahistory.org.za)

In 1836, Mzilikazi received news that white settlers (the Voortrekkers) were planning to invade his land. This caused him to launch an attack on the Voortrekkers, who managed to ward him off (Huffman, 2010; Pretoriana, 1978). A highly dissatisfied Mzilikazi launched a second attack, during which his men took possession of all the livestock owned by the Voortrekkers (Huffman, 2010). The leader of the Voortrekker army, General Hendrik Potgieter, launched a counter attack on Mzilikazi and his tribe. This battle, together with the one that had been waged by Dingane, was enough to send Mzilikazi fleeing across Limpopo. With Mzilikazi's depature, it was easy for the Voortrekkers to drive out the rest of the Matabeles who had been left behind (Huffman, 2010; Pretoriana, 1978).

Table 10 Level of diversity per typology in the pre-colonial era

Study area	Level of diversity per typology
Pretoria inner city	**Physical:** The only physical typology that existed during this phase was the African style hut or rondavel.
	Finance: Material to build these structures was sourced locally from trees, thatch grass, stones and mud. Therefore, shelter was self-funded.
	Tenure: The only tenure option was traditional tenure.
Soshanguve	**Physical:** Soshanguve was still not developed during this period and as such no physical structures existed.
	Finance: There were no financial typologies during this era in Soshanguve.
	Tenure: There were no tenure based typologies during this era in Soshanguve
Mooikloof	**Physical:** This area was still a farmland during this period and no physical structures existed.
	Finance: The few houses that existed during this period were built from personal savings that the owners had.
	Tenure: Private ownership was the only tenure type that existed during this era in Mooikloof

Level of diversity: Based on the typologies that existed at this point, diversity was low in the inner city and had not developed at all in Soshanguve and Mooikloof, during this phase.

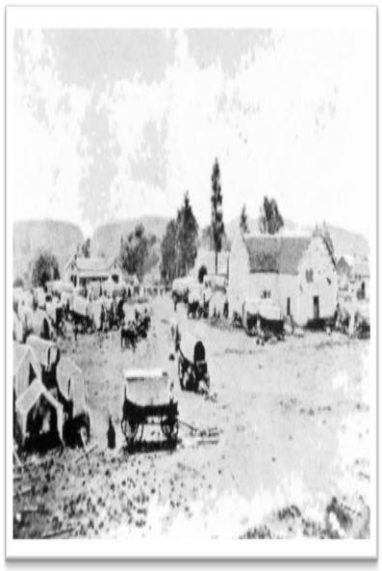
5.3. Colonial Pretoria

In 1840, the Lucas brothers settled in Pretoria and registered the farms Groenkloof and Elandspoort. A trek led by Andries Pretorius also settled in this area, and in 1853, his son (Marthinus W Pretorius) bought Elandspoort and another farm, Koedoespoort. His main purpose for buying these farms was to found a town that would serve as the capital. In November 1853, these two farms were declared a town, which came to be known as Pretoria. During this period, the main purpose of this town (which had not been developed into a town yet) was to serve as a meeting place for the Dutch Reformed Church. In 1857, a church building (a small thatched-roof building) was constructed on an open piece of land, on what was to become and still is Church Square (Cultmatrix, 2009; Theron & De Wit, 2010). In 1857, AF du Toit, a friend of Marthinus Pretorius, arrived in Pretoria and was appointed as a

magistrate. His important task, however, for the purpose of this study, was his role in planning the layout of the new settlement that was developing (Theron & De Wit, 2010).

The main task that he was given by Marthinus Pretorius was to ensure that the future permanent church building needed to be the central point of this new town. His second role was to ensure that the surrounding area (Church Square) was big enough to accommodate the oxwagons and tents (shown in table 11) that were erected when the quarterly communion services took place (Cultmatrix, 2009; Theron & De Wit, 2010). According to Clarke and Corten (2011), an orthogonal street grid design was used within the city. The size of the streets that formed the grid was determined by the length of the oxwagons and the street width required the wagons to make a U-turn (Clarke & Corten, 2011).

Table 11: Early dwellings (Africana Collection, University of Pretoria)



The building blocks in the grids contained single-storey buildings for residential buildings (shown table 11) with large backyards (Clarke & Corten, 2011). Building lines were strictly regulated to ensure that the grid was maintained (Clarke & Corten, 2011). Water was supplied to these houses via water canals that were running along the streets. These canals were distributors of water from the Apies River (Clarke & Corten, 2011). The discovery of gold in the Witwatersrand in 1886 had an impact on the demand for extra housing in Pretoria. With the influx of people who arrived during this period, the rural nature of Pretoria was transforming into an urban society. People who had come to seek employment found shelter in detached single quarters on the properties of their employers or in the Berlin Mission

Society on the northern fringe of the town. These premises became overcrowded, and in 1888, as noted by Clarke and Corten (2011), this prompted the development of a new orthogonal grid towards the southeast of the city (present-day Sunnyside) to accommodate residential dwellings.

In the early 1900s, Indians began settling in Pretoria and began trading between what is now Sisulu and Lilian Ngoyi streets. In terms of government legislation at the time, Indians were not allowed to own property in South Africa because they were not recognised as South African citizens (Cultimatrix, 2009). However, the legislation did not prohibit them from residing in any area allocated by government. In 1889, an Asiatic Bazaar was allocated for their use to the south of Marabastad (Cultimatrix, 2009). Due to a growing demand for accommodation, the vacant area between the Asiatic Bazaar and Marabastad was turned into an unsurveyed informal settlement. The government later formalised this area and proclaimed it as a settlement in 1905 (Cultimatrix, 2009).

Until about the early 1900s, the urban development in Pretoria was only focused on the central area and around Church Square. Towards the east of Pretoria, settlement patterns were mainly agricultural, the population in those areas grew and original farms were subdivided to accommodate more farmers and later smallholdings. The area where Mooikloof is today formed part of these areas. Mooikloof developed as an area outside central Pretoria as an agricultural and residential extension of Pretoria. In 1910, Pretoria became the executive and administrative capital of the Union of South Africa. Newly declared suburbs at the time consisted of a few scattered dwellings with large areas of undeveloped erven (shown in figures 18 & 19).

Figure 18: Early dwellings in Pretoria (Africana Collection, University of Pretoria)

Figure 19: Early dwellings in Pretoria (Africana Collection, University of Pretoria)

5.3.1. Outline of key historical events during this period

- In 1853, Pretoria was declared a town.
- In 1886, Melrose house was built by George Jesse Heys and it was requisitioned as a headquarters for British forces in 1899.
- In 1890, the need and demand for residential dwellings in Pretoria increased due to demand for labour in the surrounding mines.
- In 1899, war was declared between Great Britain, the South African Republic (Transvaal) and the Orange Free State. Johannesburg encountered very little military action during the South African War (also known as the Anglo-Boer War), but Pretoria was surrendered to the British, who won the war. In 1902, the Treaty of Vereeniging, which was signed in Pretoria's Melrose House, brought the South African War to a close. In total, the conflict claimed 75 000 lives and resulted in the annexation of the region under the British Empire.
- In 1910, Pretoria became the administrative centre of the new government. In November 1910, the cornerstone of the Union Building was laid.

From 1912 to 1922, the first townships emerged within Pretoria and Johannesburg on a mixed-race basis, but increasingly over time on the outskirts of towns. These settlements were allowed by government to ensure a labour force in urban areas, but limited investment was made in their development. Living conditions were extremely poor. Influx control was applied to regulate a labour supply for farmers and mines. Africans were excluded from rights

(political and land). Government applied segregation on a fragmented and decentralised basis. Civil society began to emerge to contest segregation and living conditions.

Through tradition, Africans were accustomed to building their own homes in rural areas, as illustrated in Figure 20 below. As they gradually moved into urban areas, they continued to erect their own accommodation. There were approximately 12 males to one female in urban areas. A majority were temporary migrant workers who were employed by mines and housed in mine compounds (Morris, 1981. Hostel accommodation was occupied by those under the employ of the municipality.

Figure 20: An early establishment in Mabopane East (Africana special collections)

Table 12: Level of diversity per typology in the colonial era

Study area	**Level of diversity per typology**
Pretoria inner city	**Physical:** In addition to the huts and the rondavels, single stand-alone houses started developing in the inner city during this period. Plots were irregular in size and not clearly marked off. Tents were another form of shelter that were used in the inner city as illustrated above.
	Finance: Financing of shelter was through individual savings during this period and government funding towards the end of the colonial era.
	Tenure Private ownership and traditional tenure were the only tenure types that existed during this period.
Soshanguve	**Physical:** Soshanguve was still not developed during this period and as such no physical structures existed.
	Finance: There were no financial typologies during this period in Soshanguve.
	Tenure: There were no tenure based typologies during rhis period in Soshanguve.

Mooikloof	**Physical:** single detached small dwelling types existed during this period.
	Finance: The were still a few houses which existed during this period and just like during the pre-colonial period, they were built from personal savings that the owners had.
	Tenure: Private ownership was the only tenure type that existed during this era in Mooikloof

Level of diversity: Diversity steadily started increasing. Two types of physical structures now existed and a rental option was introduced. Diversity was still low in the financial typology during this phase. While diversity had started increasing, it was still not spatially distributed.

5.4. City development during apartheid

The expansion and development of the spheres of government and industrial growth in 1940 to 1950 saw an influx of people into Pretoria. New settlement areas were developed on the periphery of the city to meet the growing demand for housing (Cultmatrix, 2009). Apartheid urban planning began in 1930 and contributed to the eviction of black nationals residing in Marabastad, who were removed from there and placed in Atteridgeville (Cultmatrix, 2009). All the houses and structures that were now vacant were immediately demolished and Marabastad was deproclaimed in 1955. Derdepoort was proclaimed as a coloured area and it was renamed to Eersterust. All black residents were removed from Lady Selbourne and were sent to Ga-Rankuwa to maintain the white-only status in that area (Cultmatrix, 2009; Hendler & Wolfson, 2013).

In 1950, to ensure the majority rule of government in towns and urban areas, a homeland or bantustan policy was developed (Cultmatrix, 2009; Hendler & Wolfson, 2013). Nine bantustans were developed in total and the language and culture of a particular ethnic group was considered in the development each bantustan (Cultmatrix, 2009; Hendler & Wolfson, 2013). Bophuthatswana was one of the homelands that was developed towards the northwestern part of Pretoria and it was meant to only be occupied by Tswana people (Cultmatrix, 2009; Hendler & Wolfson, 2013). After huge issues with overcrowding due to ethnic segregation, a new town, Mabopane, was developed in 1969. In 1976, the eastern non-Tswana section of Mabopane was separated from the Bophuthatswana homeland and renamed Soshanguve (Cultmatrix, 2009; Hendler & Wolfson, 2013). Its administration was

placed in the direct control of the South African government. Bophuthatswana was declared an independent republic within South Africa in 1977 (Hendler & Wolfson, 2013).

Soshanguve is a township situated approximately 30 km north-west of Pretoria. It was established in 1974 on trust land (land scheduled for incorporation into a homeland) bordering on Mabopane in Bophuthatswana (Huggins, 1989; Mashabela, 1988). Prior to Bophuthatswana's independence in 1977, Soshanguve was known as Mabopane East and formed part of the greater Mabopane-Boekenhout-Winterveld complex. Mabopane East was one of the areas set aside for non-Tswana residents, and in these terms, it could avoid incorporation into the Tswana homeland of Bophuthatswana (Naidoo, 2011; Huggins, 1989; Mashabela, 1988). Mabopane East was renamed Soshanguve in 1977 to house Sotho, Shangaan, Nguni and Venda people (thus the derivation of the name So-sha-ngu-ve) (Morris, 1982; Huggins, 1989).

From 1971 to 1974, further development of Mamelodi and Atteridgeville was put on hold in accordance with government policy that sought to limit the number of Africans that chose to reside in cities permanently (Mashabela, 1988. Therefore, citizens who suddenly found themselves homeless were provided with accommodation in Soshanguve (Mashabela, 1988). Soshanguve was a commuter settlement scheduled for incorporation into Bophuthatswana at the time. Unlike other African townships in Pretoria, Soshanguve had no black local authority. The residents felt that a black authority was an extension of apartheid and any plan aimed at forming such a body in the township was rejected (Mashabela, 1989).

Naidoo (2011) writes that by the late 1970s, Soshanguve had become a vast expanse of semi-developed territory with formal housing flanked by informal settlements, some well-established and some not so well established. In 1987, there were 96 400 people living in Soshanguve, of which 8 000 were on the official housing waiting list and 210 lived in a hostel (Mashabela, 1989). There were 11 424 houses in the township, of which 5 186 were rentals and 6 238 had been bought or built by residents (Mashabela, 1988). Some 1 334 of the houses that were purchased fell under the 99-year leasehold, while 2 252 were bought by individual residents with their own personal funds. A total of 209 houses were built out of self-help loans granted to individual families when the self-help scheme was launched in 1982. Another 207 houses were built under the home ownership (30-year leasehold) scheme.

Together with the rest of South Africa, segregation was formalised in South Africa in 1920, through the enactment of the Housing Act, Act No. 35 of 1920, and the Native Urban Areas Act, Act No. 21 of 1923 (Hendler & Wolfson, 2013). In 1945, the Native Urban Areas

Consolidation Act, Act No. 25 of 1945, was passed as law and became the foundation for pass law control. This act also set African housing norms and boundaries and urban residential tenure rights (Hendler & Wolfson, 2013; Mabin, 2012). The Housing Act also established the Central Housing Board. The purpose or mandate of this housing board was to control the housing or residential developments of local authorities (Hendler & Wolfson, 2013). It was also responsible for the supervision of the lending of government funds for building houses (Hendler & Wolfson, 2013; Mabin, 2012).

The erstwhile Pretoria City Council embarked on a drive to provide shelter on a sub-economic basis for the benefit of the poor (Hendler & Wolfson, 2013; Mabin, 2012). In 1942, the first of these houses was constructed in Danville (Hendler & Wolfson, 2013; Mabin, 2012; Cultmatrix, 2009). Towards the end of 1948, there were 500 such houses. Upon completion of these houses, the City Council decided that it would not continue with the construction of sub-economic houses for Europeans in the low-income group (Hendler & Wolfson, 2013; Mabin, 2012; Cultmatrix, 2009). It was decided that a scheme that would rather focus on the financial capacity, which the local government had at the time, would be used.

One of the measures to support this new approach was the site and service housing scheme. Through this scheme, local governments were able to increase the pace with which housing could be provided, especially for black people who were residing in informal settlements (Hendler & Wolfson, 2013; Mabin, 2012). It also involved relocating these residents to these serviced sites with the assurance of building a formal unit at a later stage through the involvement of construction firms and builders that the municipality had trained itself. Hendler and Wolfson (2013) note that 6 000 houses were built in Daveyton within a year and eight months through this scheme.

Nationally, a shift in the settlement patterns in black housing began in the late 1970s due to a climate of severe political and industrial conflict (Hendler & Wolfson, 2013; Mabin, 2012). Labourers' opposition towards government and employers began developing in agricultural areas, as well as in the townships (Hendler & Wolfson, 2013; Mabin, 2012). These conflicts reached a climax in 1976 with the Soweto uprisings bringing into stark focus the economic and legitimacy struggles that had engulfed South Africa for decades. This saw a change in the alignment of financial investment by national government in the provision of township housing between 1978 and 1985 (Hendler & Wolfson, 2013; Mabin, 2012).

In the late 1970s, a private ownership market was facilitated through the introduction of 99-year leaseholds (Hendler & Wolfson, 2013; Mabin, 2012). In 1984, the State further amended

its regulations and enabled the acquisition of township stands by private property developers and construction firms (Hendler & Wolfson, 2013; Mabin, 2012). The state embarked on major house-selling programme in 1973 and made an additional 350 000 residential dwellings available under the 99-year leasehold provisions (Hendler & Wolfson, 2013; Mabin, 2012). During this epoch, the functions of acquiring, holding and disposing of developed land in segregated townships were delegated among the state and private developers (Hendler & Wolfson, 2013; Mabin, 2012). During this time, national government focused on upgrading the township structure, while allowing development processes through independent black local authorities (Hendler & Wolfson, 2013; Mabin, 2012). Influx control and regulations were dropped in 1986 to make way for the involvement of private developers in the identification and initiation of land for development (Hendler & Wolfson, 2013; Mabin, 2012).

5.4.1. Financing

National Housing Fund: This fund was set up for all housing projects. Capital comprised funds voted annually by Parliament.

Bantu Housing Board: This board was set up to deal with the financing of black housing. Its main function was to consider applications by local authorities for loans for the acquisition of land.

Financing policies introduced during this period were aimed at reducing the financial burden and overreliance on the state. The following six trends developed with the introduction of new financial policies:

- A substantial reduction of sub economic housing loans
- The application of strict income limits for the payment of sub economic rentals
- The introduction of loan opportunities for builders
- The promulgation of legislation for compulsory employer contributions for employees
- Increased expenditure on homeland housing
- The introduction of legislation to ensure that black urban areas became self-financing

During this period, the Department of Native Affairs also adopted a policy of making economic loans (as opposed to the sub economic loans) available to local authorities for their housing schemes. This saw a steady increase in economic loans and a decrease in sub

economic loans. Recipients of these loans had to pay for houses provided through these loans by way of rental or purchase. Table 5 below illustrates the steady increase in economic loans alongside the steady decrease in sub economic loans for the period 1950 to 1957.

Table 13 Economic and sub economic loans for housing in South Africa from 1950 to 1957 (Morris, 1981)

Year	Economic loans (R)	Subeconomic loans (R)
1950–1951	741 867	2 161 728
1951–1952	313 324	1 449 147
1952–1953	798 324	1 841 343
1953–1954	1 683 907	1 886 465
1954–1955	2 446 064	669 465
1955–1956	4 301 748	209 982
1956–1957	4 484 175	111 662

5.4.2. Site and Services Scheme

In 1953, the Site and Services Scheme was introduced as an adjunct to normal housing schemes. Site and services areas were to be fully planned, providing for future community facilities. Initially, only critical or necessary services were provided to make the scheme habitable.

Methods of financing loans to individual stakeholders varied. Families could erect temporary shacks (towards the back of stands) using material from the homes they had previously occupied (Morris, 1981). They also had the option of obtaining a loan for building material, with which they could erect either a temporary shack or one permanent room for a future permanent house (Morris, 1981) By 1958, 12 438 houses and 6 400 hostel beds had been built in Pretoria. However, there was still a shortage of 15 000 dwellings.

5.4.3. Tenure

A number of factors limited the effectiveness of the ownership and site and services schemes as a long-term process of housing aimed at increasing community and individual responsibility. These factors included the fact that granted leaseholds were designed to be temporary and gave insufficient security of tenure to households. The lease could not be

used as security for building societies or other lending institution loans. As these were being issued, freehold rights were being withdrawn and other measures were introduced to facilitate the removal of blacks who worked in suburbs from residential areas.

5.4.4. Outline of key historical events

- In 1931, Pretoria gained status as a city, and in September 1939, when the World War II broke out, Pretoria became a military centre (Morris, 1982; Jammine, 1981). The entire country was subjected to major influences of the wartime conditions on its economy. With Pretoria as a military centre in the Union's war, the population increased.
- A sudden influx of the families of soldiers stationed in camps in and around the city occurred. This and the rapidity of industrial development attracted an extensive migration of labour from rural areas into the city.
- In 1943, the Housing Act was amended, replacing the Central Housing Board with the National Housing and Planning Commission. This was accompanied by a new financial basis for the granting of loans.
- In 1948, the National Party came to power in South Africa and formalised racial segregation with the apartheid policy.
- From 1948 to 1975, there was initially an extensive development of townships by government. Despite these efforts, informal settlements and overcrowding continued to increase due to migration to urban areas. From 1960, development slowed down as the focus shifted to homeland development. Townships are segregated physically, socially and economically from towns, and residents became progressively isolated and poorer, as access to economic opportunities and urban amenities was restricted. Civil society became increasingly militant and international sanctions and boycotts were applied.
- The Group Areas Act, Act No. 14 of 1950, was enacted and the nine ethnic bantustans were established between 1950 to 1960.
- In 1961, Pretoria was named the capital of the Republic of South Africa and in 1964, the Pretoria municipal area was demarcated. In 1969, Mabopane was established as a town.
- In 1976, the eastern non-Tswana section of Mabopane was excluded from the homeland system and was named Soshanguve. It was placed under the rule and direct control of the South African government.

- In 1976, the beginning of civil unrest, international sanctions, increasing urbanisation and a declining economy contributed to the dismantling of the apartheid policy. Government funded houses were erected in Mabopane during the same year. Towards the end of 1976 the destruction of beer halls and liquor outlets nationwide led to a loss of income that was used for the maintenance and upkeep of shelter in homelands.
- In 1977, 99-year leasehold and full property rights were provided to all races. Funding for housing was also increased and extensive private sector housing development in townships commenced.
- In 1977, racial local authorities were established, but remained dysfunctional. Africans were no longer restricted to living only in townships and started moving into the inner city and suburbs. South Africa was left with cities structured by apartheid. Townships were characterised by small, poor-quality houses, with a large number of informal settlements, poor service infrastructure and amenities, as well as a lack of affordable public transportation.

Table 14: Level of diversity per typology in the apartheid era

Study area	Level of diversity per typology
Pretoria inner city	**Physical:** Due to a statutory 30 m limit on high-rise flats that was imposed by the Pretoria City Council, high-rise flats still did not exist during this phase. The physical types that existed were multi storey walk ups, single detached houses, huts and shacks.
	Finance: In 1948, housing board loans and a loan facility were made available to local authorities for housing. The Pretoria Town Council adopted a scheme of erecting housing units in the traditional style of native huts. Shelter was also built from individual savings that people had in their possession.
	Tenure: Private ownership, rental and communal ownership were the forms of tenure that existed in the inner city during this phase. For anyone who could produce a certificate that confirmed his or her home ownership certificate and right of proprietorship, a 99-year leasehold was granted. Due to the introduction of the 99-year leasehold, the private sector could make finance available to people who wanted to negotiate building society loans to purchase property.
Soshanguve	**Physical:** Due to a focus on the development of low income housing in the homelands, housing development began around Soshanguve. The dwelling units were small semi-detached houses. Due to an increase in rural to urban migration, informal housing in the form of shacks also began to appear.
	Finance: Site and Services Scheme was introduced as an adjunct to normal housing schemes in 1953. In 1979, the Bantu Housing Board was abolished and all applicants for loans (for all population or race groups) would be administered by the Department of Community Development through the National Housing Commission. In April 1979, it was announced that housing loans for black South African citizens would be provided at the same rates and according to the same standards as those for other groups.
	Tenure: The dominant tenure types in Soshanguve during the apartheid era were government owned houses , rentals and private ownership
Mooikloof	**Physical:** Mooikloof had slowly started developing during this era, but the only physical typology that existed during this period was single detached houses that farmers who lived in the area occupied.
	Finance: The only existing funding was the individual savings that people used to build dwelling units.
	Tenure: The tenure type that existed in Mooikloof during this era was private ownership.

Level of diversity: While diversity was steadily increasing in all three typologies in the inner city and Soshanguve, the diversity was very low in all typologies in Mooikloof.

5.5. The post-apartheid city

During the early stages of post-apartheid, Pretoria went through a phase where large-scale development slowed down (Donaldson, Jurgens & Babr, 2003). An out-migration of white-owned businesses and white residents who resided in the city began during this phase. In Soshanguve, backyard shacks continued to develop as a form of urban infill, while home-based businesses contributed to mixed land use (Donaldson et al., 2003). The inner city went through a process of physical, social and economic decline.

5.5.1. Tenure

The legacies inherited from the colonial and apartheid regime meant that there was an unequal and racialised pattern of land rights in South Africa. Although attempts towards land reform have been made in the post-apartheid period, these entailed redistributing and relocating land rights in favour of the marginalised poor, and very little progress was made. So, although there are various forms of tenure systems in Tshwane, they are not distributed evenly across all income groupings or individuals. The rental form of tenure enjoys greater preference over all other forms of tenure among residents in Tshwane. There has also been a steady emergence of informal settlements in Tshwane in the post-apartheid epoch. Two such examples are the Woodlane informal settlement in Moreletta Park and the Marry Me informal settlement in Soshanguve.

5.5.2. Finance

Since 1994, the housing finance system has not had the desired effect on the low-income segment of the population. The financial sector is currently made up of big banks, dedicated finance companies and alternative lenders (Department of Co-operative Governance and Traditional Affairs 2009). Credit through micro loans has also not been as successful as initially planned to help those in the low-income segment to own property (Khan & Thurman, 2001; Department of Co-operative Governance and Traditional Affairs 2009). On a private scale, high interest rates and stringent bond qualification criteria have also swayed those who belong to the middle-income group towards renting as opposed to owning property.

5.5.3. Physical features

Figure 21: Images of social housing dwelling types in the inner city

(Taken from: http://www.ych.org.za/p/493979/jubilee)

Figure 22: Images of government funded houses in Soshanguve (Images taken by authour)

Figure 23: Images of dwelling types in Pretoria inner city (Images taken by author)

5.5.4. Outline of events from 1994 to 2004

- In 1994, South Africans went to the polls in the country's first democratic elections. The African National Congress won 62% of the vote.
- After the 1994 elections, South Africa was divided into nine provinces; the Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West and Western Cape. Johannesburg became the seat of Gauteng's provincial government.
- In 1994, the National Housing Forum formulated South Africa's inclusive housing policy.

- In the same year, the RDP was adopted. It set a goal of giving away houses, with a target of 300 000 houses per year. It replaced all previously formulated government subsidy programmes.
- In 1994, the Housing White Paper was promulgated. It set out a framework for the National Housing Policy.
- In 1999, the formal minimum norms and standards for subsidised housing were introduced.
- In 2000, the National Housing Code was introduced.
- In 2001, measures were introduced to enable people owning unsubsidised residential access to now have access to housing subsidies.
- In 2004, Breaking New Ground was introduced.

Table 15: Level of diversity per typology in the post-apartheid era

Study area	**Level of diversity per typology**
Pretoria inner city	**Physical:** The inner city has high rise buildings, multi-storey walk ups and a few single detached houses such as Melrose house have been retained as heritage sites.
	Finance: Financing of dwellings is through mortgage loans from banks, government funding (for social housing) and through private and state funded partnerships (City Property and City of Tshwane inner city urban regeneration mass project).
	Tenure: The dominant form of tenure in the inner city is rentals, followed by private ownership. There are dwelling units which are also owned by the state.
Soshanguve	**Physical:** Dwellings that can be found in Soshanguve currently include backyard rooms, single detached houses (shown in figure 22), backyard rooms, row houses and shacks.
	Finance: Funds used to finance shelter in Soshanguve are; government funding, finance from banks and as well as private savings that individuals have.
	Tenure: Tenure options in Soshanguve include rental, private ownership, communal ownership and state owned shelter.
Mooikloof	**Physical:** In the present era, Mooikloof is characterised by townhouse complexes, single detached houses (middle-high income), multi storey walk ups and the shacks seen in PLASTIC VIEW and CEMETERY VIEW.

	Finance: Funds used to finance housing in Mooikloof are currently through housing mortgages from banks, and from private savings that individuals have.
	Tenure: Tenure options that exist in Mooikloof are private ownership and rentals

Level of diversity

In post-apartheid Tshwane, diversity showed an increase in the financial typologies in the public- or government-funded domain. In terms of finance in the private domain, residents either chose to finance their own shelter through personal savings or they approached a bank. The types of physical structures also continued to increase, as did tenure options. Although there was an increase in diversity in each typology, it was still not well distributed spatially.

5.6. Conclusion

This chapter identified the three key historical periods and used these to narrate the history of Tshwane in the context of the changes that occurred in shelter within the physical, tenure and financial typologies. In Pre-colonial Pretoria, the level of connectedness and diversity was found to be very low in all three typologies, which meant that the Tshwane urban system would not adapt in the event of a perturbation. In Colonial Pretoria, the level of diversity began to steadily increase within the financial and tenure-based typologies, but it was not significant. The apartheid city development era saw an increase in all three typologies, yet even though this was the case, the diversity was still not well distributed spatially. The introduction of housing board loans meant that the local council could build more housing stock within the city, but because this housing was not accessible to everyone, diversity remained low. There is a link between diversity and the growth of the city in all typologies. While there was no diversity in the pre-colonial epochs in all three typologies, it rose steadily in the following epochs in all the study areas. More finance options were developed, although they initially were not accessed equally. More formal and informal tenure options accompanied the growth of the city as the demand for accommodation increased. Again as the demand for accommodation increased, more dwelling types started developing within the city. Chapter 6 will look at how diversity manifested in the function of shelter across the three study areas by mapping the changes in the distribution of diversity across space and time in these areas.

CHAPTER 6: ANALYSIS

6.1. Introduction

Talen (2006) notes a correlation between diversity in neighbourhoods and metrics of ecology that can assist in answering questions that relate to why diversity is important. In ecology, large patches are considered favourable because the population will be higher for any given species (Talen, 2006). This means that the species diversity will be higher and that the total elimination of species is less likely to occur. It has been argued that diversity is one of the vital determinants of a resilient system (Walker & Salt, 2006; Du Plessis, Landman, Peres, Nel, Ferreira & Swanepoel, 2014). In ecological resilience, diversity increases the array of options available to a system as it adapts and reorganises itself (Du Plessis et al., 2014). This chapter will illustrate how diversity manifested in the Tshwane urban system over four epochs, by looking at how the distribution of diversity in the function of shelter changed in each study area. Table 16 below shows a more detailed breakdown of the unit of analysis that will be used to show the different typologies and how they changed per period.

Table 16: Detailed unit of analysis

Typology		**Symbol**
Physical	Rondavel/hut	P
	Shack/	P1
	Room in backyard	P2
	Single-detached government subsidised (RDP)	P3
	High-rise flats	P4
	Multi-storey walk ups	P5
	Attached row houses/town houses	P6
	Single-detached (middle-high income)	P7
Financial	Individual savings	F1
	Mortgage from bank	F2
	Government subsidised	F3

Tenure	Private ownership	T1
	Traditional ownership & communal ownership	T2
	Rental	T3
	Government owned	T4

6.2. Analysis of the distribution of diversity in the function of shelter in the Tshwane CBD

The four epochs that were used to map changes in the Tshwane system over time show that in the inner city, the diversity in all three typologies (species diversity) was initially very low in the pre-colonial period (shown in table 17), but steadily increased from the colonial period. The diversity in the physical typologies was the highest during the apartheid period. What is important to note in all three periods within the physical typologies is the change in the types of typologies and as well as the physical typologies that fall away and the new physical typologies that are introduced. High rise flats (p4) are introduced for example in the post-apartheid period due to height building restrictions being removed, which meant that high rise buildings could be constructed. Diversity in the financial typologies was very low during the pre-colonial period and it was the highest in the post-apartheid period. When one looks at tenure based typologies in the inner city, it was the lowest during the pre-colonial phase and remained the same during the apartheid and post-apartheid phase.

The idiosyncratic model can be used to represent the relationship between the three typologies and the function of shelter in the Tshwane urban system. This means that the contribution that each typology has to the function of shelter is strongly influenced by the interactions among these typologies. The introduction of government subsidised housing for instance, meant that a different physical typology could be provided and also increased the diversity in the tenure options. The idiosyncratic model can also be used to illustrate that in the Tshwane urban system, strong interactions among the different typologies in the function of shelter increases the adaptive capacity of the system. Figure 24 shows the some of the dwelling types that exist in the present day within the inner city.

Table 17: Analysis of the distribution of diversity across time in Pretoria inner city

Epochs	Diversity in physical typologies	Diversity in finance typologies	Diversity in tenure based typologies
Pre-colonial	P	F1	T2
Colonial	P P7	F1 F3	T1 T2
Apartheid	P P1 P5 P7	F1 F3	T1 T2 T3 T4
Post-apartheid	P4 P5 P7	F1 F2 F3	T1 T3 T4

Figure 24: Dwelling types in the Pretoria inner city (Google Earth, 2015)

6.3. Analysis of the distribution of diversity in the function of shelter in Mooikloof

Table 18 shows that the pre-colonial and the colonial period was characterised by no diversity at all in Mooikloof in all three typologies because development had not taken place during those two periods. The dawn of apartheid city development saw a steady increase in the physical typology in Mooikloof. The diversity in the financial and tenure based typologies remained very low however in the apartheid period. In the post-apartheid period, there has been a substantial increase in the physical typologies. The diversity in the financial and tenure based typologies did not however increase in the same magnitude and remains low. Tenure options in Mooikloof include private ownership (freehold and sectional title) and rental housing. It is common to also find people who rent apartments or townhouses, while some own apartments or townhouses under sectional title ownership within the same building or development. Finance typologies in Mooikloof include private mortgage instruments and individual savings. The diversity in the physical typologies in Mooikloof remained low until the post-apartheid period (shown in figure 25).

The species diversity model can be used to illustrate the distribution of diversity in Mooikloof. According to this model, an urban system is more stable if it is occupied by a large number of species in the function that it provides. Since diversity is low in all typologies until the end of the apartheid period, the stability of the function of shelter was equally low. An increase in the diversity of all typologies in the function of shelter would lead to an increase in the stability of this function. So all although the focal scale is very stable, the larger scale introduces social instability because of the inequality of access to the function of shelter in Mooikloof. This causes lower level disturbances within the system and an infiltration of informality which results in shacks and homeless people sleeping in streets.

Table 18: Analysis of the distribution of diversity in shelter across time in Mooikloof

Epochs	Diversity in physical typologies	Diversity in finance typologies	Diversity in tenure based typologies
Pre-colonial	P7	F1	T1
Colonial	P7	F1	T1
Apartheid	P7	F1	T1
Post-apartheid	P1 P5 P6 P7	F1 F2	T1 T3

Figure 25: Dwelling types in Mooikloof (Google Earth, 2015)

6.4. Analysis of the distribution of diversity in the function of shelter in Soshanguve

As shown in table 19 there was initially no diversity in all typologies in Soshanguve in the pre-colonial and the colonial phase. During apartheid city development, diversity steadily started to increase in all the typologies, but was noticeably higher in the tenure based typologies. Out of all the study areas that were looked at, Soshanguve had the highest

diversity in the physical typologies in the post-apartheid period. These are shacks, backyard rooms, (RDP), single detached houses (middle income) and row houses, some of these dwelling types are shown in figure 26 below.

The post-apartheid period also saw an increase in the finance typologies and tenure options remained the same as those that existed in the apartheid period. Tenure options in Soshanguve include government-assisted housing, private ownership and rental. It is common to also find people who rent out their RDP houses or who rent out rooms built behind their main houses. There is therefore moderate diversity within the tenure options that are available in Soshanguve. Finance options in Soshanguve include private mortgage instruments, government-funded housing instruments, individual savings and rentals. South Africa's leading banks are involved in affordable housing projects where they provide finance for qualifying individuals. Individuals who build their houses from their own savings are also common in the area. This trend is influenced by preference, the flawed RDP system, or failure to qualify for a bond from a private bank. One can expect to find government-funded housing in the area, although, as mentioned before, the rightful owners of these houses either rent them out or sell them.

The drivers and passengers model of redundant ecological function can be used to illustrate how diversity has manifested in Soshanguve and what this means for the stability of the function of shelter in the Tshwane urban system. Drivers are species that have a strong ecological function and can be used as a metaphor to represent physical typologies because they have the highest distribution in the function of shelter. As typologies increase in the function of shelter, they begin to overlap or complement each other and the increase in redundancy increases the system's ability to withstand perturbations.

Table 19: Analysis of the distribution of diversity in shelter across time in Soshanguve

Epochs	Diversity in physical typologies	Diversity in finance typologies	Diversity in tenure based typologies
Pre-colonial	None	None	None
Colonial	None	None	None
Apartheid	P P1 P2	F1 F3	T1 T4
Post-apartheid	P1 P2 P3 P6 P7	F1 F2 F3	T1 T2 T3 T4

Figure 26: Dwelling types in Soshanguve (images courtesy of Google Earth, 2015)

6.5. Conclusion

This chapter analysed how diversity manifested in Mooikloof, the Pretoria inner city and Soshanguve by mapping how diversity was distributed in these areas across four epochs. The diversity was looked at in terms of physical typologies, tenure options and finance typologies. For all three areas, the distribution of diversity was initially low in the pre-colonial

phase, meaning that stability was low in the function of shelter. The colonial phase saw a small increase in the distribution of diversity in all typologies in the inner city, meaning that the stability of the function of shelter was slowly beginning to incline. The distribution of diversity in the inner city was the same in the apartheid and post-apartheid period. The distribution of diversity was very low in the pre-colonial, colonial and apartheid period in Mooikloof. While it has increased in the physical typologies in the post-apartheid period, it is still relatively low in the finance and tenure based typologies.

CHAPTER 7: CONCLUSION

7.1. Introduction

The aim of this research was to understand diversity in the function of shelter as it manifests in a typical South African city by looking at how diversity was distributed and how it manifested in three areas in the Tshwane urban system. The three areas examined in this study were the Pretoria inner city, Soshanguve and Mooikloof in the east of Tshwane. These three areas provide a point of reference to the spatial, economic and social characteristics of the City of Tshwane. The inner city, Mooikloof and Soshanguve are especially relevant, as they have medium to large residential nodes that are different or unique to each area. Using these three areas as case studies would make it possible to showcase how diversity in shelter has changed and how it is distributed per area. The aim of this chapter is twofold. The first intention is to summarise the key findings of the study, through a theoretical and empirical lens. The second intention is to reflect on how the findings in this study can contribute to a continued debate on housing and resilience within a South African context.

The questions that were explored in this study were:

- Which typologies can be used to explain how diversity is distributed in the function of shelter?
- How did diversity manifest in the function of shelter in the Tshwane urban system?

7.2. Findings

This section will briefly summarise the key findings that were made in this study by looking at each research question.

7.2.1. Which typologies can be used to explain how diversity is distributed in the function of shelter?

In order to illustrate how the distribution of diversity changed across space and spatially in the function of shelter in the Tshwane urban system, three typologies were selected. Physical, financial and tenure based typologies were deemed to be the most appropriate and encompassing in assessing the distribution of changes in the diversity of the function of shelter across time and spatially. The three typologies that were selected to assess the changes in the distribution of diversity in the function of shelter across time and spatially were; physical, financial and tenure based typologies. With regard to financial typologies, there is visible diversity in public finance instruments that the South African government uses to provide housing. Various programmes within these instruments cater for individuals with

different social and financial needs. Funding instruments for individuals who can afford to provide for their own housing needs are currently available through mortgage bonds, which are financed by banks. There is also evidence of a visible diversity in the dwelling types that exist in South Africa, but from the literature it is not almost apparent how the diversity in the dwelling types is distributed spatially. While there are a few forms of land tenure in South Africa, the public sector only focuses on private ownership in 83% of its housing projects, despite the challenges that accompany this form of tenure. Again, there is no evidence that these forms of tenure are spatially distributed.

7.2.2. How did diversity manifest in the function of shelter in the Tshwane urban system?

For all three areas, the distribution of diversity was initially low in the pre-colonial phase. In Colonial Pretoria, the level of diversity began to steadily increase within the financial and tenure-based typologies, but it was not significant. Diversity steadily started increasing. Two types of physical dwelling types and a rental option was introduced. Diversity was still low in the financial typology during this phase. While diversity had started increasing, it was still not spatially distributed in all three areas. The apartheid city development era saw an increase in all three typologies in the inner city and Soshanguve. The introduction of housing board loans meant that the local council could build more housing stock within the city, but because this housing was not accessible to everyone, diversity remained low.

In post-apartheid Tshwane, diversity showed an increase in the financial typologies in the public- or government-funded domain in Soshanguve and the inner city. In terms of finance in the private domain, residents either chose to finance their own shelter through personal savings or they approached a bank. The types of physical dwelling types also continued to increase, as did tenure options in all three study areas. Although there was an increase in diversity in each typology, it was still not well distributed spatially. There is a link between diversity and the growth of the city in all typologies. While there was no diversity in the pre-colonial epochs in all three typologies, it rose steadily in the following epochs in all the study areas. More finance options were developed, although they initially were not accessed equally. More formal and informal tenure options accompanied the growth of the city as the demand for accommodation increased. Again as the demand for accommodation increased, more dwelling types started developing within the city

7.3. Recommendations for future research

- This study looked at the importance of diversity in the function of shelter in a typical South African city by looking at how diversity is distributed within this function and furthermore how diversity manifests. The importance of how the function increases or decreases was not looked at and is therefore an important focus for future research

- Brian Walker (1992) developed the concept of three models (Idiosyncratic, rivets , drivers and passengers) of ecological stability within ecological resilience and he proposed that functional groups of species can be divided into drivers and passengers. There is a need for a detailed analysis of how this concept would manifest in an urban system, especially in understanding what one defines as passengers and how these eventually become potential drivers.
- A vital area of study that was introduced in this study would be to define more artefactual species for urban systems and how the richness in these species contributes to the stability of other functions that are performed by these systems.

7.4. Conclusion

This chapter presented a summary of the key findings that were made in this study. Although the distribution of diversity increased in all three areas in the post-apartheid period in the function of shelter, it is still not distributed equally spatially across the Tshwane urban system. If one of the key functions that an urban system has to perform is to provide shelter, then diversity in shelter should be maintained across the entire urban system and not be limited to a single area within the urban system. This study has shown that while there are currently various physical and financial types in how housing is provided, it is not distributed throughout the Tshwane urban system. The fully (government) subsidised housing is currently not addressing the issues that impede diversity in the function of shelter. RDP houses are still largely constructed in the periphery of cities, far away from places of employment and areas of economic opportunities. The financial burden faced by recipients of RDP houses, does not necessarily improve once they have received a house. The evidence of this is seen when people opt to sell or rent out their RDP house. The current RDP housing delivery process is unsustainable and it lacks focus in ensuring secure tenure and other administrative problems. An inquiry on the diversity in the function of shelter therefore begins to broaden the debate and inform policy on how the housing delivery process can be improved and made more effective.

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APPENDIX A - RELEVANT LEGISLATION

With regard to housing provision in South Africa, the Department of Human Settlements makes use of the following legislation, policies and strategies to govern how shelter is provided in both the private and public domain.

The Sectional Titles Schemes Management Act, Act No. 8 of 2011: This Act provides for the establishment of body corporates to manage and regulate common property in sectional title schemes, as well as the establishment of advisory councils periodically to advise the Minister.

The Community Schemes Ombud Service Act, Act No. 9 of 2011: This Act establishes a regulator or ombudsman service to resolve disputes that emanate from within community schemes. An increasing number of community schemes have been developed in recent years. Governance of these is through the community involved, financial responsibility and common land and facilities. This Act is thus aimed at addressing any problems and disputes among participants involving the control and administration of finances, facilities and behaviour.

The Estate Agency Affairs Act, Act No. 112 of 1976: This Act provides for the establishment of an Estate Agency Affairs Board and an Estate Agents Fidelity Fund for the control of certain activities of estate agents in the public interest, and for incidental matters.

The Housing Act, Act No. 107 of 1997: Among other things, the Act provides for facilitating a sustainable housing development process. To create an enabling environment for this process, it lays down general principles applicable to housing development in all spheres of government in respect of housing development. It also provides for the financing of national housing programmes.

The Social Housing Act, Act No. 16 of 2008: This Act aims to establish and promote a sustainable social housing environment. Within this Act, the functions of the national, provincial and local spheres of government in respect of social housing are set out. It provides for the establishment of the Social Housing Regulatory Authority (SHRA) to regulate all social housing institutions obtaining or having obtained public funds, and it allows for the undertaking of approved projects by other delivery agents with the benefit of public money. The Act provides for the recognition and accreditation of social housing institutions. Provincial governments are given responsibilities to approve, allocate and administer capital

grants, as well as administer the social housing programme in their respective provinces. The role of local government is to ensure that there is access to land, municipal infrastructure and services for approved projects in designated restructuring.

APPENDIX B - MAP OF GAUTENG DEMARCATING THE CITY OF TSHWANE

Figure 27: Map of Gauteng demarcating the City of Tshwane (City of Tshwane, 2015)

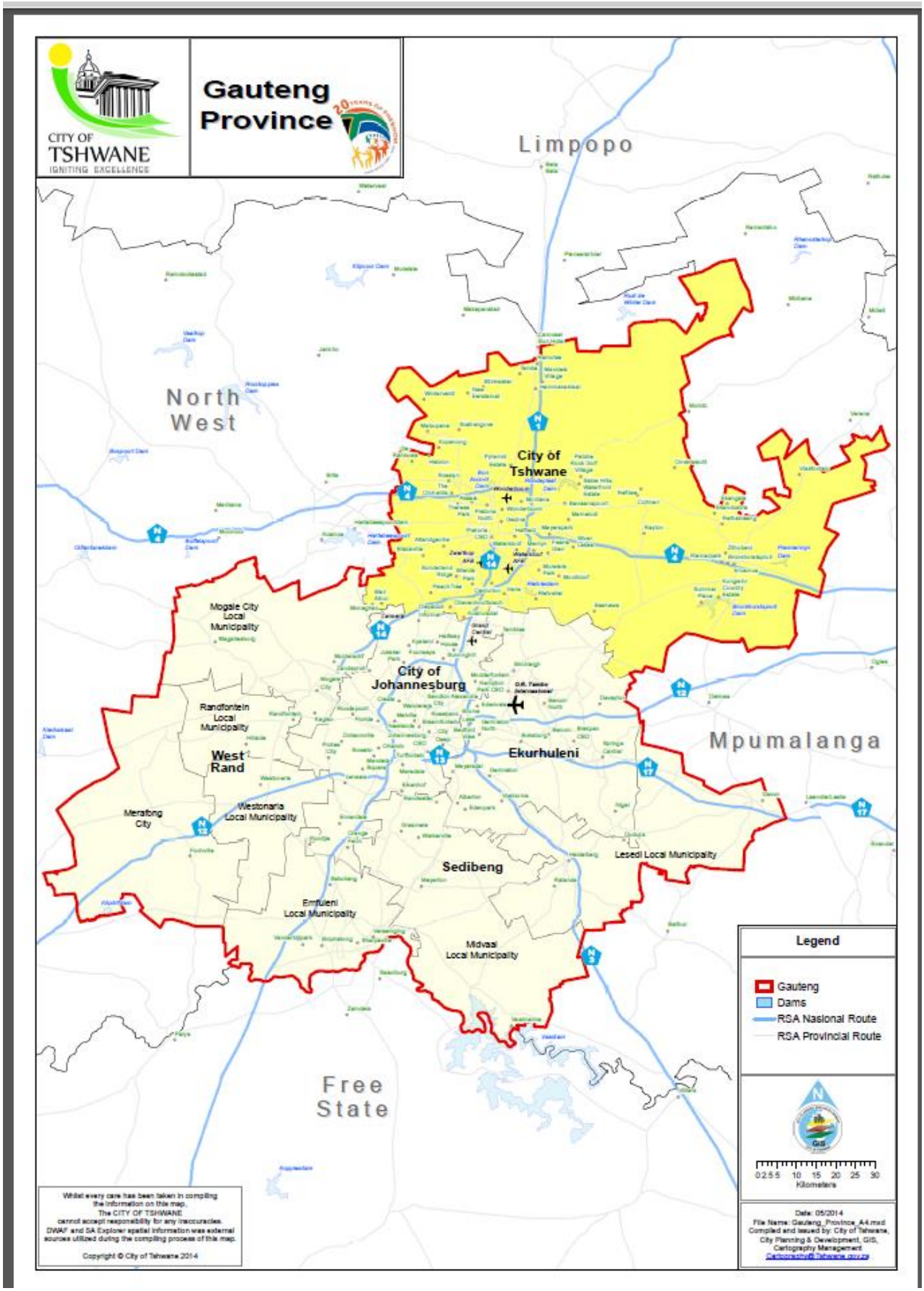

Figure 28: Map of Tshwane in the larger Gauteng region (City of Tshwane)

APPENDIX C - HOUSEHOLD TYPOLOGY STATISTICS

Type of dwelling	Thousands							
	Rented	Rented from other	Owned, but not yet paid off to bank /financial institution	Owned, but not yet paid off to private lender	Owned and fully paid off	Occupied rent-free	Other	Total
Dwelling/house or brick/concrete block structure on a separate stand or yard or on farm	929	92	1 005	165	6 135	1 004	82	**9 426**
Traditional dwelling/hut/structure made of traditional materials	51	*	3	12	977	122	8	**1 174**
Flat or apartment in a block of flats	453	95	37	6	49	45	*	**686**
Cluster house in complex	64	3	24	24	38	5	*	**160**
Town house (semi-detached house in complex)	129	3	32	9	41	*	*	**216**
Semi-detached house	40	12	29	6	88	27	*	**203**
Dwelling/house/flat/room in backyard	326	5	*	*	71	78	7	**488**
Informal dwelling/shack in backyard	463	*	*	4	92	116	25	**700**
Informal dwelling/shack not in backyard	200	*	*	5	803	330	17	**1 358**
Room/flatlet on a property or a larger dwelling servant quarters/granny flat	366	19	5	*	13	146	10	**562**
Caravan/tent	*	*	*	*	*	*	*	**6**
Other	20	6	*	*	9	87	4	**128**
Total	**3 043**	**240**	**1 141**	**233**	**8 317**	**1 962**	**155**	**15 107**

Table 20 South African Households by type of dwelling and by tenure status, (Statistics South Africa, 2014)

APPENDIX D- HUMAN SETTLEMENTS KEY FUNCTIONS, ROLES AND RESPONSIBILITIES OF THREE SPHERES OF GOVERNMENT

	National Government	Provincial Government	Local Government
Functions, Roles and Responsibilities	• Housing decisions are made within the Department of Human Settlements through the Minister of Human Settlements (Tokyo Sexwale). The housing budget is determined and provided by National Department of Treasury. • Establish and facilitate a sustainable national housing development process after consultation with every MEC and national organization representing municipalities • Formulating National policy, norms and standards – including the National Housing Code and its amendments over time • Assist provinces to develop the administrative capacity regarding housing development • Promote effective communication • Manage/ assist/ provide/ allocate/ facilitate finance / funding / subsidies for housing developments • Evaluate / monitor / assess housing goals and objectives / performance / delivery / quality • The Director-General must establish and maintain a national housing data bank – a national housing information system	• Includes the Provincial Human Settlements Departments, in this case: Department of Local Government and Housing for Gauteng. • Promote and facilitate the provision of adequate housing policy in its province within the framework of national housing policy • Formulate and facilitate Provincial housing policy and strategies • Co-ordinate housing development in the province • Support municipalities in the exercise of their powers and the performance of their duties in respect of housing development • Strengthen the capacity of municipalities • Administrating National Housing Programmes • GAP: No mention of a provincial SHS strategy or framework is required through the housing code.	• Includes: JOSHCO, City Department of Human Settlements, JDA, Land Use Management • City developed a Housing Sector Plan as part of Integrated Development Plan which amongst others commits to ascertainable delivery of SHS. • Achieved level 1&2 accreditation – advance the path of implementation of the USDG • Preparation of housing strategies and plans • Land identification • Project identification, planning and budgeting • Land use planning and development control • Township establishment • Township development • Management of housing construction • Waiting list administration • Sales administration and conveyancing • Building inspection and handovers • Administrating National Housing Programmes
	• The three spheres of government work together to plan and implement subsidised housing • Bus, rail and roads involve the three spheres of government. • The three spheres can provide land for development.		

Table 21 Human settlements key functions, roles and responsibilities, (COJ, 2012:89)

APPENDIX E- DELIVERY METHODS AND FUNDING MECHANISMS THAT ARE CURRENTLY AVAILABLE IN SOUTH AFRICA

No.	Formal Housing Delivery Method	Funding Mechanism	Tenure Options	Type of Response / Solution	Subsidy
Subsidised Income Group (R0 – R3500 – per household per month)					
1	"RDP" Housing Delivery - National	Subsidy provided by National government for the construction of housing units (top structure). The subsidy amount is dependent on the amount and quality of housing units to be built. The beneficiaries for each housing project are selected according to the National housing waiting list. Certain RDP projects may qualify for the **Urban Settlement Development Grant (USDG)** – developed as an instrument to address linkage between public housing and economic growth to simultaneously contribute to Human Settlements. It achieves this through: • land acquisition, • bulk infrstaructure provision; • informal setllement upgrades; • reticulation of services for integrated housing developments; • project packaging, and • better alignment of priority programmes in funding sources given to national, provincial and local government (subsidy is given directly to municipalities)	Full ownership	New house on owned stand	• Project linked
2	Gauteng Backyard Rental Programme	The Affordable Rental Accommodation Grant is given to qualifying landlords to repair and rebuild backyard accommodation	Rental	Informal and backyard solution	• Individual Subsidy
3	**Upgrading of Informal Settlements (UISP) - National** The Upgrading of Informal Settlements Programme (UISP) is a policy response to growth of informal settlements and supports the Presidency's Outcome 8, to upgrade 400,000 accommodation units within informal settlements. It seeks to improve the living conditions in informal	Municipalities will assume role of developer and will identify informal settlements to be upgraded and apply to the Provincial Housing Department for funding. Subsidies given to individuals. These projects may also qualify for the Urban Settlement Development Grant (USDG).	Full ownership		• Individual Subsidy • Project linked

Table 22 Summary of the various delivery methods and funding mechanisms (COJ 2012:90)

APPENDIX F- DELIVERY METHODS AND FUNDING MECHANISMS THAT ARE CURRENTLY AVAILABLE IN SOUTH AFRICA

No.	Formal Housing Delivery Method	Funding Mechanism	Tenure Options	Type of Response / Solution	Subsidy
	settlement by providing secure tenure and access to emergency and basic services				
4	**People's Housing Process – National** If individuals want to build homes themselves, this programme supports them to access various kinds of subsidies	A support organization must be established that then approaches the Provincial / Regional office to make a project application on behalf of applicants. Access is then provided to subsidies as well as other support measures.	Full ownership	New house on owned stand	• Consolidation • Project-linked • Institutional and • Rural subsidies
5	**Community Residential Units (CRU) – National** Development or refurbishment of public housing stock including hostels	CRU programme provides a subsidy for the total capital costs of project preparation and development of public property and a once-off maintenance grant after 5 years	Rental / sectional title / full ownership	Brownfields upgrading / Regeneration	• Consolidation • Project-linked
6	**Enhanced Extended Discount Benefit Scheme – National** This scheme promotes home ownership among tenants of publicly-owned rental housing (municipal and provincial)	Facilitated by Consolidation subsidy – transfer of long-term state funded housing. Purchasers can receive a discount on the selling price of the property.	Rent-to-buy		• Individual Subsidy
7	**Integrated Residential Development Programme (IRDP) – National** The IRDP enables the development of well-located, socially diverse projects that provide a mix of income groups and land uses.	**Urban Settlement Development Grant (USDG) –** developed as an instrument to address linkage between public housing and economic growth to simultaneously contribute to Human Settlements.	Rental / sectional title / full ownership	Greenfields / Brownfields upgrading / regeneration	• Project-linked
Gap Income Group R3,501 – R10,000 – per household per month)					
8	**Social Housing Institutions (SHIs) – National** Managed and implemented by institution which owns stock and is a legally constituted body. Social Housing is used locally to describe a very broad range of	Social Housing Restructuring Capital grant complemented by Institutional subsidies are available to qualifying housing institutions/Section 21 Companies. The subsidy is paid to approved institutions to provide subsidised housing on deed of sale, rental or rent-to-buy options, on condition that the beneficiaries may not be compelled to pay the full purchase price and to take transfer within the first four	Rental / sectional title / full ownership	Greenfields / Brownfields upgrading / regeneration	• Institutional

Table 23 Summary of the various delivery methods and funding mechanisms (COJ 2012:91)

APPENDIX G- DELIVERY METHODS AND FUNDING MECHANISMS THAT ARE CURRENTLY AVAILABLE IN SOUTH AFRICA

No.	Formal Housing Delivery Method	Funding Mechanism	Tenure Options	Type of Response / Solution	Subsidy
	The private sector is a major provider of rental housing stock, and plays a key role in urban regeneration. The formal private sector rental market operates primarily in the inner city and suburbs, producing mainly high-density accommodation.	R40,000 per month.	full ownership	regeneration	

Table 24 Summary of the various delivery methods and funding mechanisms (COJ 2012:92)