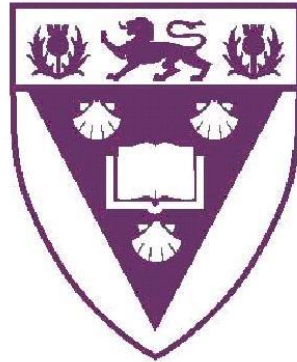


**An assessment of amount, distribution and use of urban green spaces in
small towns of the Eastern Cape**



Thesis submitted in fulfilment of the requirements for the degree of

MASTER OF SCIENCE

at

RHODES UNIVERSITY

by

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Table of Contents

Table of Contents.....	i
List of figures.....	iv
List of tables.....	v
Acknowledgments.....	vii
Dedication.....	1
Declaration.....	2
Abstract.....	3
CHAPTER 1: GENERAL INTRODUCTION.....	4
1.1 Introduction	4
1.2. Problem statement	6
1.3. Objectives and research questions	7
1.4. Structure of the thesis	8
CHAPTER 2: LITERATURE REVIEW	9
2.1. Introduction	9
2.2. Urbanisation.....	9
2.3. Significance and the meaning of urban green space	11
2.4. Classification of urban green spaces.....	12
2.5. Benefits of urban green spaces.....	16
2.5.1 Social benefits	17
2.5.2 Cultural benefits.....	17
2.5.3. Health benefits.....	18
2.5.4. Economic benefits.....	18
2.5.5. Environmental benefits.....	19
2.6. Disadvantages of urban green spaces	20
2.7. Challenges facing urban green spaces	21
2.8. Policies, enforcement and governance of urban green space.....	22
2.9. Urban planning in South Africa	23
CHAPTER 3: STUDY SITES AND RESEARCH METHODS.....	26
3.2. Background and geographical settings of the Eastern Cape	26
3.3. Climate and vegetation.....	28
3.4. Methodology.....	30
3.4.1. Research approach.....	30
3.4.2. Research design	31
3.4.3. GIS mapping	33

3.4.4. Households surveys	34
3.4.5. Focus group discussions.....	35
3.5. Ethical considerations	35
3.6. Data analysis	36
CHAPTER 4: A spatial analysis of urban green spaces in small towns of the Eastern Cape, South Africa	38
4.1. INTRODUCTION	38
4.2. METHODS.....	40
4.3. RESULTS.....	40
4.3.1.Types of green spaces	40
4.3.2. Distribution of green spaces in small towns	40
4.3.3. Distribution of urban green spaces within towns.....	45
4.3.4. Rate of change in green space area	48
4.3.5. Mapping accuracy	48
4.4. DISSCUSION.....	50
4.4.1. Classification of urban green spaces.....	50
4.4.2. Amount and distribution of green spaces.....	50
4.4.3. Rate of change	52
4.5. CONCLUSION.....	53
CHAPTER 5: Uses, benefits, preferences and perceptions of urban green spaces by residents in poorer suburbs.....	54
5.1. INTRODUCTION.....	54
5.2. METHODS.....	55
5.3. RESULTS.....	56
5.3.1.Profile of respondents	56
5.3.2. Use of urban green spaces.....	57
5.3.3. Access to urban green space.....	65
5.3.5. Benefits of urban green spaces.....	69
5.3.6. Respondent perceptions of green spaces.....	69
5.4. DISCUSSION.....	76
5.4.1. Perceptions of urban green spaces by urban residents.....	76
5.4.2. Use of and access to urban green spaces	77
5.5. CONCLUSION.....	79
CHAPTER 6: Synthesis, conclusions and recommendations	81
6.1. Introduction	81
6.2. Summary of the results and key research findings in relation to the objectives	82

6.2.1. To determine the location, amount and types of urban green spaces	82
6.2.2. To understand how urban green spaces are appreciated, preferred and used by urban residents.....	84
6.3. Conclusion.....	85
6.4. Limitations of the study	87
6.5. Policy implications and recommendation.....	88
References.....	89
Appendices.....	108

List of figures

Figure 2.1: A model of the benefits of urban green spaces

Figure 3.1: Location of the study towns

Figure 3.2: The biomes of the Eastern Cape

Figure 3.3: Summary of research design

Figure 3.4: GIS steps followed

Figure 4.1: Types of green spaces that can be found in small towns

Figure 4.2: Distribution of green spaces in slow growing towns

Figure 4.3: Distribution of green spaces in fast growing towns

Figure 5.1: Uses of green spaces at homes

Figure 5.2: Features that attract people to green spaces

Figure 5.3: Deterrents to use green space

Figure 5.4: Changes observed by respondents in green spaces overtime

List of tables

Table 2.1 Uses for urban green spaces through history

Table 2.2: Types of urban green spaces

Table 3.1: A comprehensive typology

Table 3.1: Population growth in study towns

Table 3.2: Summary of vegetation, attitudes, mean annual rainfall and temperature

Table 4.1: Types of green spaces identified in the study towns

Table 4.2: Percentage coverage of different green spaces in eight Eastern Cape small towns

Table 4.3: Green space per capita in eight small towns

Table 4.4: Proportion (%) of urban green space per suburb in slow growing towns

Table 4.5: Proportion (%) of urban green space per suburb in fast growing towns

Table 4.5: Rate of change in urban green space area in eight Eastern Cape small towns

Table 4.6: Ground-truthing accuracy assessment

Table 5.1: Demographic profile of respondents

Table 5.2: Respondents who have green spaces at home

Table 5.3: Green space usage

Table 5.4: Types of activities performed in different green spaces

Table 5.5: Exploring the use of green spaces between female and male respondents

Table 5.6: Green space usage by township and RDP residents

Table 5.7: Frequency of green space usage

Table 5.8: Visiting times of green spaces

Table 5.9: Company to types of green spaces

Table 5.10: Length of stay in the green space

Table 5.11: Estimated travel distance from home to different green spaces

Table 5.12: Means of access to different types of green spaces

Table 5.13: Choices of most desirable green spaces

Table 5.14: Benefits of green spaces

Table 5.15: Conceptualisation of green spaces

Table 5.16: Types of green spaces respondents considered to be green spaces within towns and RDP suburbs

Table 5.17: Respondents' perceptions of green spaces within their suburbs

Table 5.18 : Gender's perceptions of green spaces within their suburbs.

Table 5.19: Suggested improvements of green spaces

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Dedication

This thesis is dedicated to a lovely memory of two important people in my life who sadly did not live to see this work, my father Mr P.A. Radebe and brother V.Z. Radebe for their impact and influence in my life within a short time.

Declaration

I, Denis Siphosihle Radebe, hereby declare that the work described in this thesis was carried out in the Department of Environmental Science, Rhodes University under the supervision of Prof. Charlie Shackleton and Prof Michelle Cocks. The various components of the thesis comprise original work by the author and have not been submitted to any other university.

A handwritten signature in black ink, appearing to read 'D. Radebe', with a large, sweeping flourish extending to the right.

Denis Siphosihle Radebe

Date: 26/06/2018

Abstract

Most regions of the developing world are experiencing large-scale urbanisation, with urban population growth outstripping rural growth. This is most marked in small and medium-sized towns as opposed to megacities. Urbanisation is associated with numerous changes in social, economic and ecological states and dynamics. A key one, of interest in this study, is the sustainability and liveability of the growing towns and cities. The retention, provision and maintenance of multifunctional urban green infrastructure are a core strategy in this regard. This study therefore sought to assess the amount, distribution and use of urban green spaces within South Africa using small towns of the Eastern Cape. The primary research included sixteen aerial images of which eight were historical aerial photographs and another eight were the latest aerial images of the selected study towns. Historical and latest aerial images were digitised to classify the types and calculate the amount of urban green space. GIS mapping, interviews and focus group discussions were conducted with urban residents to understand how these green spaces are used. The analytical tools in this study derived from social science included household surveys of 180 randomly selected respondents in small towns. Fifteen types of green spaces were identified in the sample towns. The study further revealed that green spaces are not distributed equally in different suburbs of small towns, generally being less green spaces, especially formal parks and recreation areas, in poorer areas. The results indicated a decline of green spaces with urbanisation, and most marked in fast growing towns. The results suggested that urban residents frequently visited urban green spaces, with most respondents favouring the use of green spaces for social and cultural benefits. How use of different spaces was strongly gender related, with males favouring less developed green space types (such as commonages and woodlands) and females for formal areas such domestic and institutional gardens and churchyards. Respondents also identified various challenges associated with using and accessing urban green spaces, with pollution, crime and lack of maintenance in particular. The study shows the importance of GIS as a mapping tool that can be used to provide information for ecological planning in rapidly changing urban environment. The research process generated several lessons that need to be taken into consideration when designing urban landscapes, most importantly relating to the diversity, quantity, quality and maintenance of urban green spaces.

Keywords: GIS, small towns, urban green spaces and uses

CHAPTER 1: GENERAL INTRODUCTION

1.1 Introduction

Over the past three decades the world has experienced an urban revolution, with several reports noting that for the first time in human history the majority of the world's population live in urban areas (UN-Habitat, 2015). The level of urbanisation is expected to increase in all major areas of the developing world, with rates of urban growth being highest in Africa and Asia (United Nations, 2008). However, Potts (2009) argues that urbanisation rates are not so high in Africa as most scholars are claiming. Obeng-Odoom (2010) adds that rural development strategies and urban hash conditions will force rural residents to stay in rural areas. As urbanisation is an on-going process the need for urban green spaces is becoming important to support the quality of life for urban residents (Haaland and van der Bosch, 2015).

It is estimated that by 2050 approximately 1.2 billion people in Africa will be living in cities and towns (UN-Habitat, 2008). Approximately 62 % of the population in South Africa live in urban areas (Turok, 2012), and it is increasing. Although the more economically developed provinces and larger cities attract the most migrants from rural areas, poorer provinces, such as the Eastern Cape, and smaller towns are also experiencing urban growth (Todes et al, 2010). Statistics South Africa (2015) expected that approximately 189 975 people will come to the Eastern Cape between 2011 to 2016. This is because “In the new South Africa, people would choose not to be labour migrants but rather would migrate and settle permanently at the places where they work” (Posel, 2004:277). However, this surge in urbanisation after the demise of apartheid laws and restriction has posed challenges, with urban planners authorities being unable to keep up, consequently, in many towns and cities the legacy of the apartheid separations and underdevelopment are still evident today, and even reproduced (Geyer et al., 2012). For example, residential areas with high urban growth and low incomes usually have insufficient infrastructure, housing and urban green spaces (McConnachie and Shackleton, 2010). Obeng-Odoom (2010) mentioned that urbanisation might lead to ‘abnormal’ urbanisation trajectory. For example migration of farm workers might have a negative impact on food production (Obeng-Odoom, 2010).

Indeed, urban green spaces and other sustainability measures are amongst the last aspects to be considered by planners and authorities (Ruwanza and Shackleton, 2016). This perpetuates the frequent environmental injustices encountered during the apartheid era (Maas et al., 2006). Planners and local stakeholders need to understand and cater for long terms urban sustainability, which includes implementing urban green space projects that are shaped by the needs, concerns and desires of urban residents (Wolch et al., 2014). Internationally, green spaces are seen as important components of urban design because they contribute to urban health, and make the urban environment more pleasant and liveable to urban residents (Gairola and Noresh, 2010). It is now widely recognised that protection and management of urban green spaces is important for sustainable development and sustainability of urban areas (Cilliers et al, 2014).

The majority of the urbanisation and urban sustainability literature deals with large cities. This overlooks that numerically there are many more small towns than large cities and that the combined population of those living in all small towns can match or exceed that in the large cities (Freire et al., 2014). In South Africa, according to Department of Housing (1997) a small town can be defined as a town with a population of less than 100 000 people. However, different countries define small towns differently, for the example European Union (2011) defines a small town as one with a population between 10 000 and 50 000. In many countries scholars and policy-makers have neglected to address the problems that are facing small towns (Hoogendoorn and Visser, 2016), overlooking that small towns are also economic hubs at a finer scale and many play a crucial role in the agricultural, mining and tourism sectors (Baker and Cleason, 1990). Inadequate information about the dynamics and sustainability needs of small towns can lead to negative impact on the lives of the residents (White, 2004).

The complexity and constant changing of urban landscapes require detailed inventories that will provide a reliable data for planning and policy decisions (Antrop, 2004). Geographic information systems (GIS) are ideal for multi-disciplinary data sets and perform accurate analysis (Al-Ballaa et al., 2012). GIS can receive, store, manipulate and retrieve large data sets (Balram and Dragi'cevi', 2005). GIS is a computer-based system for the input, storage, analysis and display of spatial information (Steinberg and Steinberg, 2015). GIS has been used to answer different research questions pertaining to urban green spaces (Al-Ballaa et al., 2012). For example, McConnachie and Shackleton (2010) used GIS to determine the distribution of urban green spaces in small towns of the Eastern Cape, South Africa, whilst

Al-Ballaa et al. (2012) did the same in Al-Medinah, Saudi Arabia. Both studies showed that there were inequalities in the distribution of urban green spaces. In Montreal Island (Canada), Balram and Dragi'cevi' (2005) used GIS to understand attitudes of urban residents towards urban green spaces. They revealed that community members were interested in participating in policy development and plans for green spaces. It is further mentioned by Balram and Dragi'cevi' (2005) that GIS can provide up to date and correct information for environmental planning.

In this study GIS was used together with household surveys and focus group discussions to assess urban green spaces in small towns of the Eastern Cape. The study examined types of urban green spaces, the amount and changes in green spaces over time, the relationship between the distribution of urban green spaces and how urban residents use, benefit and appreciate urban green spaces in small towns of the Eastern Cape. There is considerable literature on the benefits of urban green spaces; however, very little is from small towns in the developing (Shackleton, 2006) and the knowledge on the distribution of these urban green spaces is limited (Roy et al., 2012).

1.2. Problem statement

International literature and developmental theory shows that small towns are generally ignored by development theorists and urban researchers (Donaldson and Marais, 2012, Turok 2012). This is further emphasised by White (2004) who state that what is missing in the discussion on small towns and rural urban linkages is solid empirical research on what is found and what is happening in small towns and developing countries. Some of the reasons for the lack of interest in small towns is because they are in rural areas and generally underdeveloped areas (UN-Habitat, 2008), and are deemed to play little role in national economies (White, 2004). The literature on urban planning has put more emphasis on urban migration and its consequences for large urban areas (UN-Habitat, 2008). This neglect of the nature, dynamics and challenges of small towns is likely to have negative impacts on the lives of the people living in small towns or in the immediate surrounding region (White, 2004). Additionally, given the legacy of apartheid in South Africa there are few studies that have been done in towns that were once reserved for black South Africans, i.e. in the former homelands (Hoogendoorn and Visser, 2015). This is true for urban studies generally, and in terms of the subject of this thesis, especially true regarding urban sustainability and the role

of urban greens spaces in such. In South Africa most studies focusing on urban green spaces have been in larger cities such as Cape Town, Johannesburg and Durban (Brown-Luthango et al., 2012; Pillay and Pahlad, 2014). Therefore, the study of urban green spaces in small towns is relevant.

Irrespective of town or city size, much emphasis regarding urban development in the developing world relates to the provision of basic services and infrastructure, namely housing, transport, energy and water provision, education and health services. This is typically done with little regard to the impacts that urban development might have on natural ecosystems (UN-Habitat, 2012; Ruwanza and Shackleton, 2016). The same applies in much of South Africa, as the growth in urban populations exacerbates pressure on resources and services, and in so doing creates pressures on land and natural ecosystems (Cilliers et al, 2012). Since it seems fairly clear there has been comparatively little research on green spaces in the small towns of many developing countries, it can be argued that the need to identify the range, diversity and basic attributes of their green spaces is even greater. There is a gap in understanding how urban green spaces are distributed and used in developing countries.

1.3. Objectives and research questions

With the context outlined above, and the more detailed literature in Chapter 2 this study explicitly sought to meet and answer the following objectives and questions regarding small towns in the Eastern Cape:

- (i) To determine the location, amount and types of urban green spaces.
 - (a) What types of urban green spaces are present?
 - (b) How are they distributed?
 - (c) Has the amount and composition of urban green spaces changed over time?
- (ii) To understand how urban green spaces are appreciated, valued and used by urban residents.
 - (a) How are the urban green spaces used?
 - (b) What benefits do the users derive from urban green spaces?
 - (c) What are the perceptions and preferences of urban residents towards urban green spaces?

1.4. Structure of the thesis

This thesis is divided into six chapters. The present chapter briefly outlines the importance of urban green space research, the problem statement and leads to the aims and objectives of the present study. Chapter 2 provides a review of the literature on urban green spaces, which includes urbanisation and sustainability of towns, urbanisation and planning in South Africa. It also considers the classification of urban green spaces, activities and reasons for visiting them, benefits obtained, disadvantages, challenges and governance of green spaces. Chapter 3 describes the study sites as well as the methodology and how data was gathered to address the key questions. Chapter 4 presents the spatial analysis of green spaces in the sample towns, while Chapter 5 describes and analyses the current use patterns of the different types of green spaces in the small towns. Chapter 6 provides a synthesis along with recommendations for future research and a general conclusion.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This chapter will consider the contribution of urban green spaces to urban sustainability and liveability, as well as the government policy interventions that have historically shaped the urban green spaces in South Africa. The literature review tackles several topics. The first is urbanisation, in terms of drivers, rates and consequences, globally and in South Africa. This is followed by a section defining green spaces and thematic areas of classification, and the benefits and challenges are discussed. Throughout there is an eye to policy and governance issues of green spaces that help in contextualising the study.

2.2. Urbanisation

Urbanisation is defined differently according to different disciplines. Gottdiener and Budd (2005) define urbanisation as the process that occurs when the number of people who are living in towns and cities increases leading to urban expansion. However, Parnell and Walawege (2014) define urbanisation as the process where there is a movement of people from rural to urban areas and people become concentrated in one area. From these definitions, it can be noted that urbanisation involves development, expansion and migration of people to towns and cities. Furthermore, it is predicted that the natural population growth within cities in Africa will exceed migration into towns and cities by 2050 (Parnell and Walawege, 2014).

Natural urban population growth and in-migration have been recognised as the primary drivers of urbanisation in Africa (Turok, 2010). In Africa, the natural population growth is particularly high as there is a high fertility rate compared to other continents (UN-Habitat, 2008). For example, in 2007 the fertility rate was 4.7% compared to a global average of 2.5 % (UN-Habitat, 2008). International migration is when people leave their country of origin to move to another country (Gottdiener and Budd, 2005). UN-Habitat (2008) reported that South Africa is experiencing high migration from African countries, Asia and India. Push factors such as land degradation, civil war and unemployment are the main drivers of international migration (Todes et al, 2010). Between 2000 and 2010 and annual net immigration of 247 000 was reported in South Africa (Statistics South Africa, 2015).

Todes et al (2010) state that in South Africa urbanisation was constrained by apartheid and capitalism policies. These policies were made to control movement of people from rural to urban areas, and the location and nature of urban spaces reserved for black South Africans (Tissington, 2010). The apartheid system separated South Africans according to race and social class. Apartheid spatial planning through the Group Areas Act was pronounced in this period and designated black, coloured and Indians to specific urban areas and rural homelands (Tissington, 2010). The Group Areas Act of 1950 can be linked with allocation/distribution of urban green spaces in urban planning. The repeal and breakdown of these policies in the early 1990s resulted in an influx of rural people moving to urban areas to look for job opportunities and better services and livelihoods (Todes et al., 2010). The expansion of towns and cities resulted in conversion of rural and peri-urban farm land to urban areas (Benton-Short and Short, 2008). In this period there were job opportunities in the mining sector and there was an expansion of industries in the coastal areas (Turok, 2010).

After the 1994 democratic elections, there was a movement of black South Africans to look for employment and a better quality of life in towns and cities (Todes et al., 2010). The new democratic government aimed to ensure that the standard of living for the previously marginalized was improved (Møller, 2007). The national government came up with a slogan which stated, “A better life for all” (South Africa, 1994). This aimed to narrow the gap that was formed by the apartheid government among the different race groups. This was reflected in quality of life studies, with township dwellers noticing real changes in their lives and their standard of living after 1995 (Møller, 1998). They could afford more material goods, they were provided with better schools and other basic needs.

The management or guiding of urbanisation benefits from proper urban planning (Turok, 2012). Urban planning is a framework and approach that is designed to allocate and help city planners and developers to use land sustainably and involve stakeholders in planning (UN-Habitat, 2013). Rydin (2010) suggests that sustainable development needs to be integrated into urban planning. Urban planning also looks at improving infrastructure and quality of life in cities and towns (Short and Short, 2008). Gottdiener and Budd (2005) used the term sustainable urbanisation to emphasise that urban planning needs to look at social, economic and environmental aspects so that the current and future generation can benefit. Urban planning, urban regulations and urban financial strategies are important for sustainable urbanisation (UN-Habitat, 2015).

The UN-Habitat (2009) argues that climate change, food insecurity, resource depletion and economic instability will increasingly affect towns and cities in developed and developing countries, and it will be more noticeable in areas with limited planning and policies to support sustainable cities. The natural disasters such as tropical cyclones, sea level rise, droughts and flooding will affect urban areas, especially informal settlements (UN-Habitat, 2015). For example, in 2011 most urban areas in Ibadan (Nigeria) were affected by the floods and more than 100 families were homeless (Agbonkhese, 2014). The increase in environmental problems of urban areas has forced governments to include sustainability in planning approaches (UN-Habitat, 2008). Urban sustainability refers to an urban area that meets the needs of urban residents without destroying natural resources so that the next generation will benefit (Benton-Short and Short, 2008). The main purpose of sustainability is to decrease ecological footprints and improve the quality of life in urban areas (UN-Habitat, 2009). This goes hand in hand with urban resilience, which deals with adaptability to shocks and challenges, and prevents any increase in the vulnerability of urban residents resulting from any shocks. Urban green infrastructure is seen as a crucial, and often more cost-effective, means of promoting resilience (Hansen and Pauleit, 2014; Shackleton et al. 2018), and urban green spaces are a core component of urban green infrastructure (Tzoulas et al., 2007).

Urban ecosystem services need to be seen as the part of urban sustainability (Benton-Short and Short, 2008), along social justice, political participation and ecological regeneration (UN-Habitat, 2015). Parnell and Walawege (2014) point out that weak management of cities and towns will have negative impacts in the environment and the supply of urban ecosystem services. UN-Habitat (2015) suggests that Local Agenda 21, smart growth and environmental justice need to be considered in sustainable cities and towns. UN-Habitat (2009) emphasise that there is a need to balance the brown and green agendas in urban areas.

2.3. Significance and the meaning of urban green space

Mensah (2014a) defined urban green space as the area that is covered by natural or human made vegetation in an urban area, which for some commentators is analogous to urban green infrastructure (Tzoulas et al., 2007). Parks, reserves, sport fields, river banks, trails, street trees, greenways, nature conservation areas, streams and green walls are the examples of urban green spaces (Wolch et al., 2014). The World Planners Congress and UN-Habitat

forum that took place in June 2006 in Vancouver played a major role in thinking about the future of towns and cities, especially in developing countries (Watson, 2009). The importance of incorporating urban green spaces in urban planning has been emphasised by planning concepts such as garden cities, green belts, green fingers, and greenways (Mensah, 2014a). Today urban green spaces are recognised as common features of urban ecosystems (Gairola and Noresah, 2010). Scholars have argued that the integration of urban green spaces into urban landscapes can play a major role in urban sustainability, because urban residents can obtain various benefits (Gairola and Noresah, 2010) and improve living conditions (Mensah, 2014a). This relationship is optimised when urban green spaces distribution and nature are designed to meet the needs of local residents and users (Jim, 2006). This is particularly important as the underlying needs and motivations for urban green evolve through time (Table 2.1). Additionally, these needs may be spatially variable, with different needs in different parts of the cities as expressed through resident desires.

Table 2.1 Uses for urban greenspaces through history (van Leeuwen et al, 2010: 21)

Time	Uses for urban green spaces
600 BC	Private power and social status
1300 AD	Innovative agriculture
1700 AD	Collective gardens for knowledge
1900 AD	Food production
2000 AD	Leisure and recreation
2010 AD	Health and ecology

2.4. Classification of urban green spaces

The classification systems of urban green spaces have become increasingly important when evaluating and managing urban green space systems (van Leeuwen et al., 2010). A classification of urban green spaces helps urban planners and policy makers to understand

and recognise various services and functions that different green spaces provide (Rakhshandehroo and Yusof, 2014), emphasising the their multi functionality, which is a cornerstone of the urban green infrastructure concept (Hansen and Pauleit, 2014). Different factors such as location, usage, size, and composition of biodiversity, historical origin, intended functions and other characteristics play a major role in classification of urban green spaces (van Leeuwen et al, 2010). Rakhshandehroo and Yusof (2014) point out that benefit derived from ecosystem services need to be represented in an effective typology. Swanwick et al. (2003) proposed a classification of the different green spaces that may be found in an urban area (Table 2.2). Different types of urban green spaces fulfil different functions of urban resident's needs. As noted by Swanwick et al. (2003) that an urban area with various green spaces indicates healthy environments for residents and wildlife.

Table 2.2: Types of urban green spaces (Source: Swanwick et al., 2003).

Types of green spaces			
All green spaces	Amenity green spaces	Recreation	Parks and gardens
			Recreational areas
			Sport areas
		Incidental	Housing green spaces
			Other incidental green spaces
		Private	Domestic and Private gardens
	Functional green spaces	Productive	Urban farmland
			Allotments (Vegetable gardens)
		Burial grounds	Cemeteries
			Church grounds
		Institutional	School ground
			Other institutional ground
	Semi-natural green spaces	Wetland	Open/ running water
			Marsh, peatland
		Woodland	Deciduous woodland
			Coniferous woodland
			Mixed woodland
		Other habitats	Moor/heath
			Grassland
			Disturbed (transformed) landscape
	Linear green spaces	River and canals	
		Green corridors (hiking trails and paths)	
		Other linear features (for example cliffs)	

Bell et al (2007) expanded the typology with nine types of green spaces in the United Kingdom. This classification was developed with the need of community (Table 2.3)

Table 1.3: A comprehensive typology that was developed in the United Kingdom to classify urban green spaces (Source: Bell et al., 2007)

Primary search level	Secondary search level
Parks and gardens	All parks and gardens: urban parks and gardens, private gardens, country parks
Natural and semi-natural spaces	All natural and semi-natural spaces: water and wetlands, woodland, remnant, vacant land and green belts and wedges post-industrial land
Green corridors	All green corridors: tree belts and woodland, linear green spaces, canal and riverbanks, disused railways
Outdoor sports facilities	All outdoor sports facilities: school playing fields, other playing fields and pitches, other sports
Amenity green spaces	All amenity green spaces: housing green space, informal recreation areas, other amenity green space
Provision for children and young people	All provision for children and young people; children's play facilities for special activities such as skateboarding, facilities for young people
Allotments, community gardens and urban farms	All allotments, community gardens and urban farms: allotments, community gardens, city farms, urban agriculture
Cemeteries, disused churchyards and other burial grounds	All cemeteries, disused churchyards and other burial grounds

Public space	All public space: streets, residential roads, civic squares, seafronts and promenades, market places, shopping precincts, settings for public heritage buildings, other hard surfaced places
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2.5. Benefits of urban green spaces

Different scholars have shown that urban green spaces provide many benefits to human well-being. For example, Wolf (2004) mentions that understandings of urban green space benefits need to include social, economic and environmental benefits. Schipperijn (2010) used a model to categorise the benefits of urban green spaces (Figure 2.1). The bottom section of the model indicates the elements that affect the use of urban green spaces and user (individual elements such as gender, age and preferences) while urban green space characteristics relate at features such as size and distance to urban green space. The middle section of the model indicates what can be found in the urban green spaces (UGS) and different activities that can take place. The top section of the model indicates different benefits that urban green spaces provide.

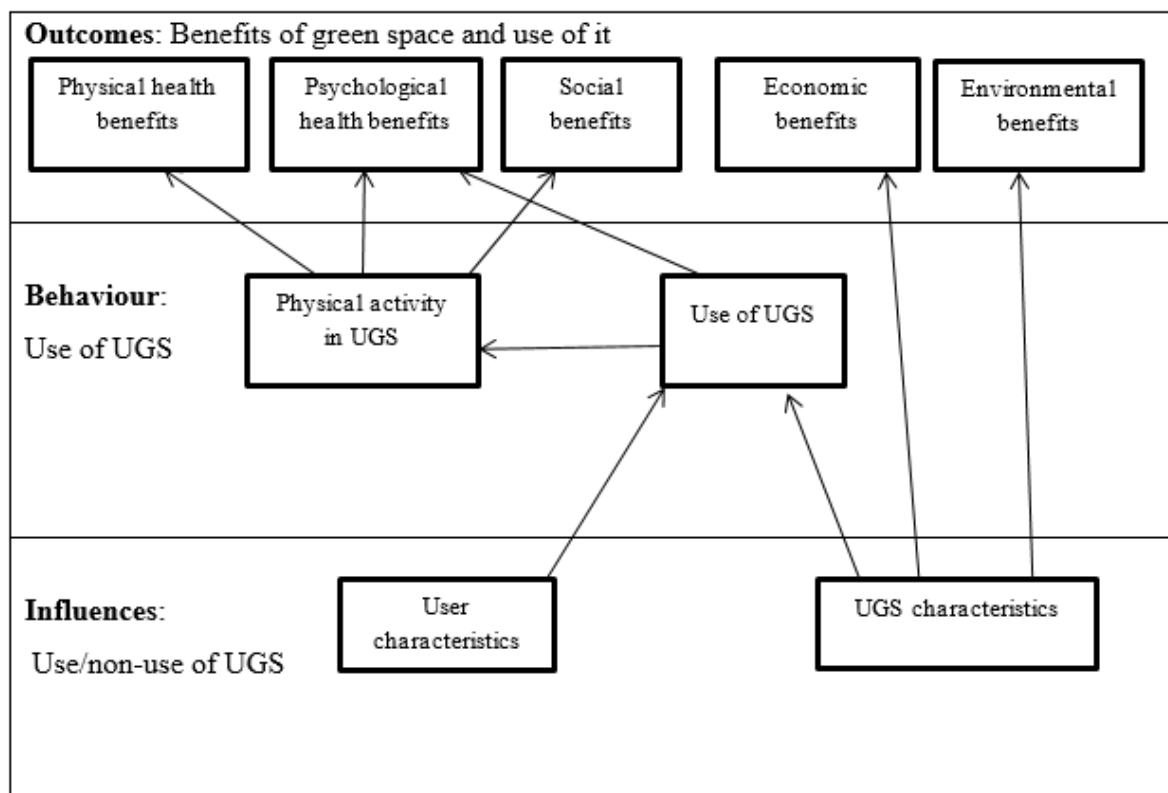


Figure 2.1: A model for the benefits of urban green space. Source: Schipperijn (2010).

2.5.1 Social benefits

Social benefits are the intangible and tangible benefits that humans obtain from contact with nature (Comber et al., 2008). Urban green spaces can promote social cohesion (Wolch, 2014), for instance, research carried out in five urban parks in The Netherlands revealed that people use urban green spaces for social interactions (Peter et al., 2010). Urban residents use urban green spaces for recreational purposes; for example, Haq (2011) revealed that 97% of urban residents in Helsinki were using urban green spaces for recreational activities in Finland. Cocks et al. (2012) revealed that Xhosa women go in groups to collect firewood in urban green spaces such as commonages and they use it as a chance to talk to each other. It is further mentioned by Roy et al. (2012) that urban green spaces can be used to teach children about nature and urban residents view trees for learning and child's play (Shackleton et al., 2015). Okunlola (2013) argues that informal education (family visits to urban green spaces) and formal education (school fieldtrips) are common in urban green spaces. In South Africa botanical gardens are used for educational purposes such as greening of school projects (Ward et al., 2010). Urban green spaces make the environment to be attractive which increases satisfaction and work performance (Sanesi and Chiarello, 2006).

2.5.2 Cultural benefits

Urban green spaces also represent important places for certain cultural and religious practices (Ormsby and Bhagwat, 2010). In the Western Ghats region, southern India, sacred urban forests are used for ceremonies and religious practices (Ormsby and Bhagwat, 2010). In South Africa, many amaXhosa believe that certain animals convey messages from the ancestors and some of these animals can be found in urban green spaces areas (Cocks et al., 2012). Medicinal plants that are used during rituals can be found in urban green space (Cocks et al., 2012). During traditional ceremonies firewood can be collected from urban green spaces and used for cooking (Cocks et al., 2012); for example, wood from *Ptaeroxylon obliquum* and *Olea europaea* subsp. *africana* are used as plates for sacrificed animal carcasses during traditional ceremonies in the Eastern Cape (Cocks and Wiersum, 2003). Tyrväinen et al. (2005) mentioned that trees in the urban green spaces have cultural meanings to individuals and communities. For instance, in Tzaneen (South Africa) trees are preserved for cultural heritage (Shackleton et al., 2015).

2.5.3. Health benefits

Health is another important component of peoples' quality of life (QOL) in many countries (Lora, 2008). Urban green spaces provide health benefits (Wolch, 2014). For example, Nufu (1999) in Tyrväinen et al. (2005) noted that sitting under a tree can reduce ultraviolet light which helps to reduce skin cancer. According to the Institute of Public Health (2006) urban residents who do not have access to urban green spaces have a higher risk of obesity and chronic diseases. Maas et al. (2006) showed that 90% of urban residents living near urban green spaces in The Netherlands were healthy and 84.5% of urban residents who were living far from urban green spaces were unhealthy. These results corroborate Tyrväinen et al. (2005) who revealed that many people use urban green spaces to exercise. Hospital patients who have window views of urban green space recover faster and use less medication than those who have windows overlooking buildings (Wolf, 2004). Kuo and Taylor (2004) showed that urban green space can reduce Attention-deficit/hyperactivity disorder (ADHD). The symptoms of ADHD were reduced in children exposed to nature while children who remained indoors ADHD symptoms remained constant (Kuo and Tylor, 2004). It is frequently argued that people need nature to meet emotional, spiritual and psychological needs (Roy et al., 2012). In addition, medicinal plants that are obtained from urban green spaces can be used for livestock treatment and self-medication (Cocks and Wiersum, 2003).

2.5.4. Economic benefits

The economic benefits of urban green spaces include tangible and intangible benefits (Tyrväinen et al., 2005). Urban green spaces can attract tourists to visit and increase the economy of surrounding areas (Roy et al., 2012). For instance, Nicolae Romanescue Park in Romania is an example of a tourism destination (Cianga, 2013). Tourists can come for historic and aesthetic visits (Cianga, 2013). In West Africa raw materials can be collected by local people to make handcrafts and some of handcrafts are sold in tourism destinations (Mpofu, 2013). Firewood and wild fruits may be collected and sold to other areas (Shackleton et al., 2015). For example, in the poorer suburbs of South African towns the collection and use of wood and fruits from urban greens spaces saves household considerable sums of money (Kaoma and Shackleton, 2014).

The findings of Tyrväinen et al. (2005) about urban residents who used urban green spaces for exercise can be linked with the findings of Wolf (2004) who mentioned that people who exercise usually spend less money on medical expenses. The presence of urban green spaces can reduce pollutants that enter rivers, streams and coastal waters and therefore decrease the costs of water purification (Duncan, 2012). Heinze (2011) revealed that approximately \$22 million per year would be spent on medical expenses, sick leave and investigation of the contamination if urban green spaces do not exist. Haq (2011) revealed that in Chicago the total energy for heating and cooling was reduced by 5-10% in the city by urban green spaces. Property values near urban green spaces are frequently higher than properties further away, which results in higher levies and taxes paid to urban authorities (Haq, 2011). In Guangzhou (China) investors and residents were most interested in buying houses that have a view of urban green space (Jim et al., 2006).

2.5.5. Environmental benefits

Environmental benefits are the ecological services provided by urban green spaces to urban residents (Wolf, 2004). For example, most towns and cities are characterised by environmental pollution (Fuwape and Onyekwelu, 2011). Vegetation in the urban green space can improve air quality by absorbing pollutants and carbon dioxide and releasing oxygen (Mpofu, 2013). Heinze (2011) noted that in the United States oxygen produced by an 18-hole golf course can support 4 000-7 000 people. Trees can reduce air pollution by absorbing dangerous pollutants through their stomata (Tyrväinen et al., 2005). According to Heinze (2011) approximately 12 million tons of dust, soil and particulate matter can be trapped and purified annually in a well maintained green space. Urban green spaces play a crucial role in water purification by trapping and removing pollutants (Heinze, 2011). Vegetation roots and soil microbes capture and breakdown pollutants (Heinze, 2011).

Urban green spaces have the potential to mitigate urban floods by balancing water flow (Demuzere et al., 2014). For example, well-drained urban green spaces allow water to infiltrate into the soil and reduce the speed of water run-off (Mpofu, 2013). In Beijing (China), Zhang et al. (2012) used rainwater runoff coefficients and economic evaluation methods to assess the role of urban green spaces in reducing rainwater runoff. They found that urban green spaces can store 154 million cubic metres and 2 494 cubic metres of runoff was reduced per hectare of green space. Heinze (2011) mentions that urban green spaces play

a major role in protecting and stabilizing soil against water and wind erosion. The presence of forest cover on a steep slope in West Africa prevented development of gully erosion (Fuwape and Onyekwelu, 2011). Such protection is especially important in risk prone areas characterised by steep slopes and shallow soils, as the vegetation reduces the threat of mudslides which could impact local houses and significant financial losses (Dalu et al., 2018). In addition, urban green spaces are habitat for animals such as birds, bats, rodents, lizards, amphibians and invertebrates (Roy et al., 2012).

Urban green spaces can reduce the heat of urban areas and give shade to urban residents (Demuzere et al., 2014). Vegetation reduces temperatures by the process of transpiration and the moister soils under the canopy of trees (Tyrväinen et al., 2005). Tzaneen and Bela urban residents who were living in RDP houses and informal settlements mentioned that trees reduced temperature by providing shade (Shackleton et al., 2015). In Bulawayo, Zimbabwe, Ngulani (2017) found that the midday temperatures in green spaces were up to 6.1 °C cooler than surrounding built up area, and that the cooling effects extended up to 1.7 km beyond the green space. Greens spaces and vegetated linear features serve as a wind break and noise buffer (Mullaney et al., 2015).

2.6. Disadvantages of urban green spaces

Although there is considerable literature on the benefits of urban green spaces in breaking down social barriers, there is also some that indicates that urban green spaces can act as a boundary by separating neighbours from each other (Roy et al., 2012). Additionally perceptions of higher crime rates in densely vegetated area is a pervasive fear throughout the world (Roy et al., 2012), even if empirical studies show that green spaces and vegetation are not riskier areas than built up areas of cities, and some suggests they are safer area (Bogar and Beyer, 2015). In Tzaneen and Bela Bela in Limpopo Province participants felt that urban green spaces are not safe (Shackleton et al., 2015). Mpofu (2013) adds that drug dealers and other crimes may take place in these green areas, especially those which are not well maintained. Another disadvantage of green spaces is that some trees are associated with diseases and allergies, which cause discomfort to some urban residents and may result in costs for such individuals to get treatment (Roy et al., 2012). For instance, people with allergies can be affected with wind pollinated plants (Lyytimäki and Sipilä, 2009). One of the most common concerns with green spaces and trees in urban environments is the leaves and

other debris that fall on or are blown into streets and then into runoff gutters where they may accumulate and cause blockages leading to flooding during heavy rains (Keatomh, 2014). Thus, city authorities must pay for the regular clearance of such debris. Larger debris may cause damage to vehicles or infrastructure when it falls. Intact vegetation may also be a problem when it blocks signs or interferes with overhead or underground wires and pipelines

2.7. Challenges facing urban green spaces

Management and conservation of urban green spaces face major challenges (Mensah, 2014). As mentioned above, rapid urbanisation is one of the major threats to urban green spaces (Cobbinnah and Darkwah, 2016), as existing green spaces are taken over to provide housing and other developments. This may be through formal rezoning by urban authorities, or it might be through development of informal housing and shelters in vacant areas by new urban migrants. For instance, people may build in sensitive areas such as riversides, swamps, steep mountains and other sensitive areas (Cobbinnah and Darkwah, 2016). Mpofu (2013) noted that rapid urbanisation in Addis-Ababa (Ethiopia) depleted urban green spaces.

In many areas green spaces and urban trees have not been prioritised in the development plans, budgets and programs of towns and cities (Mensah, 2014, Chishaleshale et al., 2015). For example, in many developing countries there is lack of political will, skilled employees and funding which limit the development and maintenance of urban green spaces (Mpofu, 2013; Chishaleshale et al., 2015). Gwedla and Shackleton (2015) mention that some municipalities, especially in small towns, do not have enough funds for maintenance. For example, in the 2012 financial year one Eastern Cape municipality allocated only R21 000 to parks, green spaces and cemetery department (Gwedla and Shackleton, 2015). Gwedla and Shackleton (2015) revealed that some of municipal officials do not have the necessary qualifications and experience to allow them to perform their duties (Gwedla and Shackleton, 2015) with respect to green space planning and maintenance.

Urban poverty can be a major challenge to urban green spaces in some regions, especially in Africa (Mensah, 2014). Poor urban residents may target green spaces for building houses and to collect firewood and edible species from urban green spaces and also medical plants for selling (Mensah, 2014). In themselves these activities may not necessarily be detrimental to

green space integrity and function, but if the number of people seeking such provisioning uses is high relative to the area of green spaces available, then the structure and integrity may be vastly altered and comprise other benefits such as biodiversity and recreational uses. Often linked to poverty is the issue of urban green spaces may not be accessible to all residents as there are frequently inequalities (Kuta et al., 2014). As the unemployed and the poor usually have time but lack the financial means to access these facilities as compared to the those that are financially rich but do not have the time to access these facilities (Lloyd and Auld, 2003). As an extreme, civil strife is another problem that may affect greens spaces in some regions (Mensah, 2014a). For example, the civil war that took place in 1988-1990 and civil strife (1994-1997) destroyed urban green spaces in Somalia (Candle for Health, Education and Environment, 2006).

2.8. Policies, enforcement and governance of urban green space

In most societies social ills are addressed by legislation, this being a plethora of documents ranging from policies and bills to acts. With regards to the present study, it is important to highlight some of the relevant environmental legislation and policies that influence urban green space provision and planning in South Africa. Section 24 of the Constitution (No. 108 of 1996) advocates for human rights and section 25 for the protection of the environment in which residents of South Africa live and their responsibility to conserve it as it directly and indirectly affects human well-being (South Africa, 1996). Although historically neglected, there is a growing collection of regulations, policies and other legislation which are a guideline for the sustainable use of environmental resources and sustainable environmental management, capturing all areas of significance in the environment- particularly those pertaining to resources vital for human life (DEAT, 2006; Ruwanza and Shackleton, 2016). Institutions such as local government, private sector, sport, health and education play a major role in shaping urban green space policies and practices. The South African Constitution, the National Environmental Management Act (NEMA), the Environment Conservation Act (ECA) and the Integrated Development Planning processes play a major role in governing urban green spaces.

The South African Constitution (No. 108 of 1996) serves as the primary legislation informing the legal framework, section 24 stipulates that all citizens have a right to an environment that

will pose no harm to their health and welfare. Another important piece of legislation is the National Environmental Management Act (NEMA) (No. 107 Of 1998) (South Africa, 1996). NEMA was implemented in 1998 to support and ensure that environment is incorporated. Additional policies and legislations are enacted at the provincial and local levels (Chishaleshale 2013). However, there is very varied knowledge about and implementation of the relevant legislation, policies and bylaws by local municipal officials (Chishaleshale et al., 2015; Gwedla and Shackleton, 2015).

2.9. Urban planning in South Africa

Todes et al. (2014) commented that the increase in urbanisation has placed pressure on urban planners and developers to find solutions to reduce in the attendant challenges of poverty, social segregation, unemployment, insufficient shelter and pollution (Fuwape and Onyekwelu, 2011). UN-Habitat (2008) noted that in Africa between 1990 and 2000 informal settlements increased by 4.5%, and that poverty and environmental degradation are more prevalent in low income residential areas (UN-Habitat, 2009), in contrast to high income residential areas (Benton-Short and Short, 2008). The rate of population growth in urban areas in many regions has exceeded the ability to create jobs (UN-Habitat, 2015) and pollution can be seen as a significant challenge in low income urban areas because many are often close to industries (UN-Habitat, 2009).

The new democratically elected South African government has promised a better life for all after the 1994 political transition (Møller, 2007). The new government devised policies and strategies to ensure that all South Africans have more opportunities and to close the economic gap among different race groups by empowering them and improving the delivery of basic services to all (Tissington, 2010). The African National Congress government introduced the Reconstruction and Development Programme (RDP) (Huchzermeyer, 2001). The aim of the RDP was to address the social injustices of the apartheid era (Tissington, 2010). Huchzermeyer (2001) highlights that the RDP emphasises that housing is a human right for everyone, especially poor communities. The housing policy was supported by the South African constitution which highlights that every citizen has the right to live in a place that is safe and decent (Huchzermeyer, 2001; Tissington, 2010). Almost two million of South Africans were supplied with electricity in the first decade, and three and a half million were supplied with water (Møller, 2001). Yet, the rapid growth of urban centres has challenged

the South African government to build more houses and associated infrastructure, but progress has been constrained by a lack of funds (Turok, 2010).

In addressing the injustice of apartheid planning, South Africa's democratic government devised policies to promote development of urban areas (Tissington, 2016). Nel (2016) mentions that these policies include the development facilitation act (63 of 1997) and the urban development framework and the current planning act known as the spatial planning and land use management act (SPLUMA, 16 of 2013). Nel (2016) points out that community participation, equity and sustainable development are the main pillars of SPLUMA (Nel, 2016). The SPLUMA works together with municipal bylaws and provincial legalisations (Department of Rural Development and Land Reform, 2012). The SPLUMA is given effect through the Integrated Development Planning processes which each local municipality must conduct every five years and which are founded on community consultation and participation (Atkinson, 2002; Todes, 2004). This also includes public approval of spatial planning, which includes green spaces.

Spatial planning, land use management and policy can be combined in the spatial planning system in government (Nel, 2016). However, many municipalities still rely on using bylaws because they strongly believe that they are suitable for their municipalities (Department of Rural Development and Land Reform, 2013). Nel (2016) mentions that SPLUMA tries to address spatial inequalities by including low income residential areas. However, it is difficult to use land in informal settlements because in most cases land ownership of these areas is not clear or registered (Department of Rural Development and Land Reform, 2013).

In addition, urban planning depends on land use (Department of Rural Development and Land Reform, 2012). Land use can be defined as the land cover (mountains, vegetation, forestry, and rivers) changes resulting from human activities (Kumar, 2009). Land cover changes play a major role in how ecosystem goods and services are generated and used (Leper et al., 2005). Land use patterns can be seen as an indicator of how humans associate and use natural resources in particular areas and can indicate the likely state of the area for future developments (Benton-Short and Short 2008; Kumar, 2009). Booth (2009) adds that changes in natural land cover to built environments can affect services that are provided by urban ecosystems and green infrastructure. Human population growth is the main driver of land use change in urban areas (Booth, 2009), and much land use change contributes to

climate change, biodiversity loss and sedimentation water of bodies. These environmental issues can have negative impacts on human well-being in urban areas (Kumar, 2009).

Not only are SPLUMA and land use important to urban planning but also cultural needs should be considered (Sirayi, 2008). Cultural planning can be described as the planning that looks at history, sense of place, community relationships, identity and common memories (Saco et al., 2009). Cultural planning can play a major role in community development and form a positive relationship between developers and communities (La Rosa et al., 2009). Sirayi (2008) states that cultural planning helps municipalities to address racism, social exclusion, xenophobia and cultural identity

CHAPTER 3: STUDY SITES AND RESEARCH METHODS

3.1. Introduction

In this chapter the study sites and research methodology that were employed to execute the research are described. Different methods are separated into themes to help address the research objectives. The chapter is divided into five sections namely study sites, research approach, research design, ethical considerations and data analysis.

3.2. Background and geographical settings of the Eastern Cape

The study towns are all located in the Eastern Cape province of South Africa. It shares borders with KwaZulu-Natal, Free-State, Western Cape, Northern Cape, Lesotho and the Indian Ocean (Department of Economic Affairs, Environment and Tourism, 2004). It is the second largest province in South Africa with an area of 169 580 km², representing 13.8% of South Africa's total land area (Department of Economic Affairs, Environment and Tourism, 2004).

The population of the Eastern Cape is approximately 6.9 million, representing 14 % of the total South African population, making the region the third most populous province in South Africa (Statistics South Africa, 2016). According to Census 2011 approximately 40% of the population live in urban areas (Statistics South Africa, 2011). The Census 2011 data reported dominant population groups in the region as black Africans (86.3%), Coloureds (8.3%), Whites (4.7%) and Indians/Asians (0.4%) and other 0.3% (Statistics South Africa, 2011). The Eastern Cape is dominated by Xhosa speaking people (Eastern Cape provincial government, 2012). Statistics South Africa (2016) reported that the number of households in the Eastern Cape have increased from 1.3 million in 1996 to 1.8 million in 2015 of which about 386 802 are low cost government subsidised houses, locally known as RDP houses, after the Reconstruction and Development Programme which saw the building of millions of low costs homes nationwide.

The province remains one of the poorest provinces in South Africa (Statistics South Africa, 2016). Based on the Census 2011 the poverty percentage was 60.8%. (Statistics South Africa, 2011). The main sources of income are crop production, livestock, agro-industries, migrant labour and eco-tourism (Department of Economic Affairs, Environment and Tourism, 2004).

In addition, social grants received by the elderly, retired civil servants, disabled and children play a major role in supporting people (Department of Economic Affairs, Environment and Tourism, 2004). Eight study towns were selected, four towns with a relatively rapid population growth rate over the last decade, namely Alexandria, King Williams towns, Queenstown and Paterson, and four towns with a relatively low annual growth rate, i.e. Adelaide, Bedford, Stutterheim and Cathcart. Due to time constraints, King Williams town, Stutterheim and Queenstown were selected to unpack social perspectives of the study. The selection of these study towns was based on the population growth and annual percentage growth rates. For further details, refer to Table 3.1 and Figure 3.1 that shows the location of selected study towns.

Table 2.1: Population growth in study towns (source: City Populations Database, 2016).

Town	District Municipality	Local Municipality	Census 2001	Census 2011	Population Growth change	Annual Growth Rate (%)
Adelaide	Amathole	Nxuba	12 052	12 191	139	0.10
Alexandria	Sarah Baartman	Ndlambe	7 715	10 086	2 371	3.07
Bedford	Amathole	Nxuba	8 575	8 769	194	0.22
Cathcart	Amathole	Amahlathi	6 867	7 360	493	0.71
King Williams town	Buffalo city metropolitan		63 774	77 682	13 908	2.18
Paterson	Sarah Baartman	Sunday river valley	4 404	5 582	1 178	2.67
Queenstown	Chris Hani	Lukhanji	84 092	98 988	14 896	1.77
Stutterheim	Amathole	Amahlathi	22 589	24 672	2 083	0.92

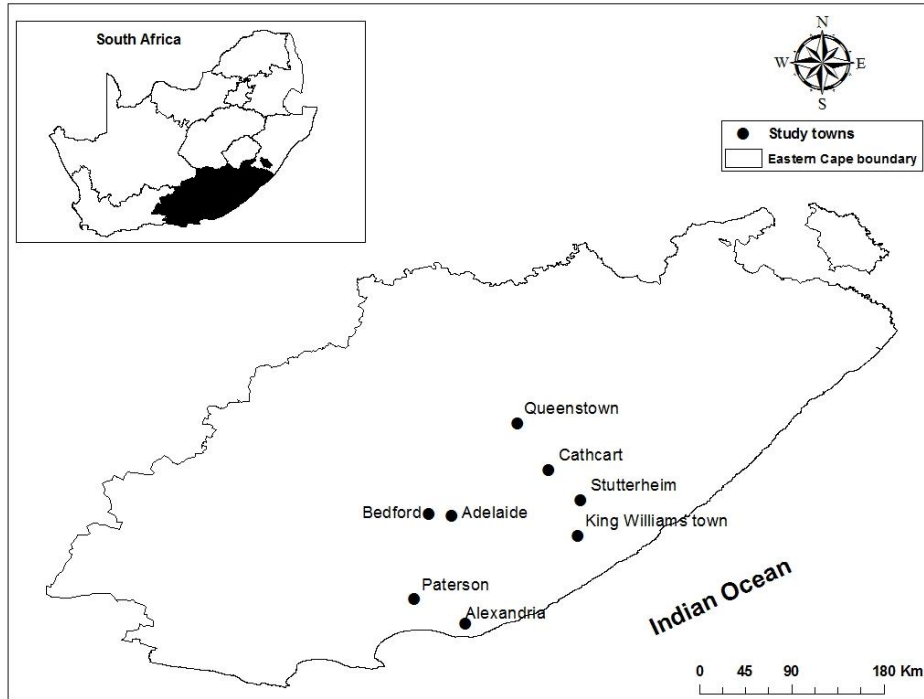


Figure 3.1: Location of the selected study towns.

3.3. Climate and vegetation

With regard to urban green spaces rainfall and temperature are the two of the most important climatic elements. In the Eastern Cape, the average annual rainfall has been declining while the average annual temperature is increasing, presumably as a result of global climate change (Department of Economic Affairs, Environmental and Tourism, 2004). The climate varies from mild temperature conditions of 14 °C to 23 °C along the coastal areas to slightly more extreme conditions of 5 °C to 35 °C among the inland areas (Department of Economic Affairs, Environmental and Tourism, 2004). The western arid areas receive an annual rainfall of 200-300 mm per annum while the eastern regions receives 400-800 mm, with most of rainfall received in summer (except in the west, winters are largely cool and dry with some snow mainly on the highlands and mountain ranges (Chris Hani municipality IDP, 2012). The vegetation of the Eastern Cape consists of several types in line with the varied climate and geology (Mucina and Rutherford, 2006). The study towns are distributed amongst the Grassland, Savanna and Albany thicket biomes. Refer to Table 3.2 for further details about vegetation, altitude, mean annual rainfall and temperature of selected study towns and Figure 3.2 shows the distribution of biomes in the Eastern Cape.

Table 3.2: Summary of vegetation, altitude, mean annual rainfall and temperature

Town	Biome	Mean Annual Rainfall (mm)	Mean Annual temperature (°C)
Adelaide	Grassland	672	14
Alexandria	Albany thicket	517	17.5
Bedford	Grassland	672	14
Cathcart	Grassland and savanna	672	14
King Williams town	Savanna and Albany thicket	717	17
Stutterheim	Grassland	672	14
Paterson	Albany thicket	517	17.5
Queenstown	Grassland	751	13

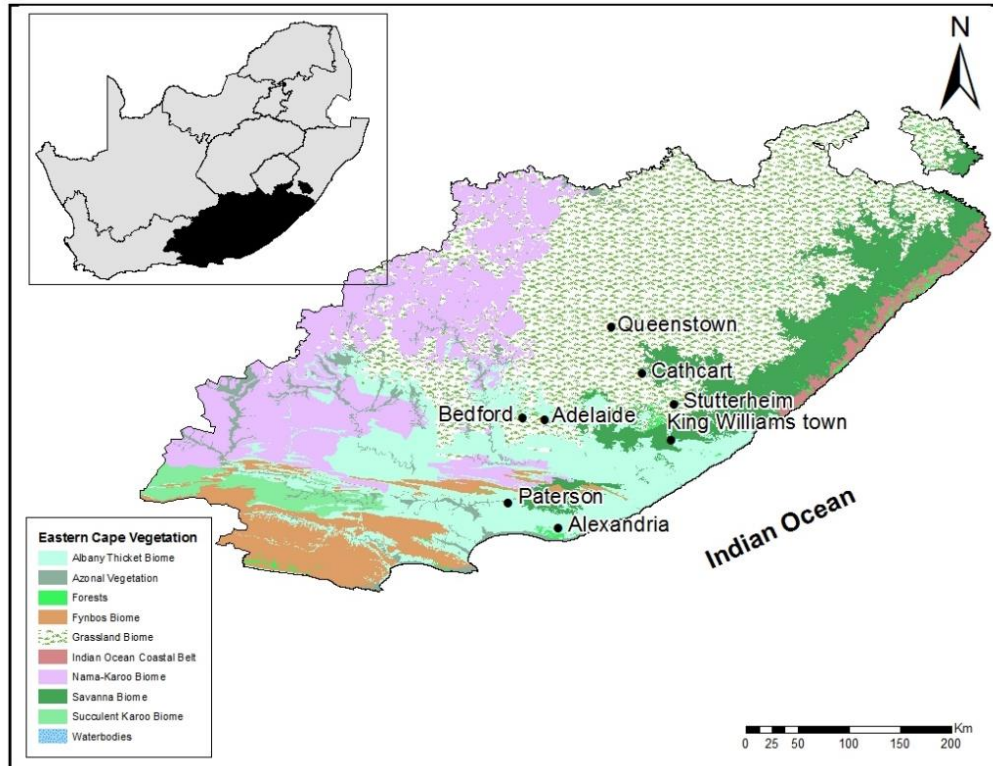


Figure 3.2: The biomes of the Eastern Cape

3.4. Methodology

3.4.1. Research approach

The research used a mixed methods approach. It involves philosophical assumptions in combining both qualitative and quantitative approaches (Johnson and Onweugbuzie, 2007). It is more than simply collecting and analysing qualitative and quantitative data but it also allows the researcher to draw from the strengths of both methods (Creswell, 2014). According to de Silva (2010) mixed method research is used to answer research questions that other methodologies cannot answer. In addition, mixed research methods produce a more comprehensive analysis than from one method alone (de Silva, 2010). Different methods allowed the researcher to understand different levels of reality for instance, the quantitative methods allowed for a broader understanding of features of urban green space such as patterns of usage, general perceptions and relationship between broader samples, while qualitative methods allowed for an exploration of people's preferences of green spaces and why they feel they use particular urban green spaces.

Mixed methods also allowed for triangulation, triangulation refers to the combination of two or more data sources, theories or methods in a single study of a particular phenomenon with the intentions of gathering diverse perceptions or points of view on a common issue or question (Yeasmin and Rahman, 2012). The triangulation principle involves minimising the insufficiencies of single-source research (Hussein, 2009). Two sources potentially complement and verify one another. Triangulation reduces the possibility and impact of bias (Yeasmin and Rahman, 2012). Triangulated methods and perspectives are important in cross-checking and in offering verification and wholeness, which grants equilibrium between two or more different of approaches (Yeasmin and Rahman, 2012).

There are different types of triangulation but the study employed specifically methodologic triangulation. Methodologic triangulation can be regarded as either data collection methods or research designs in which the two or more methods are used in studying the topic (Hussein, 2009; Thurmond, 2001). By employing different methods, the researcher attempted to limit deficiencies and biases that may result when using a single method thereby, generating the opportunity for counterbalancing any limitation of a single method with the power of another one (Thurmond, 2001). Methodological triangulation can be further divided into two types which are within-method triangulation and between-method triangulation. Within-method triangulation includes cross-checking of information for internal reliability (Hussein, 2009). This method requires using numerous corresponding methods within a specific paradigm in

data gathering. On the other hand, the between-method is used in gaining convergent legitimacy and testing the extent of external legitimacy (Hussein, 2009). This study used within-method triangulation and I used four data collection methods from the similar design approach.

3.4.2. Research design

Two broad approaches were used to gather the necessary data to address the research objective. The first was the use of GIS to produce maps that indicate the location, amount and types of urban green spaces in the selected towns. The second was household surveys and focus group discussions with residents to reveal social perspectives on the use, accessibility, benefits and preferences for urban green spaces within towns. The research study was carried out in eight towns, situated in the Eastern Cape, each with population size of less than 100 000 people. The selection of these towns included towns that have had a rapid population growth in the last ten years and dominated by Xhosa residents. Four towns that have rapid growth and four towns that have slow rapid growth were selected. GIS maps were produced for each of the eight towns. The household surveys and focus group discussions were conducted in three of the towns. For further details, refer to Figure 3.3 for a summary of the research design.

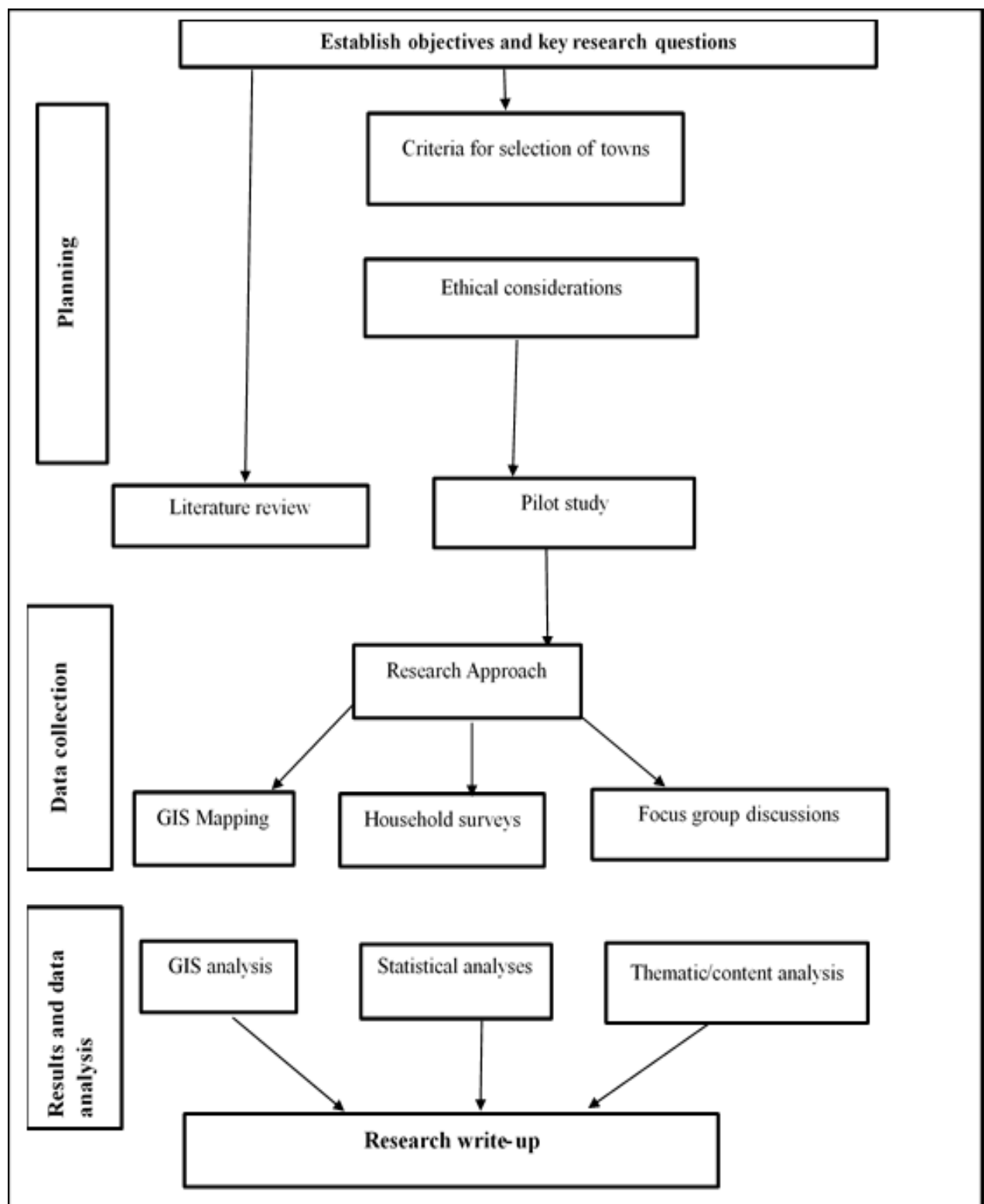


Figure 3.3: Summary of the research design

3.4.3. GIS mapping

The most recent ortho-rectified images of each of the study towns were obtained to determine the amount and types of urban green space in each town. Historical aerial images were georeferenced; this allowed consistency with regards to the spatial measures of extent of the study area and green spaces. Georeferencing allows spatial data layers to use the same map projection (Steinberg and Steinberg, 2015). ARCGIS 10.3 was used to digitise aerial images of each town, images taken included one per decade, dating back to 1985s to determine changes in land cover over time. To calculate the rate of change, impermeable areas (roads, buildings and other non-green areas) were digitised leaving behind green space. The rate of change was then calculated as the change in area divided by the length of time between successive estimates. Latest aerial images of study towns were used to capture amount and classify green spaces into categories. The urban green spaces were selected using existing typologies found in the relevant literature. Figure 4.4 below summarises the methodology used to obtain final map products of urban green spaces.

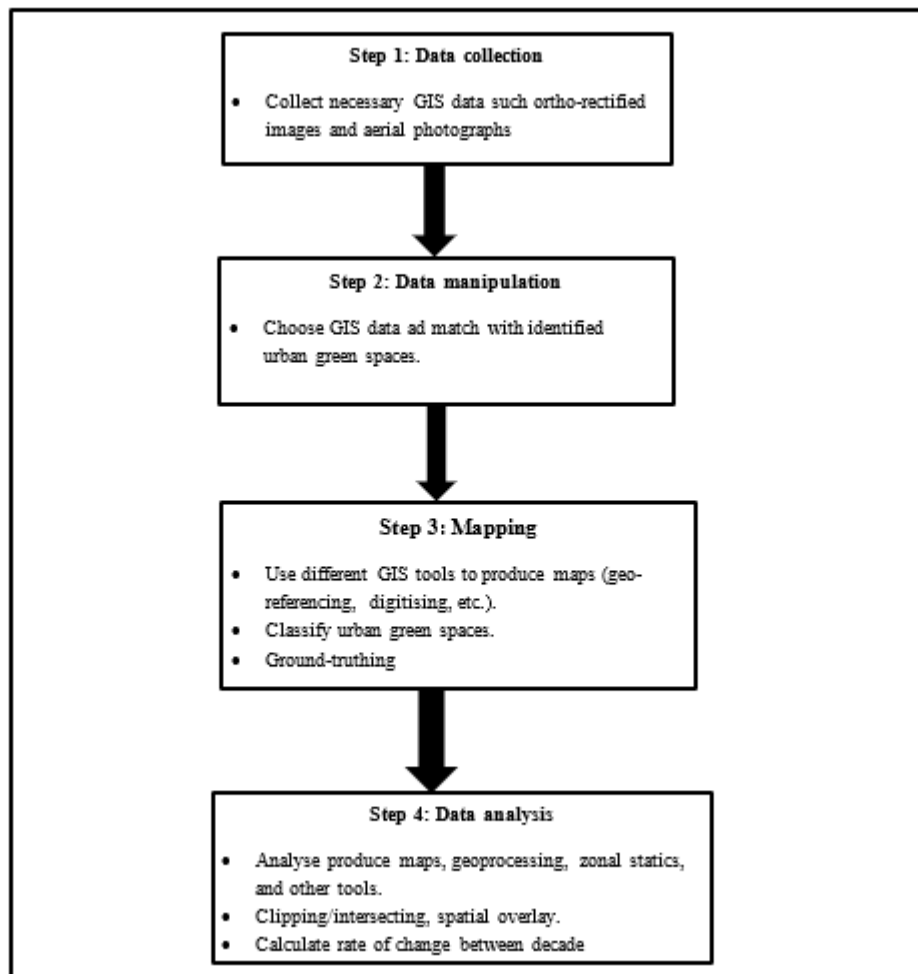


Figure 4.4 :The sequential steps taken to assess the extant, types and rates of change in urban green spaces across the eight sample towns.

3.4.4. Households surveys

Walliman (2005) defines a pilot study as the study that is designed to collect information and test logistics for a bigger study. A pilot study can improve quality and competence of the research (Creswell, 2014). The questionnaires were pre-tested in Grahamstown using a sample of 12 respondents before being administered to the in the study towns. Some questions that were unclear during the pre-testing phase were modified.

Qualitative and quantitative questions were incorporated into the household surveys. The structured questionnaires covered topics such as the usage of urban green spaces, what respondents like in public green space, what they don't like about urban green spaces and

how accessible they thought such spaces are, the types of activities they wished to carry out within such spaces, and how such spaces could be improved (Please refer to appendix A). A stratified random sampling was carried out, since the researcher was interested in understanding green space usage and perceptions among different gender, age and suburbs in small towns. An advantage of stratified random sampling is that there is a guarantee that the sample will contain sufficient representatives from each of the strata. Sixty household surveys were conducted in each of King Williams Town, Stutterheim and Queenstown. Thirty household members were interviewed from RDP settlements and 30 from older township suburbs, from randomly selected households using the GIS. . Any adult present at the time of the interview was chosen to participate in the study. The respondents were selected based on their availability and willingness to respond.

3.4.5. Focus group discussions

Apart from conducting household surveys, focus group discussions were also conducted. According to Krueger and Casey (2000) focus group discussions are useful in determining feelings and perceptions of people around a particularly topic. Focus group discussions were held with residents of all ages, educational and economic backgrounds. This allowed for diverse and rich information. The focus group discussions explored a range of topics including how people perceive and use urban green spaces, what categories of urban green space they recognise and how accessible they consider them to be.

In each town gender specific focus group discussions were carried. The gender specific group discussions allowed both genders to freely express their views and perceptions about urban green spaces as these maybe different between the two groups. Eight to twelve participants were recruited to participate in the focus group discussions and they were dominated by female participants. The focus group discussions were held in a public institution like school or community hall. Digital recorders were used to record focus groups.

3.5. Ethical considerations

The research adhered to ethical guidelines from Rhodes University Ethics Policy and was approved by the University ethics committee. Specific actions included:

- I asked approval from the ward councillor before the research commenced.
- An Informed consent form was provided which explained the purpose, objectives and methods that were used during the research.
- Participants were assured that participation in the research was voluntary and if they felt uncomfortable they are allowed to withdraw at any time.
- Respondent anonymity and confidentiality was assured.
- Possible risks from participation were noted.
- Completed questionnaires would not be handed to or shared with third parties and would be protected in a locked filing cabinet.
- Research findings will be communicated with the community via community meetings.

3.6. Data analysis

GIS ArcMap software was used as a tool to combine different layers of spatial data and conduct analysis of spatial data. Keeping GIS database up to date, especially in developing countries is the major problem facing urban planners, it is important to confirm the accuracy of GIS data (Steinberg and Steinberg, 2015). Google Earth was used to view the existing urban green spaces in different study small towns. Descriptive statistics was used to describe and summarise quantitative data. T-tests were used to test for significant differences between continuous variables in two settings or comparable samples; for example between fast growing and slower growing towns, or between male and female respondents. Chi-squared tests were used to assess differences in proportional data between genders or sites. Results were quantitatively displayed using tables, charts and graphs reflecting important issues, correlations and trends in relation to the literature. According to Steinberg and Steinberg (2015) there are three processes that need to be followed in analysing qualitative research namely identifying relevant themes, defining themes and providing theme variables with names. Relevant themes were classified by listing all themes that emerge. After classification,

emerging themes were categorised and coded. Then the coding took place. I repeated listening to interviews and organised the findings in themes that emerged.

CHAPTER 4: A spatial analysis of urban green spaces in small towns of the Eastern Cape, South Africa

4.1. INTRODUCTION

Although more than 50 % of world's population lives in urban areas, towns and cities cover only 3 % of the earth's surface (Cilliers et al., 2014). However, with increasing urban populations, through rural-urban migration and autogenous growth, the area of land under urban development continues to grow. Such growth has brought substantial urban sprawl, redevelopment and restructuring of cities and towns (UN-Habitat, 2015). Such continuous growth also offers opportunities and challenges to urban planners in relation to urban design that mitigate the negative aspects of urbanisation and embrace the opportunities for promoting sustainability, quality of life and human wellbeing (Jim and Chen, 2006). A core strategy in achieving this is the promotion of urban green infrastructure, particularly urban green spaces for the multiple ecosystem services and benefits that they can provide (Gonzalez-Duque and Panagopolous, 2013; Neuenschwander et al., 2014). Promoting urban health requires that there are sufficient, varied, well-distributed and accessible green spaces (Sanesi and Chiarello, 2006). In addition, they bring aesthetic qualities that can contribute to development of a sense of place (Wolch et al., 2014). However, urban green spaces still do not receive sufficient attention in urban planning discourses, policies and approaches (Neuenschwander et al., 2014; Gwedla and Shackleton, 2015). This lack is typically even more severe in developing countries (Gwedla and Shackleton, 2015), due to higher rates of urban growth and lesser expertise and finances (Angel et al., 2011; Chishaleshale et al., 2015).

Land-cover and land use are dynamic and are important indicators for understanding the interaction of human activities with the environment (Dewan and Yamaguchi, 2009) with the former reflecting structure or form and the latter revealing function (Dennis et al., 2017). The private and public domains need timely and accurate information on existing land cover for land use planning and zonation, environmental and vegetation monitoring and natural resource management (Sternberg and Sternberg, 2015). Developing practical and cost-effective tools for monitoring and mapping urban green spaces remains a challenge in many countries (Sternberg and Sternberg, 2015). Mapping the distribution of green spaces within urban areas needs to be comprehensive and detailed (Sreetheran and Adnan, 2007; Dennis et

al., 2017). Increasingly such planning and monitoring is achieved through or aided by remote sensing and GIS tools, which allow researchers to map, assess, model and portray trajectories of change in urban environments more efficiently and cost-effectively than traditional methods (Sreetheran and Adnan, 2007).

Kong and Nakagoshi (2006) emphasise that quantification of green space is essential in understanding green space changes, monitoring and assessing green space functions. Land-cover change in urban areas can be assessed through observations of the past and present (Odindi et al., 2012). Such assessments can be used to understand changes that are required for informed environmental management decisions. Quantifying the rates of urban green space changes is an important step in understanding and prioritising the threats facing urban environments (Barbosa et al., 2007) and the benefits that humans obtain from them. Despite increasing knowledge on the value of urban green spaces, classification of the types of spaces, the benefits each type provides and their use by urban population are limited (Bell et al., 2007). In other words, often all green spaces are regarded or treated as the same by planners, even though they are of many different sizes, are located in different parts of the city, have different management agencies and user profiles and are often characterised by different biological assemblages (Gill et al., 2008). Consequently, classification of green spaces should not be ignored in urban planning, conservation and protection and in meeting the varied needs of urban populations (Cvejić et al., 2015). Different sources have been used for reference as benchmarks in trying to develop green space typologies (Swanwick, 2003; Woldegerima et al., 2017). However, in many instances there are the inconsistencies in classification systems or categories used by different governments, local authorities and other organisations (Swanwick, 2003; Cvejić et al., 2015).

Urban expansion and the increasing urban population in South Africa's cities and towns have placed increasing demands on the urban green spaces (Odindi et al., 2012). The high urban population growth rate has resulted in urban expansion and urban landscape transformation (UN-Habitat, 2015). For example, in Sub-Saharan African countries constant development of urban grey infrastructure, deforestation, residential developments and dumping has resulted in reductions in urban green space and constant threats of transformation or degradation (UN-Habitat, 2009; Mensah, 2014; Abele and Megento, 2016). This implies that the urban landscape should be developed in a manner that takes into account the physical character of the original natural environment on which the urban area is built (UN-Habitat, 2015).

Within this context, this project sought to ascertain the nature, distribution and use of urban green spaces in selected small and medium towns of the Eastern Cape Province, South Africa. Specifically, in this chapter I aimed to determine the location, amount and types of urban green spaces. This was achieved by addressing the following three questions:

- (a) What types of urban green spaces are present in the study towns?
- (b) How are they distributed in the study towns?
- (c) Has the amount and composition of urban green spaces changed over time?

4.2. METHODS

The methods of data collection are provided in Chapter 3.

4.3. RESULTS

4.3.1. Types of green spaces

Based on the latest aerial images, Google Earth and field visits/ground-truthing, 15 different types of urban green spaces were identified (Table 4.1). The proposed categories relate to current land use. An example of the classification results for single town is presented in Figure 4.1.

4.3.2. Distribution of green spaces in small towns

As evident in Figures 4.2 and 4.3, in the Eastern Cape urban green space is dominated by commonages, urban farmlands and woodlands/thicket. Most of these are external to the core urban area, although they fall under the jurisdiction of the urban authorities. This is potentially an artefact of the where the boundary of the urban space is delineated. Narrowing down onto the urban core specifically (i.e. excluding commonages, woodlands//thicket and farms on the periphery of the town) the percentage of green space cover varied between towns from 27.2 % in Queenstown to 73.6 % in Stutterheim (Table 4.2). Some towns have considerably more green spaces than others (Table 4.2). However, some towns do not have recreational green space, for example there are no parks in Paterson. During ground-truthing it was noted that particular areas in some towns lacked green space, such as the town centre

or RDP suburbs (Figure 4.3). Results in Table 4.2 indicate that the predominant types of green space are wastelands (24.4 %) followed by domestic gardens (11.3 %). Slow growing towns are characterised by large amounts of wasteland (e.g. 34.9 % in Stutterheim) while fast growing towns have less wasteland e.g. 2.7 % (Queenstown). Generally, slow growing towns with large areas have greater green space coverage; such as in Stutterheim the total area was 2405.9 ha and total green areas was 73.6 %.

Table 4.1: Types of green spaces identified in the study towns.

No:	Type of green space	Description
1	Cemetery	The place for human remains.
2	Churchyard	Vegetated area of land adjacent to a place of worship.
3	Commonage	Unfarmed vegetated land that is outside town.
4	Domestic garden	Vegetated area adjacent/around a residential dwelling.
5	Informal area	Piece of land close to residential areas that is undeveloped and has no building structure.
6	Institutional	Vegetated piece of land around/adjacent to an institution.
7	Outdoor sports area	Vegetated piece of land with sport facilities.
8	Formal park	Vegetated land with facilities for rest and leisure.
9	Riparian zone	Vegetated area within 10 m of water bodies.
10	Wasteland/servitudes	Unused lands where plants grow without human agency.
11	Woodland	An area that is dominated by trees
12	Thicket	Evergreen heathlands and shrublands.
13	Road verge	Vegetated area within 5 m from street, mostly found in residential areas.
14	Urban farmland	Agricultural land in an urban area.
15	Street tree	Tree planted at side of the street.

The mean for area of green space per capita is $86.7 \pm 31.0 \text{ m}^2$. In addition, it appears that slow growing towns are characterised by higher green space per capita than fast growing towns. Cathcart has the highest area 150.1 m^2 per capita while in Queenstown it is 45.6 m^2

per capita. Although the slow growing towns appeared to have more green space per capita, there were no significant differences between slow and fast-growing towns ($t=1.13$; $p=0.30$).

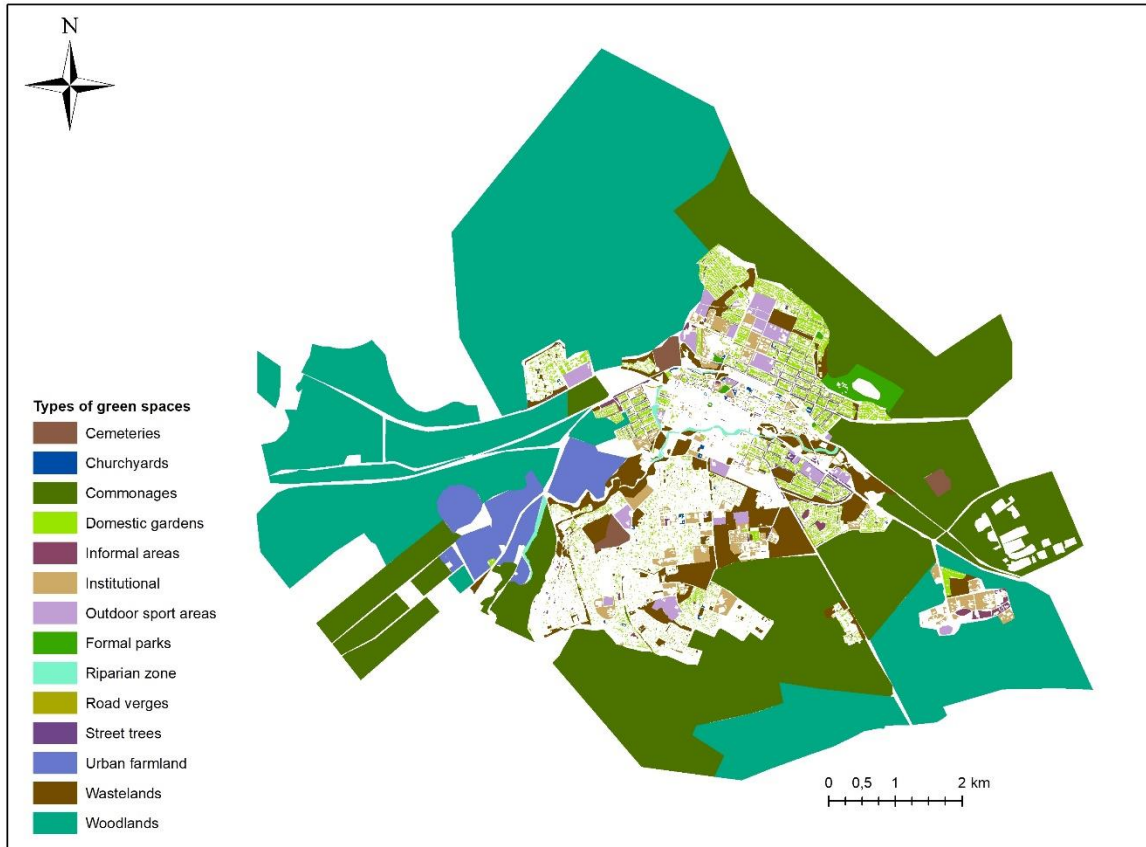


Figure 4.1: Types of green spaces that can be found in small towns (Queenstown, 2015).

Table 4.2: Percentage coverage of different types of green spaces in eight small towns of Eastern Cape.

Types	Adelaide	Alexandria	Bedford	Cathcart	KWT	Paterson	Queenstown	Stutterheim	mean	Std dev
	%	%	%	%	%	%	%	%	%	%
Cemeteries	1.6	4.3	0.9	1.8	1.0	1.3	1.7	0.5	1.6	1.2
Churchyards	0.3	0.9	0.8	0.7	0.1	1.6	0.2	0.3	0.6	0.5
Domestic	4.1	12.4	13.1	11	18.3	7.6	9.0	14.6	11.3	4.4
Informal	3.1	4.8	8.0	0.1	1.2	6.0	0.7	2.5	3.3	2.8
Institutional	0.6	1.1	0.8	4.4	6.0	2.9	4.8	1.0	2.7	2.1
Parks	0.2	0.4	0.7	0.1	0.2	0	1.7	0.2	0.4	0.5
Riparian	10.9	0	2.1	7.1	7.0	4.9	0.9	17.9	6.3	5.9
Road verges	0.2	1.6	1.0	0.7	1.5	4.7	0.4	0.6	1.4	1.5
Sports areas	1.1	12.5	1.9	8.5	4.0	0.8	3.7	0.4	4.1	4.3
Street trees	1.4	2.2	1.5	0.8	0.5	0.1	1.8	0.7	1.1	0.7
Wastelands	32.6	18.2	31.4	19.8	17.1	38.8	2.17	34.9	24.4	12.2
Total	55.6	58.4	62.0	55.0	57.0	68.8	27.2	73.6	57.2	13.8
Non-green spaces	44.3	41.6	38.0	45.0	43.0	31.2	72.8	26.4	42.8	13.8
Town area (ha)	865.2	319.9	397.5	500.4	2494.3	257.3	2326.6	2405.9	1195.9	1021.7

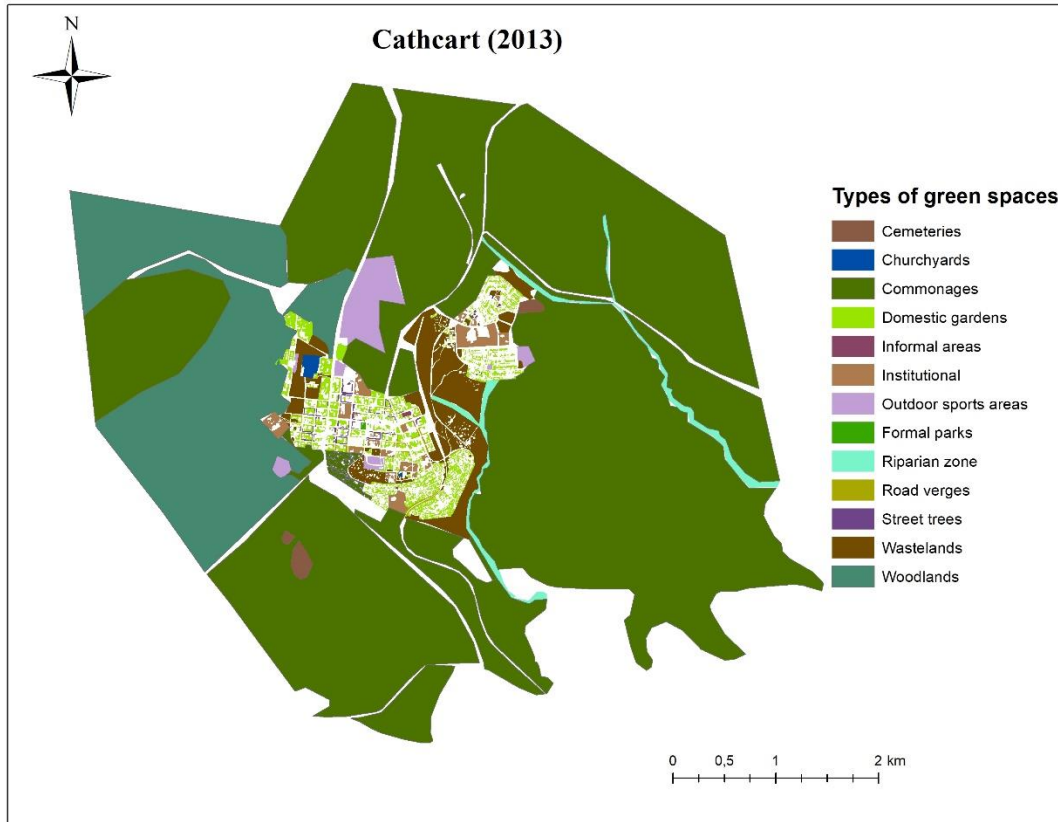


Figure 4.2: Distribution of green spaces in a slow growing town.

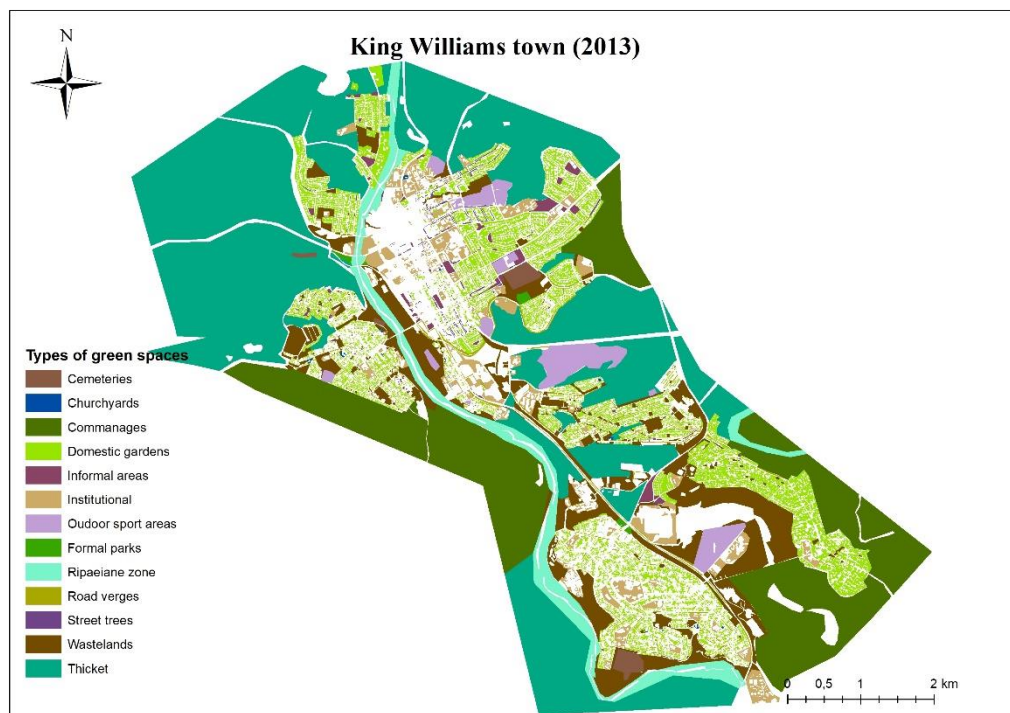


Figure 4.3: Distribution of green spaces in fast growing town.

Table 4.3: Green space per capita in eight small towns of Eastern Cape.

Town	Growth rate	Area of green space (ha)	Population (2016)	Green space per capita (m²)
Adelaide	Slow	82.3	12 191	67.5
Alexandria	Fast	64.9	10 086	64.4
Bedford	Slow	75.6	8 769	86.2
Cathcart	Slow	110.5	7 360	150.1
KWT	Fast	712.2	77 682	91.7
Paterson	Fast	54..0	5 582	96.7
Queenstown	Fast	451.5	98 988	45.6
Stutterheim	Slow	226.3	24 672	91.7
Mean		222.1	28 834	86.7
Std dev (±)		238.8	36 510	31.0
Mean (slow growing towns)		123.6	13 248	98.9
Mean (fast growing towns)		320.6	48 084	74.5

4.3.3. Distribution of urban green spaces within towns

The area of green space varies widely between different suburbs. It can be noted from Tables 4.4 and 4.5 that in the affluent suburbs there are more green spaces than in RDP and township suburbs. In affluent suburbs the total amount of urban green space in slow growing towns ranges from 35.6 % (Stutterheim) to 58.7 % (Bedford). While in fast-growing towns the total amount of urban green space ranges from 34.8 % (King Williams town) to 74.2 % (Queenstown). Generally, the RDP suburbs have small areas of urban green space in both slow and fast-growing towns; ranging between 0.9 % (Queenstown) and 16.9 % (Paterson), in fast growing towns, and 3.8 % (Stutterheim) to 26.0 % (Bedford) in slower growing ones. It can be noted from Tables 4.4 and 4.5 that the green spaces in the RDP and township suburbs are dominated by wastelands and informal green spaces. In contrast, affluent areas have formal recreation areas such as sports grounds and parks and streets lined with trees. Domestic gardens are common in affluent areas. In Bedford domestic gardens contribute 34.4% to the total area of green space, while the township suburbs have high amount of wasteland (37.0 %).

Table 4.4: Proportion (%) of urban green spaces per suburb in slow growing towns.

Types	Adelaide			Bedford			Cathcart			Stutterheim			Mean		
Suburbs	AFF	TSP	RDP	AFF	TSH	RDP	AFF	TSH	RDP	AFF	TSH	RDP	AFF	TSH	RDP
Cemeteries	4.3	2.8	0	1.4	1.3	0	0	0	1.6	0.6	1.3	0	1.6	1.4	0.4
Churchyards	0.4	0.6	0.5	1.8	0.2	0.3	1.9	0.1	0.1	0.6	0.4	0.1	1.2	0.3	0.3
Dom. gardens	14.0	3.0	2.1	34.4	1.7	3.5	16.6	1.0	5.7	7.6	8.4	0.2	18.2	3.5	2.9
Informal	2.4	8.8	1.2	1.7	2.0	1.1	0.2	0	0.2	5.5	4.4	0.7	2.5	4.1	0.8
Institutional	0.9	1.9	0	1.2	0.3	0	4.6	3.0	4.8	0.8	3.2	0	1.9	2.1	0.8
Parks	1.0	0	0	2.0	0	0	0.2	0	0	0.9	0	0	1.0	0	0
Riparian zone	0.4	1.7	0	6.3	0	0	0	1.4	0	3.3	3.8	0	2.5	1.7	0
Road verge	0.1	0.6	0.7	0.2	0.6	2.1	0	0.6	0	0.7	1.3	0.5	0.3	0.8	0.8
Sports areas	5.0	0.6	0	0.4	0	0	21.0	1.2	1.8	0	0.7	0.2	2.6	0.6	0.5
Street trees	5.0	0	0	4.2	0	0.1	3.6	0	0	2.6	0	0	3.9	0	0
Wastelands	9.8	21.1	11.3	5.0	9.3	18.8	4.7	19.2	6.6	13.0	37.0	2.0	8.1	21.4	9.6
Total	43.2	41.1	15.7	58.7	15.3	26.0	52.6	26.6	20.8	35.6	60.6	3.8	47.4	35.9	16.6

*AFF-Affluent *TSP-Township *RDP-Reconstruction Development Programme

Table 4.5: Proportion (%) of urban green spaces in per suburbs fast growing towns.

Types	Alexandria			KWT			Paterson			Queenstown			Mean		
Suburbs	AFF	TSH	RDP	AFF	TSH	RDP	AFF	TSH	RDP	AFF	TSP	RDP	AFF	TSH	RDP
Cemeteries	0.8	2.6	0	0.9	1.1	0	0	3.4	0	3.5	1.8	0	1.3	2.2	0
Churchyards	0.8	1.3	0.4	0.0	0.1	0	2.1	1.9	0.2	0.4	0.3	0.3	0.8	0.9	0.2
Dom. gardens	23.9	4.0	0.6	15.7	15.7	3.2	17.1	1.4	1.4	22.5	1.1	0.2	19.8	5.6	1.4
Informal	3.8	1.9	1.3	1.7	0.6	0.1	11.7	0.2	0.1	0.8	0.3	0.1	4.5	0.6	0.4
Institutional	0.1	3.0	0	5.6	5.3	0.7	4.4	1.5	0	6.6	5.2	0	4.2	3.8	0.2
Parks	1.0	0	0	0.3	0.1	0	0	0	0	53.0	0	0	1.7	0	0
Riparian zone	0	0	0	2.7	8.3	0	0	0	0	1.3	0.2	0	1.0	2.1	0
Road verge	0.8	2.9	0.7	0.7	1.4	0.8	7.6	2.4	1.8	1.0	0.3	0.1	2.5	1.8	0.9
Sports areas	0.1	2.6	2.1	2.3	2.3	0.1	1.9	0	0.3	8.4	3.1	0	3.2	1.5	0.6
Street trees	4.0	0	0.3	1.0	0	0	0.2	0	0	5.6	0.1	0.0	2.7	0	0
Wastelands	4.9	31.8	4.3	3.7	22.6	2.7	10.4	16.9	13.1	18.7	12.5	0.5	9.4	21.0	5.2
Total	40.2	50.0	9.7	34.8	57.6	7.6	55.4	27.7	16.9	74.1	24.9	0.9	51.1	40.1	8.8

4.3.4. Rate of change in green space area

Based on historical and the latest aerial images, it appeared that slow growing towns have a low rate of change in green space area compared to the fast growing towns. For example, the change in Queenstown (fast growing town) is -39.2 % while the change in Stutterheim (slow growing town) is 11.2 %. However, this difference is not significant ($t=0.13$; $p=0.90$).

Based on the ground-truthing and latest aerial images there is also fast growth of informal, unplanned settlements in commonages and thicket areas. The higher levels of transformation of green spaces were noted in those close to RDP and township suburbs compared to the affluent suburbs.

Table 4.6: Rate of change in urban green space area in eight Eastern Cape towns

Town	Growth rate	Year	Area of green space (%)	Year	Area of green spaces (%)	Difference (%)	Period (Years)	Annual rate of change (%)
Adelaide	Slow	1988	78.8	2013	55.6	-23.2	25	-0.9
Alexandria	Fast	1994	73.5	2013	58.4	- 15.1	19	- 0.8
Bedford	Slow	1996	80.0	2013	62.0	- 18.0	17	-1.1
Cathcart	Slow	1996	72.3	2013	55.0	- 17.3	17	-1.0
KWT	Fast	1985	72.1	2013	57.0	-15.2	28	-0.5
Paterson	Fast	1990	71.6	2015	68.8	-2.8	25	-0.1
Queenstown	Fast	1994	66.4	2015	27.2	-39.2	21	-1.9
Stutterheim	Slow	1992	84.8	2013	73.6	-11.2	21	-0.5

4.3.5. Mapping accuracy

Mapping accuracy for the cemeteries, riparian zones and thicket was 100 %, while for informal recreation areas it was 40 % (Table 4.7). This provided for an overall accuracy of 78.2 %. Figures for informal areas and road verges were less accurate because it was difficult to identify them from some aerial images. However, it is important to note that the ground-truthing was done in May-June 2017 while aerial images were taken in 2013 and 2015.

Therefore, one cannot assume that no land cover change had occurred between when the image was captured and when ground reference points were examined. Another limitation of the ground-truthing was the limited number of ground control points and the distribution of the points in study towns. The issues of inaccessibility meant that ground control points were only collected in areas directly accessible by road while time and cost meant that only five control points per green space in each town were collected.

Table 4.7: Ground-truthing accuracy assessment (Queenstown and Adelaide).

Types of green space	Number of sites	Site matching	Accuracy (%)
Cemeteries	5	5	100
Churchyards	10	9	90
Commonages	8	6	75
Domestic gardens	10	8	80
Informal areas	10	4	40
Institutional	10	7	70
Parks	8	6	75
Riparian zone	2	2	100
Road verges	10	5	50
Sports areas	10	6	60
Street tress	10	9	90
Wastelands	10	9	90
Thicket	7	7	100
Urban farmlands	4	3	75
Overall accuracy			78.2
Std dev ($\pm$)			18.6

4.4. DISSCUSION

4.4.1. Classification of urban green spaces

This study identified and mapped 15 different types of green spaces in a sample of small towns in the Eastern Cape. This is similar to the findings of Neuenschwander et al. (2014) who identified 13 types of green spaces in Zurich-Altstetten. A major difference was that for the Eastern Cape towns, most had large expanses of commonages on the periphery of the town, which does not correspond to other studies. Urban commonages are widespread throughout the Eastern Cape and Western Cape provinces of South Africa (Kepe et al., 2015) and are widely used for a variety of provisioning, cultural and recreational ecosystem services (Davenport et al., 2012; Kepe et al., 2015; Stickler and Shackleton, 2015). In contrast, other studies have recognised and mapped far fewer types of green space. For example, Fuwape and Onyekwelu (2011) recognised only seven different types, namely public green spaces, residential spaces, trees planted for environmental protection, designated parks, tree plantations, forests and rangeland close to urban areas and nature reserves. Indra (2008) identified only two broad green space types (linear and non-linear spaces) in Yogyakarta, Indonesia. This study has indicated that green spaces in developing countries are not limited to recreation areas and parks as suggested by Bell et al. (2007).

4.4.2. Amount and distribution of green spaces

This study shows that most of the 15 different types of green space were present in every town, with a few small exceptions. Additionally, it was found that well over half of the land cover was one or more types of green space, irrespective of whether commonage was included or excluded from the estimates. Excluding commonage makes the results more comparable to figures in the literature. Without commonage or peripheral woodlands, green space constituted, on average, 57 % of the town area. This is comparable to the 60 % estimated by Shackleton et al. (in press) for nine other towns in the Eastern Cape. However, it is higher than the average of 33 % calculated across 100 cities worldwide (Dobbs et al., 2014), which is likely to be a result of this study looking at small towns rather than large cities. This high proportion of land under green space also means that the calculated area per capita ($86 \pm 31 \text{ m}^2$) is well above the 20 m^2 target recommended by the United Nations and European Council. Queenstown had the least green space per capita (46 m^2) but was still double this recommended ratio.

The original hypothesis that the growth rate of the towns would influence the proportion of town area under green space and the rate of change was not supported. The percentage area of green space was marginally larger in slow growing towns than fast growing ones, as was the area per capita; however, neither of these measures were statistically significant between the two sets of towns. However, the difference tended to be in favour of the slow growing towns, in line with the original hypothesis, but was likely to be compromised by the low sample size of only four towns in each group. The rationale of the hypothesis stands, in that faster growth rates are likely to result in loss of green spaces for development of housing, commercial areas and infrastructure (Brown-Luthango et al., 2012), whether formally planned and implemented or via land grabs and squatting. However, the results of Gwedla and Shackleton (2017) show that such a hypothesis might not be sound for all types of green spaces, when they showed that large towns in the province had higher densities of street trees than small towns.

Although the sampled towns had high amounts of green space by world standards, it was not evenly distributed within the towns. Most striking was the low proportions of green spaces in the township ($38.0 \pm 5.9\%$) and RDP ($12.7 \pm 4.5\%$) areas in comparison to the more affluent suburbs ($49.3 \pm 4.8\%$). And with the higher population densities in the RDP areas this results in far lower areas of green space per capita (McConnachie and Shackleton 2010). Thus, a small minority of urban residents enjoy a diversity and abundance of green spaces while the majority have few or no green spaces in their immediate surrounds. This echoes the findings of McConnachie and Shackleton (2010) who reported that the RDP suburbs had substantially less public green space than the affluent suburbs, and Kuruneri-Chitepo and Shackleton (2011) who found the same pattern reflected in the distribution of street trees. More broadly, the economic and class disparities in access to green spaces is increasingly being revealed. For example, Alexis et al. (2008) noted that Indian, Hindu, and Sikh groups in Leicester (UK), have limited access to green space. Kuta et al. (2014) studied urban green space accessibility for different socio-economic groups in the UK and found that socio-economically deprived groups have far less access to green space within 300 m from their residence. Wolch et al (2014) also noted inadequate amounts of green spaces in socioeconomically deprived residential areas.

What is concerning about this finding is that the post-apartheid government committed to address socio-economic disparities in the provision of services. The RDP areas are post-

apartheid housing schemes, and yet they have failed to take cognizance of international norms regarding the need for public urban green space, as well as the felt needs of urban residents who desire and use urban green spaces for a range of goods and services (Shackleton and Blair, 2013; Shackleton et al., 2014; 2015). This study supports the view of inequitable access where a minority enjoy the green spaces (Wolch et al., 2014). Not only is the distribution of green spaces uneven or even inequitable, the quality of green spaces comes into question. This resonates with the evidence from the social survey of this study (Chapter 5) that green spaces such as wastelands and servitudes are used to dump waste. The findings resonate with Zhou and Wang (2011) who indicated that the quality of green spaces has been compromised in many regions due to mismanagement, or lack thereof, and waste dumping. This is also contra to the Constitution of the Republic of South Africa (1996: p. 1251-1252) which states that “all South Africans have the right to an environment that is not harmful to their health and wellbeing; and to have the environment protected, for the benefit of the present and future generations”.

4.4.3. Rate of change

The analysis shows that all the studied towns are experiencing change and a consequent loss of urban green spaces. The mean rate of loss was approximately 0.9 % p.a. Thus, even though these are relatively small towns, it shows that they are growing and that often the growth is at the expense of urban green space. This study therefore corroborates others showing that urban green spaces are facing major challenges in developing countries (Mensah, 2014; UN-Habitat, 2015; Abele and Megento, 2016). With regards to population growth in South Africa, the urban landscape transformation has been associated with the period immediately after the country’s democratic transition in the 1990s (Odindi et al., 2012; Statistics South Africa, 2015). This urbanisation trend has been attributed to, among other factors, the abolition of restrictive laws that sought to limit urban movement and urban-pull and the rural-push factors (Todes et al., 2010). Much of the increase in unplanned settlements has occurred on the commonages and wastelands/servitudes. The results correlate with those of Andreasen et al. (2017) regarding suburbanisation in Dar es Salaam, Tanzania, which led to fragmentation and change of urban green spaces which compromised their ability to provide ecosystem goods and services. Additionally, suburbanisation might have a negative impact on the cultural practices of urban residents because the commonages play a major role as sites

for initiation ceremonies (Kepe et al., 2015). In contrast, Mensah (2016) describes the loss of formal, public urban green spaces in Kumasi, Ghana, through encroachment of business enterprises, as well as waste dumping and the inability of the city parks authorities to police or revert such land grabbing. The findings resemble the study of Yin et al. (2011) who noted that Shanghai (China) has undergone rapid expansion in the city centre. These concerns appear to be particularly strong in developing countries, where there is evidence that urban green spaces are often being lost or degraded at alarming rates (Yaakup et al., 2004). Whether this is due to increasing human populations and attendant pressures, or weak environmental policies and management is difficult to differentiate. However, it is well reported that urban environmental planning and governance is weak in many parts of the developing world, including South Africa (Chishaleshale et al., 2015; Pasquini et al., 2015; Ruwanza and Shackleton, 2016). There is consequently a clear need for strong policies and regulations and their observance or enforcement to preserve urban green space, and to ensure that green space is available throughout the urban matrix.

4.5. CONCLUSION

This spatial analysis undertaken in this study has shown that small towns in the Eastern Cape possess a variety of green spaces for both private and public use, and that generally the area per person is well above international norms. However, the distribution of green space is markedly uneven, with most green space being located in the more affluent residential areas. This disparity highlights the role of both income and the legacies of past racial planning and zonation. It can be noted that the post-apartheid government has done little to decolonise the conception and structure of urban planning. The quantitative results of this study generally support the literature that urbanisation generally has a negative impact on the area of green space. Yet the patterns and rates were no different between towns experiencing relatively rapid growth in human populations relative to slower growing towns. Therefore, conservation of green spaces is important however urban development and housing demands will threaten the future of green spaces in small towns.

CHAPTER 5: Uses, benefits, preferences and perceptions of urban green spaces by residents in poorer suburbs

5.1. INTRODUCTION

With rapid urbanisation in the developing world there is increasing need for research and policy to help minimise or mitigate the negative consequences and guide urbanisation processes towards desirable outcomes in terms of sustainability, liveability and human wellbeing (UN-Habitat, 2015). However, urban research is dominated by concerns of planning, housing provision, waste and transport (Turok, 2012). In comparison, Wolch (2014) argues that relatively little attention is given to issues such as access, equity, uses and ownership of urban land generally and green spaces specifically. The natural environment, including urban green spaces, provides multiple benefits and quality of life to society and urban residents (Konijnendijk et al., 2006; Cianga and Popescu, 2013; Ives et al., 2014). “Urban green space provision should aim squarely at users, yet many cities especially in developing countries exclude citizen’s wishes in the determination of location, design and management” (Jim and Chen, 2006:339). Viewing urban green spaces in a more social-ecological framework facilitates integration of the physical planning and conservation perspectives with those of human wellbeing and health (Dennis et al., 2017).

There are an increasing number of people living in urban areas, resulting in growing concerns from urban residents about their living conditions (UN-Habitat, 2015). Concurrently, citizens’ environmental awareness and demand for ecosystem services is growing (Haaland and van der Bosch, 2015). Thus, the demand for urban greening with natural amenities and functionalities to meet local needs has increased among urban residents (Fuller et al., 2007; Dennis and James, 2016; Mensah et al., 2017). It has been recognised by many researchers that green spaces have significant social, economic and ecological functions (Wolch, 2014). Optimisation of the delivery of the desired ecosystem goods and services requires that planners and managers take into account the perceptions and needs of local populations, at various scales. This is because the planners might not be aware of the residents’ needs, or may hold different ideas or values and therefore fail to meet the needs of the local populations. This applies equally within developed and developing countries (Broussard et al., 2008; Gwedla and Shackleton, 2015; Riechers et al., 2017). Moreover, attitudes and perceptions are also shaped by the nature and purpose of the green space. Green spaces differ

in facilities, age, design, planting, maintenance and patterns of use (Schipperijn, 2010). They include various elements such as flowerbeds, open grassy areas, trees, benches, statues, ponds, pathways, fountains and sporting facilities (Byrne and Wolch, 2009). Green spaces are regarded as places of social interaction and education, cultural identity, tourist destinations, and important for peripheral property development (Konijnendijk et al., 2006).

Urban areas of the Eastern Cape, South Africa, are undergoing many changes (Ruiters, 2011). With increasing human populations and persistent poverty, it is imperative that the towns and cities adopt development trajectories that optimise human wellbeing and health. International research indicates that the provision of urban green space is an important dimension of urban sustainability and human wellbeing (Konijnendijk et al., 2006; Ives et al, 2014). Whilst the same is likely to apply in the South Africa, there is relatively little work, and hence understanding, on the preferences and needs of urban dwellers in South Africa (Shackleton et al., in press). Since the context is very different to that of Europe or North America, it is inadvisable to simply transfer knowledge and models from those continents to southern and South Africa. Additionally, much of the work internationally has been in large cities and metropolises, with relatively little examination of the situation and dynamics in small towns. In other words, there is need for context specific and user driven information and understanding to best contribute to debates and actions around developing sustainable urban areas in South Africa. Consequently, the objective of this study was to understand how urban green spaces are appreciated, preferred and used by urban residents in small and medium-sized towns of the Eastern Cape. This was accomplished through answering three key questions, namely:

- (a) How are urban green spaces in towns used?
- (b) What benefits do the users derive from the urban green spaces?
- (c) What are the perceptions and preferences of urban residents towards urban green spaces?

5.2. METHODS

The details of data collection are presented in Chapter 3.

5.3. RESULTS

5.3.1. Profile of respondents

Of the 180 respondents the majority were females (68 %). The average age of respondents was 45.1 years, ranging from 18 to 88 years (Table 5.1). Most of the respondents (70 %) had secondary school education or higher and were thus literate. More than half of the respondents (71 %) grew up in the township suburbs. Half of respondents (50 %) lived in households with 4-7 occupants. Employment opportunities within small towns are limited and consequently about 50 % of the respondents were unemployed. Consequently, most of them (55 %) were relying on government social grants for cash income. The interviews and focus group discussions were conducted in Xhosa.

Table 5.1: Demographic profile of respondents.

Demographic variables		Number	Percentage
Gender	Female	123	68
	Male	57	31.7
Age (years)	18-29	41	22.8
	30-40	34	18.9
	41-50	37	20.6
	51-60	35	19.4
	61-70	21	11.7
	>70	12	6.7
Level of education	No schooling	11	6.1
	Primary schooling	42	23.3
	Secondary schooling	70	38.9
	Matric	41	22.7
	Undergraduate & certificate	13	7.2
	Postgraduate	3	1.7

5.3.2. Use of urban green spaces

The majority of the respondents (67 %) indicated that they have some green space or garden at their house (Table 5.2). However, the green or garden areas were relatively small, comprising approximately only 10 % or less of the size of the property. No households had green space covering greater than 50 % in their property (Table 5.2).

Table 5.2: Respondents who have green space at home (n=180).

Green space at home	Percentage (%)
Yes	67
No	33
Proportion of home space that is green	
Less than 10 %	60
Between 10-30 %	40
Between 31-50 %	0
Greater than 50 %	0

The most common use (50 %) of any unbuilt space at home was for food production (Fig. 5.1), followed by aesthetics. Only a few respondents were using green spaces in their homestead for recreation (9.1 %).

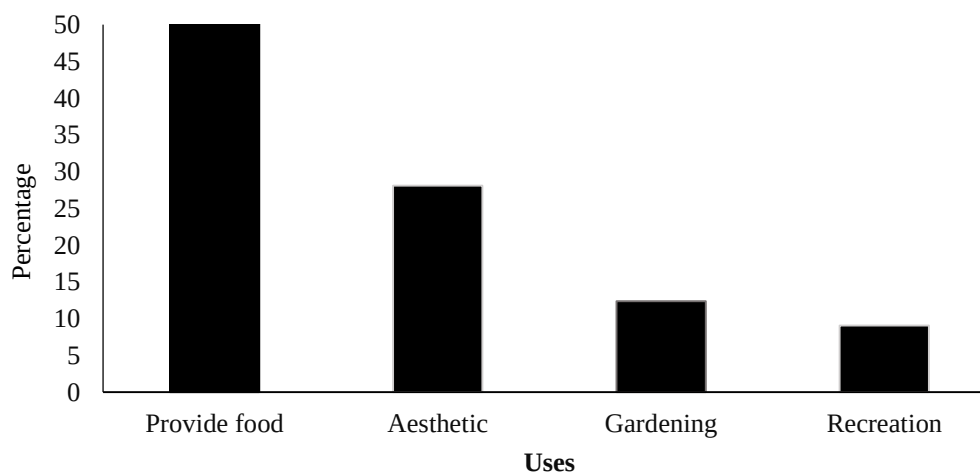


Figure 5.1: Uses of green spaces at home.

With respect to green spaces in the town, many residents used multiple types of spaces. The most commonly used or visited were cemeteries (57.2%), followed by tree-lined streets (54.4 %) and green areas in institutions (such as schools, hospitals, libraries) (Table 5.3), while road verges were not formally used by any respondent.

Table 5.3: Green space usage (n=180).

Types of green spaces	Number using	Percentage (%)
Cemetery	103	57.2
Street trees	98	54.4
Institutional	95	52.8
Sports areas	92	51.1
Parks	80	44.4
Churchyards	78	43.3
Woodland/thicket	76	42.2
Commonages	62	34.4
Wastelands/servitudes	59	32.8
Riparian zone	22	12.2
Informal areas	12	6.7
Road verges	0	0

Hobbies and personal interests affect how urban residents interact with specific green spaces so that different users visited green spaces for different reasons. The most common activities in green space were recreation and leisure (Table 5.4), especially in informal recreation areas (100 %) and outdoor sports areas (89.1 %). Green spaces such as cemeteries and churchyards were associated with spiritual and religious values. Cultural uses were most apparent in commonages, cemeteries and churchyards. Some respondents (66.1 %) mentioned that they were using wastelands as dumping sites. Commonages had the greatest diversity of uses and informal areas the least (Table 5.4).

Table 5.4: Types of activities performed in different green spaces.

Types	N	Recreation and leisure	Collect natural resources	Cultural values	Spiritual and religious values	Share local knowledge	Shade	Firewood	Vegetable gardens	Grazing	Exercise	Dump waste	Memories
Cemeteries	103	-	-	6.1	79.6	-	-	-	-	-	-	-	9.7
Churchyards	78	34.6	-	1.3	42.3	-	-	-	21.8	-	-	-	-
Commonages	62	6.5	64.5	9.7	3.2	-	-	-	-	16.1	-	-	-
Formal parks	80	86.3	-	-	-	13.7	-	-	-	-	-	-	-
Informal areas	12	100	-	-	-	-	-	-	-	-	-	-	-
Inst green spaces	95	21.1	-	-	-	2.1	-	-	76.8	-	-	-	-
Riparian zone	22	-	54.5	-	-	-	-	-	-	45.5	-	-	-
Road verges	0	-	-	-	-	-	-	-	-	-	-	-	-
Sport areas	92	89.1	-	-	-	-	-	-	-	-	10.9	-	-
Street trees	98	-	-	-	-	-	100.0	-	-	-	-	-	-
Wastelands	59	-	6.8	-	-	-	-	-	-	33.9	-	66.1	-
Woodland/thicket	76	2.6	57.9	-	-	-	-	39.5	-	-	-	-	-

There were strong differences between women and men ($X^2 = 355$; $df = 10$; $p < 0.0001$) in terms of the types of green spaces that they visited or used (Table 5.5). The top three for females were informal areas, churchyards and cemeteries, whereas for males they were woodlands, wastelands and riparian areas.

Table 5.5: Exploring the use of urban green spaces between female and male respondents.

Types of green spaces	N	Females (%)	Males (%)
Cemeteries	103	69.9	30.1
Churchyards	78	70.5	29.5
Commonages	62	48.4	51.6
Formal parks	80	61.3	38.7
Informal areas	12	75.0	25.0
Institutional	95	69.5	30.5
Riparian zones	22	40.9	59.1
Road verges	180	0	0
Sports areas	92	47.8	52.2
Street trees	98	69.4	30.6
Wastelands	59	44.1	55.9
Woodlands/thicket	76	28.9	71.1

Additionally, there were also significant differences ($X^2 = 409$; $df = 10$; $p < 0.0001$) in the extent of use between residents in township areas compared to RDP suburbs (Table 5.6). The proportion of respondents using the different types of green spaces was higher amongst township dwellers than RDP residents for all green space types other than wastelands. Township respondents were using green spaces such as informal recreation areas (83.3 %) and thicket/woodlands (71.1 %). The wastelands were mainly used by RDP residents (54.2 %).

Table 5.6: Green space usage by township and RDP residents.

Types of green spaces	N	Township (%)	RDP (%)
Cemeteries	103	51.5	48.5
Churchyards	78	62.8	37.2
Commonages	62	61.3	38.7
Formal parks	80	53.8	46.2
Informal areas	12	83.3	16.7
Institutional	95	61.1	38.9
Riparian zones	22	63.6	36.4
Road verges	180	0	0
Sports areas	92	62.0	38.0
Street trees	98	52.0	48.0
Wastelands	59	45.8	54.2
Woodlands/thicket	76	71.1	28.9

Most respondents (51.3 %) indicated that they visit churchyards at least more than one per week (Table 5.7). Street trees were visited one to two times per month (36.7 %). Slightly less than one-third of respondents (29.1 %) indicated that they visit outdoor sports areas at least every two to three months (29.1 %). Cemeteries were visited annually (29.1 %) while a large proportion of respondents (66.7 %) visited informal recreation areas occasionally.

Table 5.7: Frequency of green spaces usage.

Types of green Space	N	Daily (%)	1-4x /wk (%)	1-2x /mth (%)	1 x /quarter (%)	Yearly (%)	Sometimes (%)
Cemeteries	103	1.9	3.9	12.6	28.2	29.1	24.3
Churchyards	78	14.1	51.3	20.5	7.7	0	6.4
Commonages	62	11.3	4.8	8.1	16.1	6.5	53.2
Formal parks	80	2.5	11.3	21.3	26.3	23.8	15.0
Informal areas	12	0	8.3	0	25	0	66.7
Institutional	98	4.2	14.7	11.6	12.6	5.3	51.6
Riparian zones	22	45.5	22.7	0	4.5	0	27.3
Road verges	10	0	0	0	0	0	0
Sports areas	92	10.9	18.5	13.0	48.9	1.1	7.6
Street trees	98	3.1	10.2	36.7	8.2	0	41.8
Wastelands	59	33.9	3.4	0	0	0	62.7
Woodlands/thicket	76	0	6.6	19.7	27.6	9.2	36.8

In terms of daily patterns, the most common time for visiting churchyards (43.8 %) and cemeteries (38.8 %) was in the mornings (Table 5.8). The majority of respondents were using recreational green spaces such as informal recreation areas (66.7%), outdoor sports areas (68.5 %) and parks (76.3 %) during the day. Respondents were using commonages (43.5 %), riparian zone (45.5 %) and institutional green spaces (55.8 %) anytime. Green spaces such as cemeteries, commonages, riparian zones, road verges and thicket were rarely visited in the evenings.

Table 5.8: Visiting times of urban green spaces.

Types of green space	N	Mornings (%)	Midday (%)	Evenings (%)	Anytime (%)
Cemeteries	103	38.8	40.7	0	20.3
Churchyards	78	43.6	46.2	1.3	9.0
Commonages	62	32.3	29.0	0	43.5
Formal parks	80	6.3	76.3	6.3	11.3
Informal areas	12	33.3	66.7	0	0
Institutional	95	18.9	24.2	1.1	55.8
Riparian zones	22	27.3	27.3	0	45.5
Road verges	180	0	0	0	0
Sports areas	92	10.9	68.5	7.6	2.2
Street trees	98	5.1	49.0	6.1	39.8
Wastelands	59	16.9	13.6	1.7	67.8
Woodlands/thicket	76	26.3	34.2	0	39.5

Generally respondents visited natural green spaces such as wastelands (66.1 %) and riparian zones (63.6 %) alone. Outdoor sports areas were more social spaces, and consequently the majority of respondents (71.7 %) visited them with friends (Table 5.9).

Table 5.9: Company to types of green space.

Types of green space	N	Alone (%)	Friends (%)	Partner (%)	Family (%)	Children (%)
Cemeteries	103	21.4	24.3	5.8	41.7	6.8
Churchyards	78	12.8	24.4	3.8	9.0	50.0
Commonages	62	38.7	54.8	3.2	3.2	0
Informal areas	12	16.7	50.0	8.3	8.3	16.7
Institutional	95	52.6	25.3	6.3	14.7	1.1
Outdoor sports areas	92	13.0	71.7	10.9	2.2	2.2
Parks	80	16.3	43.8	10.0	10.0	20.0
Riparian zones	22	63.6	18.2	18.2	0	0
Road verges	180	0	0	0	0	0
Street trees	98	20.4	61.2	7.1	8.2	3.1
Wastelands	59	66.1	22.0	1.7	6.8	3.4
Woodlands/thicket	76	23.7	73.7	0	1.3	1.3

Regarding the length of stay, the findings suggest that the time spent in a green space is related to the type of green space (Table 5.10). Respondents spent more than 60 minutes in parks (77.5 %), cemeteries (77.6 %) and outdoor sport areas (70.7 %). The majority of respondents were just passing by in terms of road verges (100 %), and wastelands (95.7 %).

Table 5.10: Length of stay in the green space.

Types of green space	N	Just pass (%)	< 30 min (%)	30-60 min (%)	>60 min (%)
Cemeteries	116	2.6	1.7	18.1	77.6
Churchyards	79	17.7	8.9	13.9	59.5
Commonages	65	9.2	10.8	41.5	38.5
Formal parks	80	13.8	0	8.8	77.7
Informal areas	108	50.9	0.9	10.2	38.0
Institutional	118	13.6	61.9	4.2	20.3
Riparian zones	22	5.9	5.9	47.1	41.2
Road verges	180	100.0	0	0	0
Sports areas	82	11.0	0	18.3	70.7
Street trees	98	47.8	49.4	2.2	0.6
Wastelands	94	95.7	4.3	0	0
Woodlands/thicket	54	3.8	5.7	58.5	32.1

5.3.3. Access to urban green space

Not unexpectedly, the estimated distance to different types of green spaces varied, ranging from zero to a maximum of 4 km (Table 5.11). It can be noted from the Table 5.11 that recreational green spaces were typically far from households as parks were 2-4 km (60 %) and outdoor sport areas between 0.5-2 km (45.7 %) away. Road verges were the closest green spaces to peoples' homesteads. Most respondents (69.5 %) stated that wastelands (69.5 %) were between 0.5 - 2 km away from their homes.

Table 5.11: Estimated travel distance from home to different green spaces.

Types of green space	N	<500 m (%)	0.5- 2 km (%)	2 -4 km (%)	>4 km (%)
Cemeteries	103	11.7	15.5	40.8	32.0
Churchyards	78	11.5	47.8	46.5	30.0
Commonages	62	0	53.2	41.9	9.7
Formal parks	80	2.5	25.0	60.0	12.5
Informal areas	12	50	16.7	33.3	0
Institutional	95	20.0	40.0	21.1	18.9
Riparian zones	22	4.5	22.7	59.1	13.6
Road verges	180	83.3	16.7	0	0
Sports areas	92	10.9	45.7	29.3	3.3
Street tree	98	2.0	11.2	51.0	35.7
Wastelands	59	16.9	69.5	8.5	5.1
Woodlands/thicket	76	3.9	32.9	43.4	19.7

Table 5.12 indicates that the majority of green space users did not use transport to access respective green spaces. For example, most respondents were walking to access natural green spaces like riparian zones (95.5 %), commonages (91.9 %) and wastelands (86.4 %) (Table 5.12). Public transport was used to access green spaces such as parks (55.0 %), though a small percentage travelled using private vehicle and bicycle.

Table 5.12: Means of access to different type of green spaces.

Types of green spaces	N	Private vehicle (%)	Bicycle (%)	Public transport (%)	Walking (%)
Cemeteries	103	8.7	1.9	47.6	41.7
Churchyards	78	5.1	0	17.9	76.9
Commonages	62	3.2	1.6	3.2	91.9
Formal parks	80	10.0	0	55.0	35.0
Informal areas	12	8.3	0	8.3	83.3
Institutional	95	10.5	0	36.8	52.6
Riparian zones	22	4.5	0	0	95.5
Road verges	0	0	0	0	0
Sports areas	92	9.8	0	16.3	73.3
Street tree	98	10.2	1.0	61.2	28.6
Wastelands	59	5.1	0	8.5	86.4
Woodlands/thicket	76	18.4	0	2.6	78.9

5.3.4. Preferences for green spaces

As presented in Table 5.13, participants reported various reasons for enjoying or using particular types of green spaces. Men recalled mostly natural green spaces. In Table 5.13 it is shown that male participants preferred commonage as the important green space. In contrast, domestic gardens and institutional green spaces were strongly preferred by female participants. Road verges and wasteland was among the least preferred green spaces by participants in the study towns.

Table 5.13: Choices of most desirable green spaces.

Rank	Type of green space	Rank by females	Reason	Rank by males	Reason
1	Cemetery	4	Important to connect with ancestors	3	Important for memories, spiritual and cultural values
2	Churchyards	3	Used to worship, grow vegetables and areas for children to play	8	Important for worship during important days
3	Domestic gardens	1	Important to grow vegetables, medicinal plants and beautify homesteads	5	Important to grow vegetables and beautify yards
4	Commonages	7	Collection of medicinal plants and wild food	1	Important for grazing, collection of medicinal plants and can be used during initiation season
5	Informal areas	9	Used for socialisation and community meetings	10	Used for social gatherings
6	Institutional	2	Important to grow vegetables and other green spaces are used for recreation	9	Used to grow vegetables and when visiting institutions, they relax in these green spaces
7	Sports areas	5	Used to exercise and relax	4	Enables participants to exercise and relax
8	Parks	8	Enables children to play	6	Important for relaxation and social gatherings
9	Riparian zone	11	Used to harvest medicinal plants and wild foods	11	Used for grazing and collection of medicinal plants
10	Road verges	13	Protect soil and beautify the suburbs	13	Protect soil and prevent t soil erosion
11	Street trees	10	Provide shade when participants are in town	12	Provide shade when participants are in town
12	Wastelands	12	Dump waste	7	Important for grazing and dumping waste
13	Woodlands	6	Collect firewood and medicinal plants	2	Important for collection of trees that are important when they have ceremonies, e.g <i>Olea</i>

5.3.5. Benefits of urban green spaces

Respondents asserted that the benefits of urban green spaces include a healthy environment (50.6 %), and being a place for relaxation and to socialise (31.7 %) (Table 5.14). The least common benefits mentioned were cultural benefits (12.8 %) offered by urban green spaces.

Table 5.14: Benefits of green spaces.

Importance of green spaces	Frequency	Percentage
Create healthy environments	91	50.6
Spaces for relaxation and to socialise	57	31.7
Shade	32	17.8
Access wild plants	31	17.2
Good for grazing	30	16.7
Fuelwood	29	16.1
To educate children about biodiversity	28	15.6
Protects environments	26	14.4
Cultural benefits	23	12.8

5.3.6. Respondent perceptions of green spaces

Different themes emerge when asking the respondents about what they understand by the term “urban green spaces”. The majority of respondents (65.6 %) understand green space as “areas containing plants, trees, grass and wildlife” (Table 5.15). About 5.0 % of respondents define green space as a “clean place that is not polluted”.

Table 5.15: Conceptualisation of urban green space (n=180).

Respondent opinions	Percentage
Areas containing plants, trees, grass and wildlife	65.6
A place for relaxation, leisure and enjoyment	12.2
Clean place that is not polluted	5.0
A place that can be used to grow vegetables	6.6
A place for grazing	10.6

Respondents were asked to indicate the types of areas they considered as green space. From Table 5.16 it can be seen that most respondents identified the different types as green spaces mapped in Chapter 4, other than cemeteries (25 %) and road verges (35 %).

Table 5.16: Types of urban green spaces respondents considered to be green spaces (n=180).

Types of green space	Number of people	Percentage
Cemeteries	45	25.0
Churchyards	113	62.7
Commonages	171	95.0
Domestic gardens	160	88.8
Info recreation areas	100	55.6
Outdoor sport areas	146	81.1
Institutional spaces	81	45.0
Parks	170	94.4
Riparian zone	92	51.1
Road verges	63	35.0
Street trees	114	63.3
Wastelands	116	64.4
Thicket/woodland	159	88.3

The green spaces provide a variety of attractions to green space users. Figure 5.2 indicates that 47.8 % of respondents mentioned that they are attracted to green spaces that have plants. Respondents (29.4 %) also mentioned that the green spaces need to be clean and well maintained. Safety was mentioned by only a small percentage of respondents (2.2 %) as a reason for choosing to visit particular green spaces or avoiding other spaces.

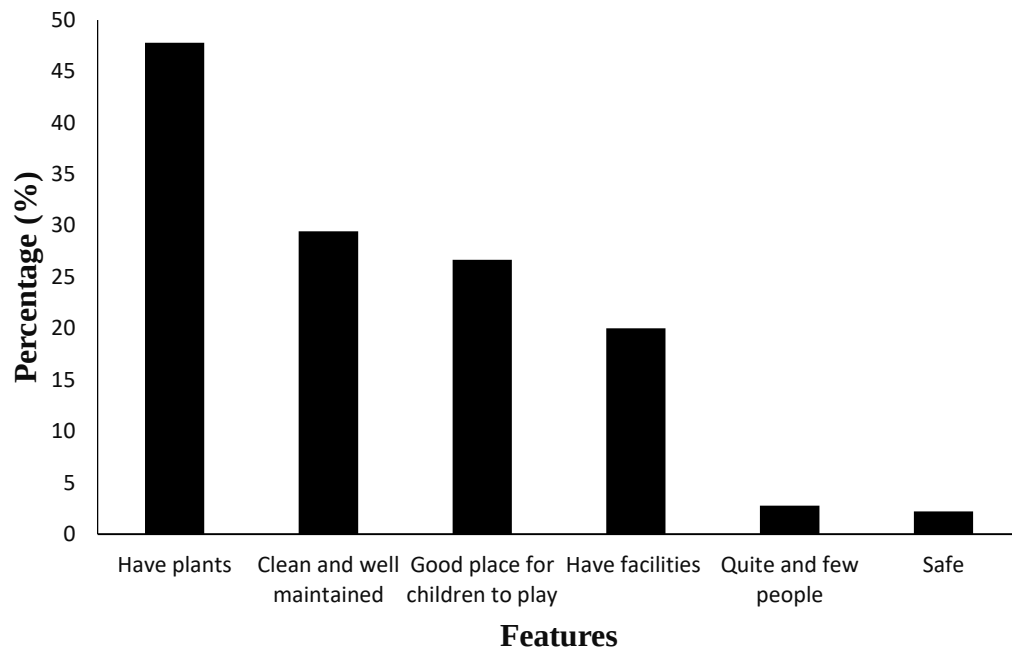


Figure 5.2: Features that attract people to green space.

Although safety was hardly mentioned as an attractor, the most frequently mentioned deterrent to use of green spaces was crime (58.3 %) (Figure 5.3). Another often mentioned deterrent was litter (51.7 %). Dangerous animals (8.9 %) and an absence of trees (2.2 %) were the least mentioned deterrents to use of green space. A number of respondents were concerned about the presence of invasive alien plants (10.6 %) in green spaces.

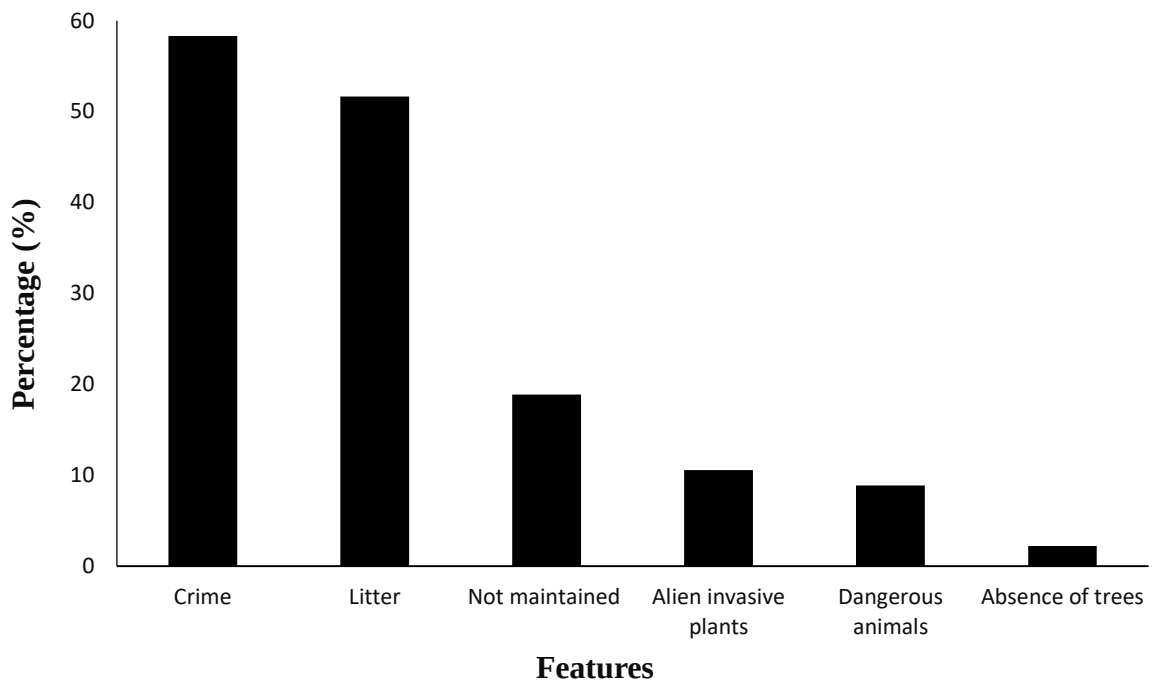


Figure 5.3: Deterrents to use green space.

Table 5.17 summarises respondents' level of agreement with specific statements relating to green spaces within their suburbs. The majority of the respondents (89.5 %) disagreed with the statement "The green spaces in my community are well maintained". About 71.7 % said that they did not feel safe after dark in green spaces. Most the respondents (87.0 %) expressed a negative response with the statement "I am satisfied with green spaces in my community". The majority of respondents (70.0 %) agreed that there are not enough trees in green spaces.

Table 5.17: Respondents' perceptions of green spaces within their suburbs.

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The green spaces in my community are well maintained.	33.9	55.6	5.6	4.4	0.5
The green spaces in my community are too small.	6.7	20.0	3.3	61.7	8.3
Trees in green spaces are not enough.	5.6	15.6	10.0	60.6	8.3
The green spaces in my community are quiet and peaceful.	6.1	30.0	23.9	35.0	5.0
The green spaces in my community are easily accessible.	1.6	12.8	14.4	65.6	5.5
The green spaces in my community allow people to interact with nature.	7.8	38.9	20.6	28.3	4.4
The green spaces in my community have adequate facilities.	20.6	63.3	3.3	11.6	1.1
I feel safe during the day in the green space.	4.4	23.3	7.8	60.0	4.4
I feel safe after dark in the green space.	11.7	60.0	15.6	10.0	2.8
The green spaces in my community are for children to play.	5.0	27.2	17.8	44.4	5.5
The green spaces are important as places for people to meet.	1.7	25.6	23.9	0	4.4
The green spaces are important for the health of people in my community.	6.1	59.4	16.7	16.7	1.1
I am satisfied with green spaces in my community	45.0	42.0	5.5	6.1	1.1

The majority of women (62.6 %) disagreed with the statement “I feel safe after dark in the green space” and they agreed with the statement “I feel safe during the day in the green spaces (61.4 %). The majority of men (70.2 %) agreed that “The green spaces are easily accessible.

Table 5.18: Disaggregation of perceptions of public green spaces within their suburbs by respondent gender.

Gender Statement	Females					Males				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Strongly disagree	Disagree	Neutral	Agree	Strongly
The green spaces in my community are well maintained.	39.8	48.8	5.7	5.7	0	21.1	70.2	5.3	1.8	1.8
The green spaces in my community are too small.	8.1	22.8	2.4	57.7	8.9	3.5	14.0	5.3	70.2	7.0
Trees in green spaces are not enough.	6.5	15.4	12.2	58.5	7.3	3.5	15.8	5.3	64.9	10.5
The green spaces in my community are quiet and peaceful.	6.5	30.1	22.0	35.8	5.7	5.3	29.8	28.1	33.3	3.5
The green spaces in my community are easily accessible.	1.6	13.8	15.4	63.4	5.7	1.8	10.5	12.3	70.2	5.3
The green spaces in my community allow people to interact with nature.	9.8	39.0	17.9	29.3	4.1	3.5	38.6	26.3	26.3	5.3
The green spaces in my community have adequate facilities.	23.6	56.1	4.1	14.6	1.6	14.0	78.9	1.8	5.3	0
I feel safe during the day in the green space.	3.5	17.5	12.3	61.4	5.3	4.9	26.0	5.7	59.3	4.1
I feel safe after dark in the green space.	15.4	62.6	13.8	7.3	0.8	3.5	54.4	19.3	15.8	7.0
The green spaces in my community are for children to play.	4.9	27.6	14.6	48.0	4.9	5.3	26.3	24.6	36.8	7.0
The green spaces are important as places for people to meet.	1.6	22.0	24.4	46.3	5.7	1.8	33.3	22.8	40.4	1.8
The green spaces are important for the health of people in my community.	0.8	17.9	13.8	61.0	6.5	0.6	12.2	9.4	41.7	4.4.
I am satisfied with green spaces in my community	48.0	39.0	4.9	6.5	1.6	38.6	49.1	7.0	5.3	0

Urbanisation was mentioned most by respondents (33.3 %) taking place in natural green spaces such as in commonages and thicket/woodland. The introduction of invasive alien plants (16.6 %) was mentioned as a major change occurring in urban green spaces (Figure 5.4).

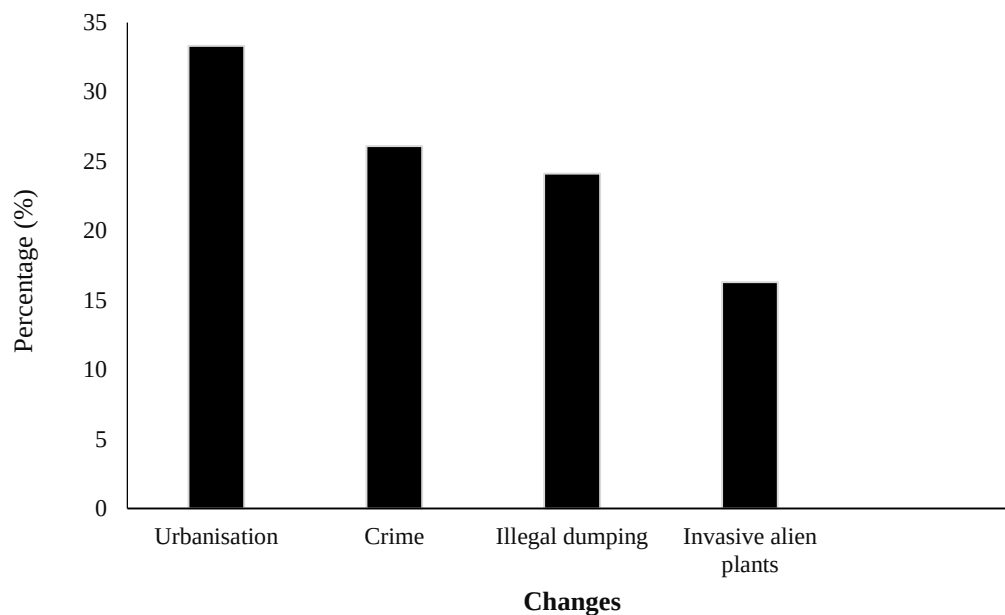


Figure 5.4: Changes observed by respondents in green spaces overtime.

Respondents were asked about what improvement they would like to see in the green spaces (Table 5.18). Many felt that there is a need for fencing (47.2 %) of green spaces. Only a few respondents (12.8 %) mentioned that it is important to involve residents in the management of green spaces.

Table 5.19: Suggested improvements of green spaces.

Type of improvement	Percentage
Fencing	47.2
Improve facilities	26.1
Lights	25.6
Municipality need to maintain	20.6
Security	16.7
Plant trees	13.3
Involve local people in green space management	12.8
Monitor	10.0

5.4. DISCUSSION

5.4.1. Perceptions of urban green spaces by urban residents

The majority of respondents demonstrated a fairly good understanding of and insight into the meaning of green spaces. The specific ways in which these green spaces were thought included both the environmental and social functions. For example, respondents argued that green spaces are areas containing plants, trees, grass and wildlife and “provide healthy environments” (Table 5.15). This is similar to Munien (2016) who showed that in Inanda, KwaZulu-Natal, that urban residents associate green spaces with plants, trees and animals. This parallels M’lkingu et al. (2012) who defined green spaces as semi or natural green spaces with plants and animals. Other respondents mentioned that green spaces are places for relaxation, leisure and enjoyment (Table 5.15). The findings are similar to studies in developing countries such as Latin American countries (Wendel et al., 2012). It was interesting to note that social and environmental functions were defined together in response to questions related to green space concept and benefits. One explanation of the above is that the respondents have rich and different opinions about green spaces.

5.4.2. Use of and access to urban green spaces

The results of this study show considerable differences in the proportion of males and females using particular types of green spaces. For example, of the 12 different types of green spaces, 10 were frequented by more than 40 % of female respondents. The only exceptions were road verges and woodlands/thicket. In contrast, only five of the 12 types were frequented by more than 40 % of the male respondents (Table 5.5). The highest proportion of use by males was for woodlands/thicket, which registered the lowest proportion of female users (excluding road verges which was zero for both genders), whereas the highest for females was informal areas, which was the lowest for males. Many users took advantage of commonages to collect natural resources and of cemeteries for spiritual and religious values (Table 5.4). Informal parks and formal areas were used for leisure and recreation. Although, very few studies provide an understanding of urban green space uses in developing world contexts (Stafford, 2005; Lee and Maheswaan, 2011; Shackleton and Blair, 2013), these findings support Pillay and Pahlad (2015) who reported a gendered dimension of green space use in Durban townships. In a developed country example, Schipperijn et al. (2010) observed that women were the main users of green spaces in Odense, Denmark. The study indicates that each green space attracts users with specific interests. This can be seen as both an opportunity and barrier to green space use. Understanding what a specific green space is used for can play a major role in modification or improving and attracting more users to a particular green space. The study reveals that when the green space does not offer meaningful services to urban residents, a lower percentage of residents make use of it. Therefore, the results of this study call for urban planners and designers to assess how different green spaces are used by urban residents.

This study indicates that men give more emphasis on natural green spaces such as commonages and woodlands while women give more emphasis on domestic gardens and institutional green spaces (Table 5.13). In addition, the preference of natural green space such as commonage by men can be linked to findings of Kepe et al. (2015) who mentioned that men are the main users of the commonages in Eastern Cape because initiation ceremonies are performed in the commonages, and it is also where many keep their livestock. On the other hand, women give more emphasis to domestic and institutional green spaces. The findings are in line with de Vries et al (2003) who found that women tend to spend time near or close to their home environment. The preference of domestic gardens and institutional green spaces

by women can be explained by high levels of unemployment's and they are using these spaces to produce food needed for households' livelihoods.

The study also revealed that many urban residents had to travel more than 2 km to access urban green spaces (Table 5.11). This is concerning because the respondents were from the poorer areas of the study towns, and thus have the least financial means to pay for public or private transport. This corroborates Willemse (2015) who noted that urban residents in poorer suburbs of Cape Town were travelling more than 15 minutes to access nearby green spaces. However, Shackleton and Blair (2013) reported for two towns in the Eastern Cape, that most residents were within 200 m of some green space, although the quality was low in some instances. English Nature recommends urban dwellers should have accessible green spaces 300 m from their homes, while the European Environmental Agency recommends that urban residents have to access green spaces within 15 minutes walking distance of their homes (Barbosa et al., 2007). Given the racial history of South Africa's urban planning, the question of equitable access to urban green space for all urban residents needs to be addressed. It can be noted that many factors may influence access to green spaces. Therefore, distance in this study is one of the reasons for visiting green space. Wendel et al (2012) also mentioned that distance was the major barrier in accessing green spaces in Bolivia.

The vast majority of users access green spaces by walking or public transport (Table 5.12). Use of public transport can be seen as a viable option when travelling with family or young children. Low cost is likely to be the reason for public transport. Wolch (2005) noted that the urban poor depend on public transport because of low wages jobs and single parent families and thus they cannot afford to own or operate a vehicle. The data suggest that other barriers in accessing green spaces may be economic. Although public transport was used in accessing green spaces, many users had concerns over safe walking routes, especially women, many of who mentioned that they did not feel safe at night (Table 5.18). These findings support Willemse (2015) who noted that fear of crime and other safety issues may hinder urban residents to access green spaces in poorer suburbs. Women especially are most likely to feel unsafe in public green spaces (Perry et al., 2008; Wendel et al., 2012).

Safety concerns were expressed by respondents that some green spaces are not safe because they attract criminals and drug dealers. For example, more than 50 % of respondents indicated that they were not using green spaces because of crime (Figure 5.3) Therefore, people's perceptions of security and safety within and around green spaces can act as barrier

to using particular green spaces. Safety concerns are generally feelings of being unsafe in green spaces such as drug users, alcoholics, crime, vagrants and litter (Byrne and Wolch, 2009), and consequently, most urban residents will not use green spaces if they are viewed as unsafe (Schipperijn et al, 2010).

Safety is intimately linked to maintenance and use. Green spaces that are not maintained appeared neglected and attract users who have little respect for the place and its infrastructure, which leads to littering, vandalism and graffiti. Willemse (2015) noted that poor maintenance, lack of facilities and safety were major barriers to using green spaces in poorer suburbs. McConnachie and Shackleton (2010) who noted that green space users are not interested in visiting green spaces that are neglected and unappealing. Respondents mentioned that they prefer green spaces that are close to their homes, with a variety of playing equipment so that children will be safe (Figure 5.2 and Table 5.19). More than 50 % of respondents reported that green spaces were not well maintained in their suburbs (Table 5.17). Effective management, involvement of community members in green space management and lighting are important ways of increasing safety in urban green spaces. In order for green spaces to be used, urban planners and designers need to promote safety of green spaces and involvement of local residents so that they can enjoy the benefits of having green space in local proximity. The study indicates that poor maintenance of green spaces can act as a barrier to use green spaces. Therefore, the study emphasises that green space maintenance is very important to attract users, and that while local participation can be encourage assisting with maintenance, the primary responsibility lies with the local municipalities.

5.5. CONCLUSION

In exploring the influence of demography gender, preferences, use and perceptions of green spaces this study confirms the importance of green spaces to urban residents. It can be noted that urban green spaces offer livelihood, leisure, recreation, cultural and spiritual values to urban residents. However, most of these functions are supplied by different types of green spaces. This stresses the importance of providing a diversity of green space types so to meet these varied needs. However, the majority of residents felt that the urban green spaces in their town generally lack proper and regular maintenance. Safety, security, user interest and

proximity play a critical role in accessing green spaces. The study revealed that urban residents hold a strong attachment to green spaces that were close to their home

CHAPTER 6: Synthesis, conclusions and recommendations

6.1. Introduction

Over the past years research on urban green spaces has focused on topics such as urban green space design, values, perceptions, and more recently, health of users and those living in proximity to urban green space. These examples have generally emerged from cities in global North developed country contexts (Shackleton, 2012; Wendel et al., 2012), and from large metropole and economic hubs. In contrast, the examination of understandings of green space user needs, patterns and perceptions from small towns in a developing world context is limited. This provides a clear rationale for and the value of the research reported in this thesis. Moreover, the integration of interviews, behavioural observation or GIS analysis is limited in urban green space research (Wendel et al., 2012), with much of it still divided between natural and planning science questions on the one hand and more social science questions and methods on the other (Gonzalez-Duque and Panagopolous, 2013).

In an ever more urbanising world the role of urban green space is important to maintain and enhance the quality of life in urban areas (UN-Habitat, 2015). To promote urban green space benefits and uses, it is important to have knowledge of green space users, the ways in which green spaces are used, the perception of green spaces by urban residents, access to green space, types and user preferences with regard to different landscapes (Wendel et al., 2012). Also, insight is needed into the amount and distribution of green spaces (Barbosa et al., 2007) to promote equitable distribution and sufficient area of green space (McConnachie and Shackleton, 2010). The purpose of urban green space for the urban residents needs to be clear and therefore policymakers and urban planners should be knowledgeable about all such green space aspects, as is confirmed by Schipperijn et al (2010: p.31): “It is necessary to have a good insight in who the neighbourhood residents are and what their wishes and preferences are, as well as an insight in how other green spaces in the neighbourhood look and which possibilities they offer”.

In this thesis an assessment of the amount, distribution and use of urban green spaces in small towns of the Eastern Cape were addressed. To accomplish this overall research goal, the researcher identified two objectives, i.e. to determine the types, location and amount of green spaces and to understand how urban green spaces are used, preferred and appreciated by urban residents. As discussed in Chapter 3, the study used a multi-methods approach to

address these research objectives. GIS was used to classify and quantify the types of green spaces across eight small and medium-sized towns while household surveys and focus group discussions were used to understand how green spaces are used by urban residents in three of those towns. This chapter provides a summary of the key findings, conclusions, study limitations, policy implications and future research coming from the study. These policy implications are made based on the researcher's interpretation of the data and insights gained from the study.

6.2. Summary of the results and key research findings in relation to the objectives

6.2.1. To determine the location, amount and types of urban green spaces

To determine the location, amount and types of urban green spaces, historical and recent aerial images were used. All green spaces were digitised and classified into one of 15 types. The area of each town was determined and analysed, which permitted determination of rates of change.

6.2.1.1. Types of green spaces in small towns

The study has argued that classification and understanding of green spaces is important in urban planning. From studying the international literature on green spaces and observing the types of green spaces in the sample of small and medium-sized towns in the Eastern Cape, South Africa, a typology of green spaces was developed. The typology accounted for three separate axes, namely size, tenure and 'formality'. Thus, the different green space types ranged from small to large, from private to institutional to state, and from informal, unplanned and unmanaged spaces to formally designed and managed parks and sports grounds and recreation areas. Importantly, nearly all 15 types were found in every town except for riparian areas in Alexandra and formal parks in Paterson. It is not necessary that every type is represented in every town, but the fact they were shows the comprehensiveness of the typology and its potential utility for other places. Being developed in the international literature, the typology should be applicable not just to small towns in the Eastern Cape but with some adaptation to other small towns in developing countries. The study has produced a picture of small towns as urban area with diversity green spaces.

Differentiating the different types of urban green spaces helps to push forward understandings of green space use because it shows that not all green spaces are the same. Much of the international literature, and that is South Africa, simply talks about urban green space without acknowledging that there are different types which serve different purposes and will therefore have different visitation profiles.

6.2.1.2. Distribution of green spaces

A core finding was that most of the towns had a relatively high proportion of the area under different types of green spaces. The proportion of green space was much higher than many global figures and the mean of 33 % across 100 cities globally reported by Dobbs et al. (2014), which is likely to be a result of this study looking at small towns rather than large cities. The mean area of green space per capita of $86 \pm 31 \text{ m}^2$ was also high in comparison to global targets. The largest green space type by far was commonage, located on the outskirts of each town, and available for people to use for a variety of purposes

Despite the relatively high area of green space the results showed that green spaces generally, and at a finer scale, specific types of green spaces, are not equally distributed within and between towns. In terms of economic status, the lower income residential areas have less urban green space in total, and fewer formal and maintained spaces. This overlaps with the historical zonation, showing that the small towns are shaped by the historical apartheid spatial development which had clear negative impacts on the distribution of urban green spaces. However, this has continued in the post-apartheid period as most of the RDP suburbs have limited formal green spaces.

6.2.1.3. Rate of change

The expansion of built-up areas and the consequent reduction of urban green spaces in this study is consistent with literature on South Africa's urbanisation and international trends in developing countries. As urban areas increase, the allocation of green spaces is threatened by development of grey infrastructure. The increase in grey infrastructure can be attributed to developments of new residential areas, roads and retail services. Thus, whilst the current area of green space is high by world standards, it is declining in the face of urban expansion. If the benefits of urban green spaces are to be preserved in these towns it will require proactive

planning and securing of green spaces for future generations, and open debate on the types and desirable extent required.

6.2.2. To understand how urban green spaces are appreciated, preferred and used by urban residents

In order to assess the social perspectives on the use, preference and appreciation of green spaces within the small towns, this work considered the demographic characteristics of respondents, respondents' uses and perceptions of urban green spaces in the two poorest areas of each town, namely the townships and RDP suburbs. Whilst both a home to poorer urban residents, the former is older and most established during the apartheid period, and the latter is new, and represents the post-apartheid government's attempts to provide housing to poor South Africans.

6.2.2.1. Usage and access of green spaces

The majority of respondents used one or more types of urban green spaces, a clear indication of their importance to the urban residents. Although many urban residents feel insecure about some types of green spaces, their feeling of insecurity does not prevent them from using urban green spaces overall. The results indicated that a greater proportion of women used green spaces than men. The green space usage depends on the user interests. Although there is diversity in terms of green space commonly used by urban residents, one aspect common is that individuals use more than one type of green space for different activities. For example, collection of natural resources, leisure, recreation, spiritual and religious values were most common reasons for using green spaces. Apart from these functions, urban green space is a venue for events and a place where people relax, escape from everyday stress and routine, meet other people, and where children play in a natural environment or semi-natural. The distance to green space was important in determining access. Results revealed that access to green spaces depends on proximity, transport, safety and security. Most of the green spaces in small towns are accessible via pedestrian paths

6.2.2.2. Preferences and benefits of green spaces

The ways in which urban green spaces are used is differentiated by to gender. Women for example, are found to engage more with domestic gardens and institutional green spaces whereas men prefer to use commonages and outdoor sports areas. The conclusion from this study is that urban residents have respect for urban green spaces since they provide them with various benefits. Regarding to green space benefits, although there are variations in terms of green space benefits one thing in common is that green spaces benefits include social, cultural, environmental and health.

6.2.2.3. Perceptions of urban green spaces

The results also showed that there are variations in the perceptions of green spaces according to gender. Females feel more insecure than male respondents. However, the results indicated that more women accessed green spaces compared to men. Although females feel more insecure they see green spaces as important for recreation and collecting natural resources. An interesting aspect of urban green space use and perception in the study towns is the influence of the socioeconomic context. Green spaces in the poorest suburbs are perceived as being poorly maintained less safe, offering fewer leisure facilities and the play and sports equipment is of a lower quality. Thus, it can be concluded that people's perceptions and meanings of urban green spaces are shaped by what green spaces are used for. Safety, security and maintenance concerns were voiced as important issues that need to be considered in green space management

6.3. Conclusion

Since the beginning of democracy in South Africa in 1994 there have been major developmental projects in urban areas. These were part of addressing social and economic inequalities that were so obvious for decades in the South African urban landscape, as well as seeking to accommodate the influx of rural migrants after the racial barriers to urban dwelling were removed. Whilst these developments are providing infrastructure and services to urban dwellers that were often neglected by the authorities, much of the unprecedented urban development comes at a cost to urban greens spaces and biodiversity. The growth of urban areas internationally, and in South Africa, brings changes in the ecological infrastructure and directly affects biodiversity and human quality of life (Haarland and van den Bosch, 2015).

Whilst such urban development cannot be halted, it should be guided by sound planning, best international practices and accommodating local needs and visions to ensure that human quality of life is not undermined. This is even more important in poorer urban areas where often the poor lack voice or a sympathetic ear to ensure that their needs and concerns are addressed. Any planning must be accessible to all urban citizens and be founded on their needs rather than the planner's views and preferences, which is often not the case (Broussard et al., 2008; Gwedla and Shackleton, 2015). The use of GIS tools makes it easier to plan, but also easier to forget who the plan is required to serve. This study particularly highlights the value of GIS techniques in understanding urban green spaces. Making these techniques more participatory is a new frontier in urban planning (Balram and Dragi'cevi, 2005). Therefore, there is a need for urban planners and designers to understand how urban green spaces are distributed.

It should be noted that urban green spaces provide a range of benefits in various forms and offer a variety of opportunities to urban residents (Jim and Chen 2006). They reinforce the identity of urban areas which can enhance living and working. The study paid attention to gender, it is necessary for urban planners and policymakers to include gender preferences in green space planning. There are urban spaces where women feel unsafe, but men feel safe and there are green spaces that women use more than men. Therefore, differential experience of green spaces is not neutral (Pillay and Pahlad, 2014). Although the urban land question has been widely conceived in terms of challenges of housing and informal settlements, the access and use of green spaces is becoming recognised by urban residents (Shackleton et al., 2015). Future urban planning should pay attention to the importance of equal access to green spaces across wealth, gender, disability and other social stratifications; all urban residents deserve equal access to green spaces. The spatial analysis shows that small towns possess a diversity of both private and public urban green spaces types. However, the extent of private green spaces are limited in the poor areas (McConnachie and Shackleton, 2010), which means there is a greater need for public green spaces in these areas, which is currently not the situation (McConnachie and Shackleton, 2010; Kuruneri-Chitepo and Shackleton 2011, Shackleton et al., in press). Most of these facilities are located close to affluent residential areas and are accessible via pedestrian paths. However, the findings show that recreational green spaces lack proper maintenance, also reported by Shackleton and Blair (2013), also working in the Eastern Cape. Whilst planners need to consider the interests of green spaces users to reduce fear of crime and other related problems that might influence the usage of green spaces, local

authorities need to have the vision, plans and budgets to maintain public green spaces so they are attractive and useable. If not they become underused and undesirable areas with no champions if plans were made to convert them to built infrastructure.

From this study, it can be argued that green spaces should not be seen as ‘left over’ spaces that have not yet been developed within an urban area, but rather as spaces which support and provide ecosystem services in urban areas that benefit urban residents through providing them with better surroundings in which to live and work and hence to enjoy a better quality of life. Proper planning and maintenance can improve the quality and quantity of the ecosystems services provided. South Africa’s history of apartheid urban planning is an important factor throughout the study and affects many issues that are related to green space usage and accessibility.

6.4. Limitations of the study

The quality of GIS data output information is primarily determined by quality of GIS data input (Sternberg and Sternberg, 2015). Evaluating data input is therefore essential. Data quality can be evaluated in terms of accuracy. Accuracy refers to the degree with which recorded data positions and their attribute represent the true or real world. In this study the data quality limitation was encountered, especially for historical images. For some images the resolution was not clear and was not georeferenced. Data quality was further limited by not finding the up to date aerial images. However, ground-truthing was used to verify the aerial images. Secondly, because of the financial and time constraint, the researcher could not afford to conduct the surveys in all the towns for which GIS analyses were conducted. Nonetheless, the results in Chapter 5 are believed to be broadly applicable to the other small towns in the region. Lastly, the approach used qualitative approaches to assess urban residents stated uses and preferences for urban green spaces. This was not triangulated by actual observations of what those residents did or not with respect to greens space use. Thus, I have no means of verifying the stated responses by actual practices. However, comparison of the findings to other studies from the region and more widely do lend credibility to the results.

6.5. Policy implications and recommendation

Recommendations that can be given to green space designers and policy makers are related to the diversity of green spaces and diversity of users and uses, their equitable distribution, quantity, safety and maintenance issues. This study has highlighted the diversity of green spaces that are typically available in small towns of a developing world country. The typology that is presented here will help to provide a more complete picture to policymakers and urban designers about the diversity of green spaces and how these green spaces are used.

A second point of improvement that appears from this study is the unequal distribution of urban green areas in small towns. The affluent suburbs are known to be much greener than RDP and township suburbs, since the urban planning is influenced by apartheid spatial planning and zonation in South Africa, this is a good indicator of spatial segregation and social exclusion. Poorer suburbs in the extreme parts of the small towns hardly have greenery. These require urgent redress.

A third point is related to the quantity of green space available per town and per suburb. This means that urban planners need to have guidelines on how much space she or he needs to plan for each suburb in an integrated manner. Public green spaces are not adequate in poorer suburbs. The majority of urban residents live in RDP/township suburbs who do not have immediate access to recreational space, either because the existing spaces are too far, or not present. Consequently, I recommend that guidelines be developed by the provincial government with respect to the total area of public urban green space per person and the maximum distances away from work and residential areas. Once gazetted they should be widely publicised.

A fourth recommendation relates to the need for municipal authorities to embrace urban greens spaces as vital for the wellbeing of urban residents, and consequently they should have proper plans and budgets for the regular maintenance of formal urban green spaces. This can be guided by participatory forums in terms of what types of services residents would like in particular public green spaces. Authorities can also engage local residents to participate in the upkeep and maintenance of particular green spaces and ensure that they are safe spaces for all. Therefore, there is a need for more comprehensive and current monitoring of existing green spaces due to continuing threats from development and mismanagement of waste.

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Appendices

Appendix A: Households surveys



Household surveys

Date of survey..... Name of township/RDP..... Questionnaire no.....

Research project title: An assessment of amount, distribution and use of urban green spaces in small towns of the Eastern Cape

The research project is conducted by Denis, S. Radebe, student no 07r3489 who is a postgraduate student at Rhodes University, Grahamstown. The aim of the research project is to understand how urban green spaces are appreciated, valued and used by urban residents. This study seeks to contribute to the body of knowledge that will inform policy recommendations for urban planning.

For any queries I can be contacted by email at g07r3489@campus.ru.ac.za. You can also contact my supervisor Prof C. Shackleton at c.shackleton@ru.ac.za and Prof Michelle Cocks (m.cocks@ru.ac.za) at Rhodes University, Department of Environmental Science.

A. Understanding of green space

A1. What do you understand by the term urban green space?

A2. What do you consider green space to be? (Please tick all boxes that apply)

- | | | |
|--|--|---|
| ☐ Woodlands | ☐ Cemeteries | ☐ Commonages |
| ☐ Domestic gardens | ☐ Informal recreation areas | ☐ Churchyards |
| ☐ Street trees | ☐ Wastelands | ☐ Outdoor sport area |
| ☐ School/Hospital/Institutional green space | ☐ Other | |

A3. Do you think green spaces are important? ☐ Yes ☐ No

A4. why?

B. Access and use of green spaces

B1. How far away is the closest green space?

☐ <500m ☐ 500m-1 km ☐ 1-2km ☐ > 2km

B2. Is there enough green space in:

Your area ☐ Yes ☐ No ☐ Don't know

Your town ☐ Yes ☐ No ☐ Don't know

B3. Do you think green spaces are in equal abundance in all parts of the town?

☐ Yes ☐ No ☐ Don't know

B4. If no, which part of the town has the most and which part has the least green spaces?

B5. Do you have green space at home?

☐ Yes ☐ No

B6. If yes, what proportion of green space in relation to the size of your property?

☐ <10% ☐ 10-30% ☐ 31-50% ☐ >50%

B7. If yes, what are the main uses of that space? (Please tick all boxes that apply).

☐ Gardening ☐ Entertainment ☐ Aesthetics ☐ Provide food ☐ Other

Types of green space	B8. Do you visit? Yes/No	B9. How often?	B10. What are your preferred visit times?	B11. How far do you travel from home to green space?	B12. Whom do you usually go with to green spaces?	B13. What mode of transport do you use when visiting green space?	B14. What do you use green spaces for?	B15. How long do you usually stay?
Domestic gardens								
Road verges								
Street trees								
Informal recreation areas								
Parks								
Wastelands								
Churchyards								
School/Hospital/Institutional green spaces								
Outdoor sport areas								
Woodlands								
Riparian zone								
Commonages								
Cemetery								
Other								

Codes

B9. 1=Daily	B10. 1=Mornings	B11.1 =Less than 500m	B.12 =Alone	B13.1 =Private vehicle	B14. 1=Recreation and leisure	B15.1 = Just pass through
2=More than 1 per week minutes	2=Middays	2=500m-2km	2= Friends	2=Bicycle	2=Collect natural resources	2=Less than 30
3=One to two times per month	3=Evenings	3=2-4km	3=Partner	3=Public transport	3=Cultural values i.e including ceremonies	3=30-60 minutes
4= Every 2-3 months minutes	4=Anytime	4=More than 4km	4=Family	4=Walking	4=Spiritual and religious values i.e pray or reflect	4=More than 60
5=Yearly		5=Children	5=Other	5=Share local knowledge or educate		

C. Perceptions and Benefits of urban green

C1. Where would you like green space to be located? (Tick any)

☐ Close to my house

☐ In the community

☐ Anywhere in town

C2. What attracts you to specific green spaces?

C3. What don't you like about the green spaces in your town?

C4. Please rate the level of agreement with regards to perceptions.

Strongly agree (SA), Agree (A), Neutral (N), Disagree (D) and Strongly Disagree (SD)

	SA	A	N	D	SD
The green spaces in my community are well maintained.					
The green spaces in my community are too small.					
Trees in green spaces are not enough.					
The green spaces in my community are quiet and peaceful.					
The green spaces in my community are easily accessible.					
The green spaces in my community allow people to interact with nature.					
The green spaces in my community have adequate facilities.					
I feel safe during the day in the green space.					
I feel safe after dark in the green space.					
The green spaces in my community are for children to play.					
The green spaces are important as places for people to meet.					
The green spaces are important for the health of people in my community.					
I am satisfied with green spaces in my community					

C5. In the time that you have been a resident of this area have you noticed any changes in green spaces?

☐ Yes

☐ No

C6. If yes, what changes are you noticing?

C7. What can be done to improve the quality of the experience of the urban green spaces in your area?

C8. Are there any additional comments you would like to make about green spaces?

D. Demographic profile of respondents

D1. Gender ☐ Female ☐ Male

D2. How old are you? _____

D3. How many family members live in your home? _____

D4. What is your highest level of education completed? _____

D5. What is your employment status?

☐ Full-time employed

☐ Part-time employed

☐ Retired

☐ Self-employed

☐ Unemployed

☐ Student

D6. How many adults are employed? _____

D7. What is your main source of household income?

☐ Salary/wage

☐ Social grants

☐ Remittances

☐ Selling goods

☐ Other

D8. How many family members receiving government grants? _____

D9. How many rooms are there in the house? _____

D10. How much do you spend on electricity per month? _____

D11. How long you have been living in this part of town? _____

D12. Where did you grow up?

☐ Town

☐ Township

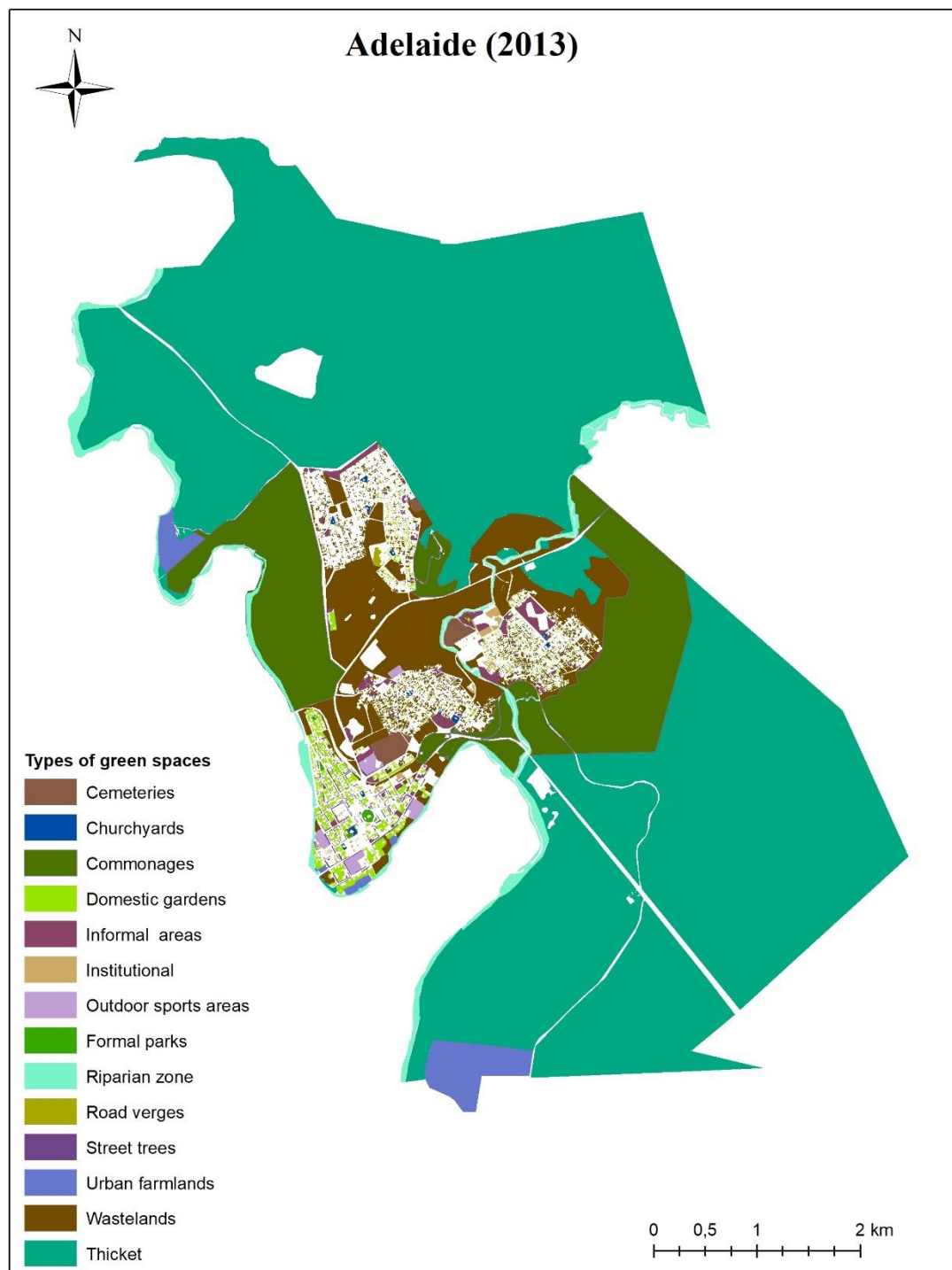
☐ Farm

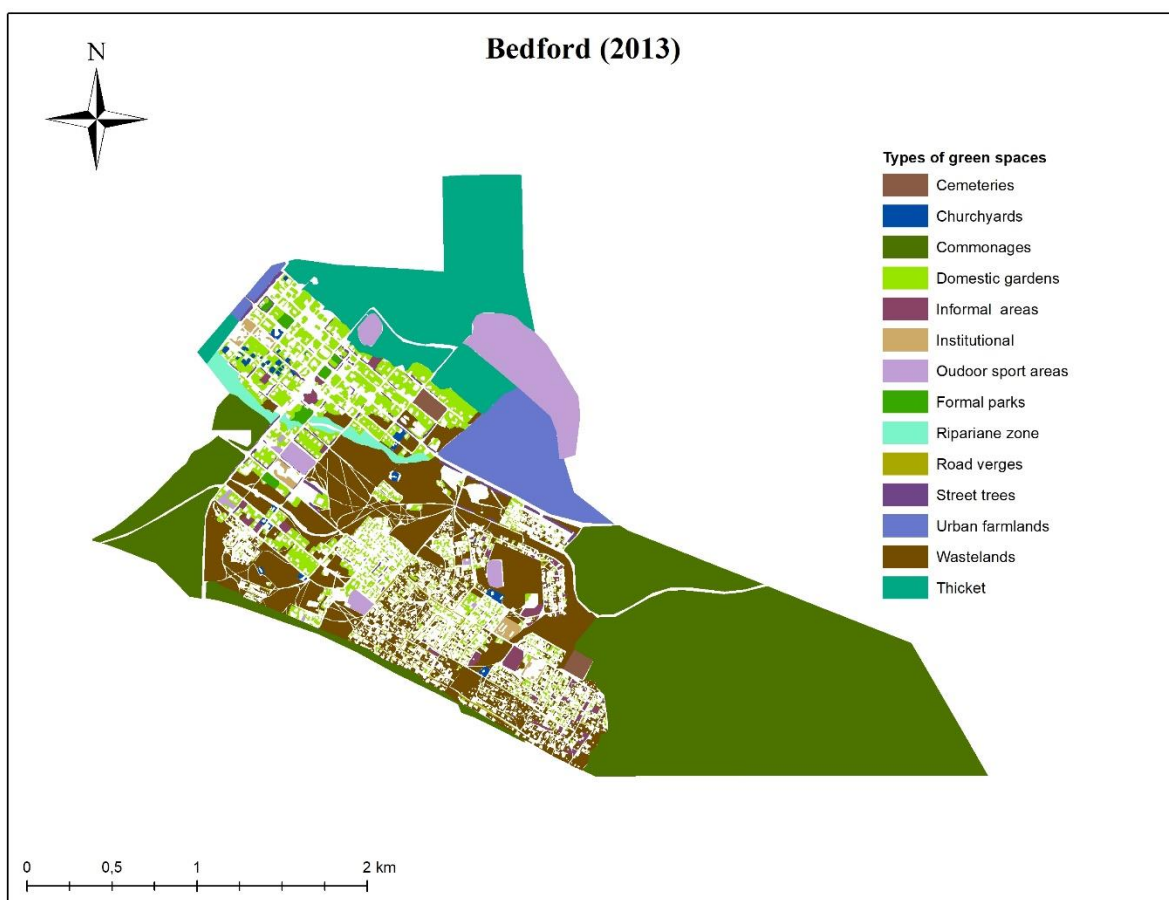
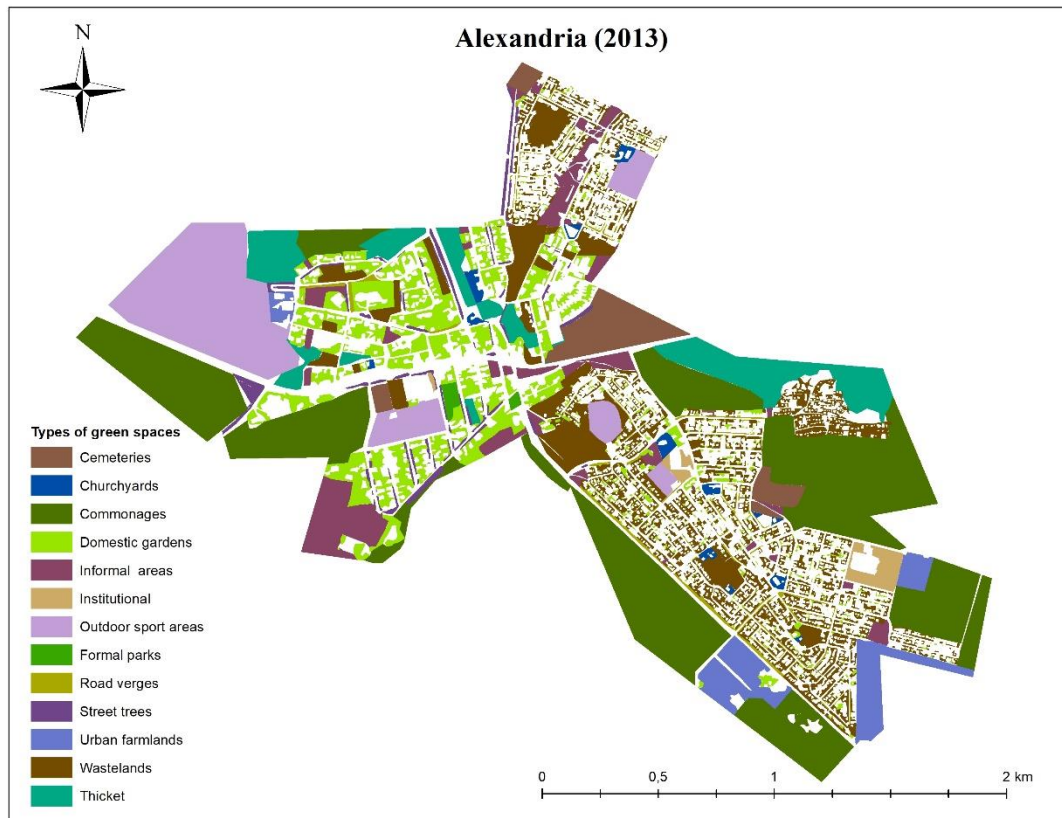
☐ Village

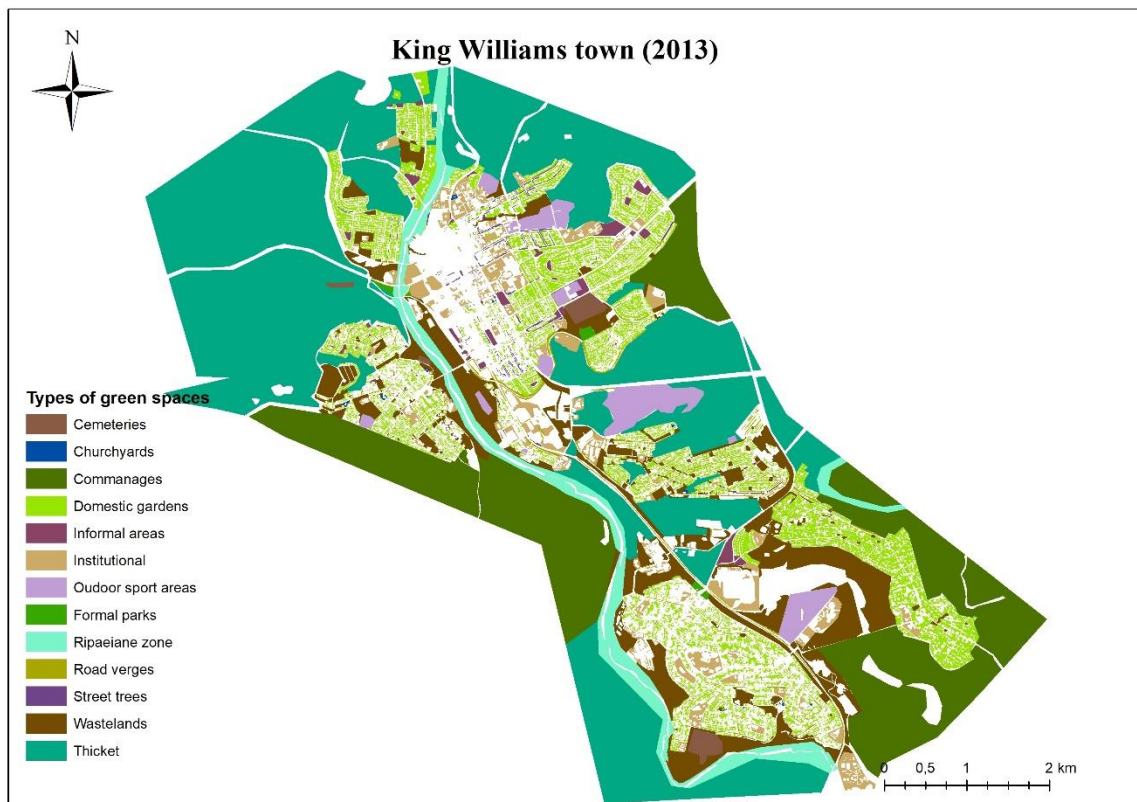
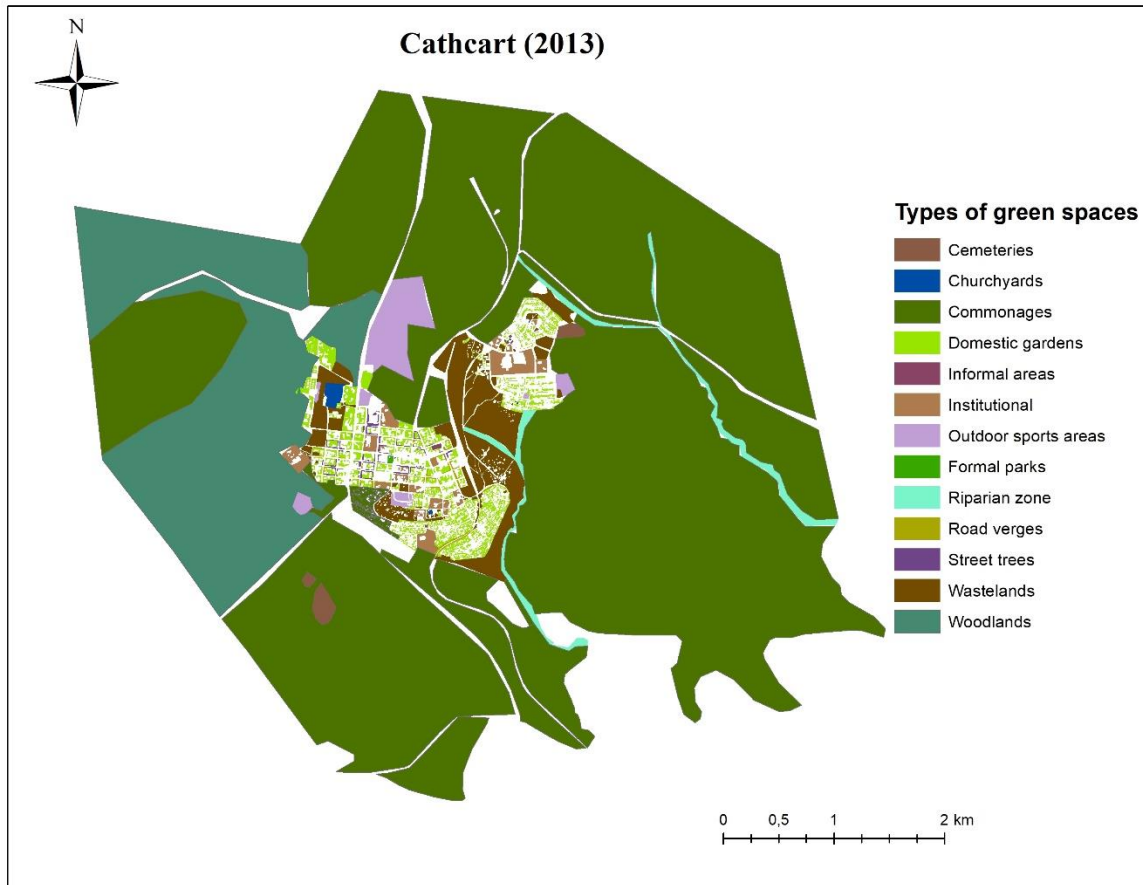
D13. What is your home language? _____

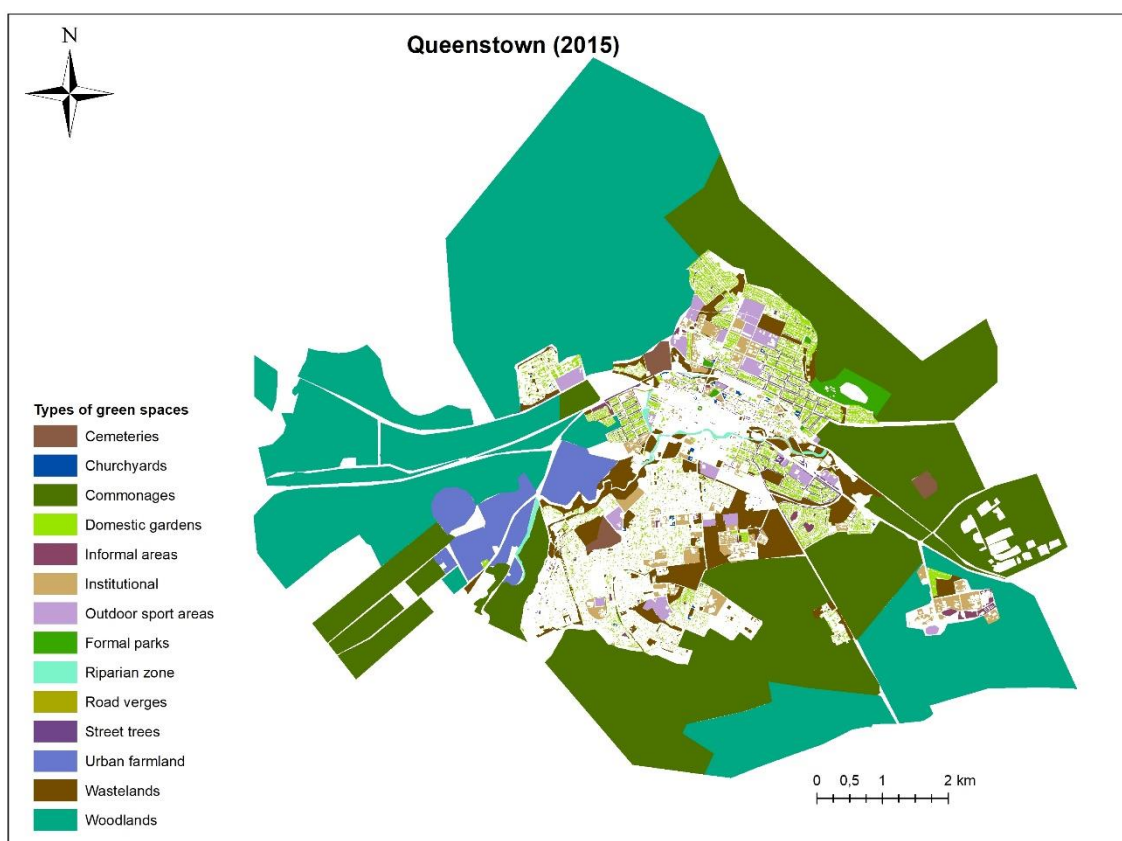
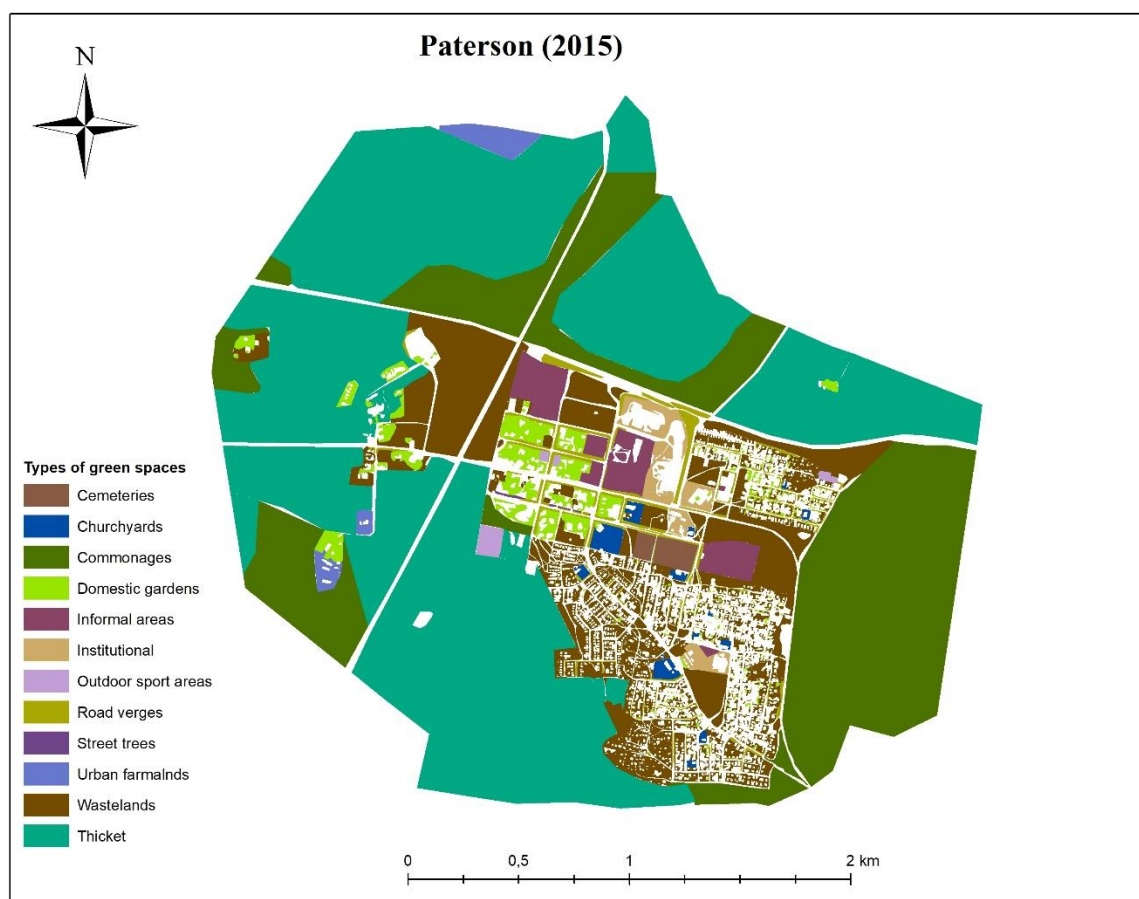
Thank you very much for your participation!

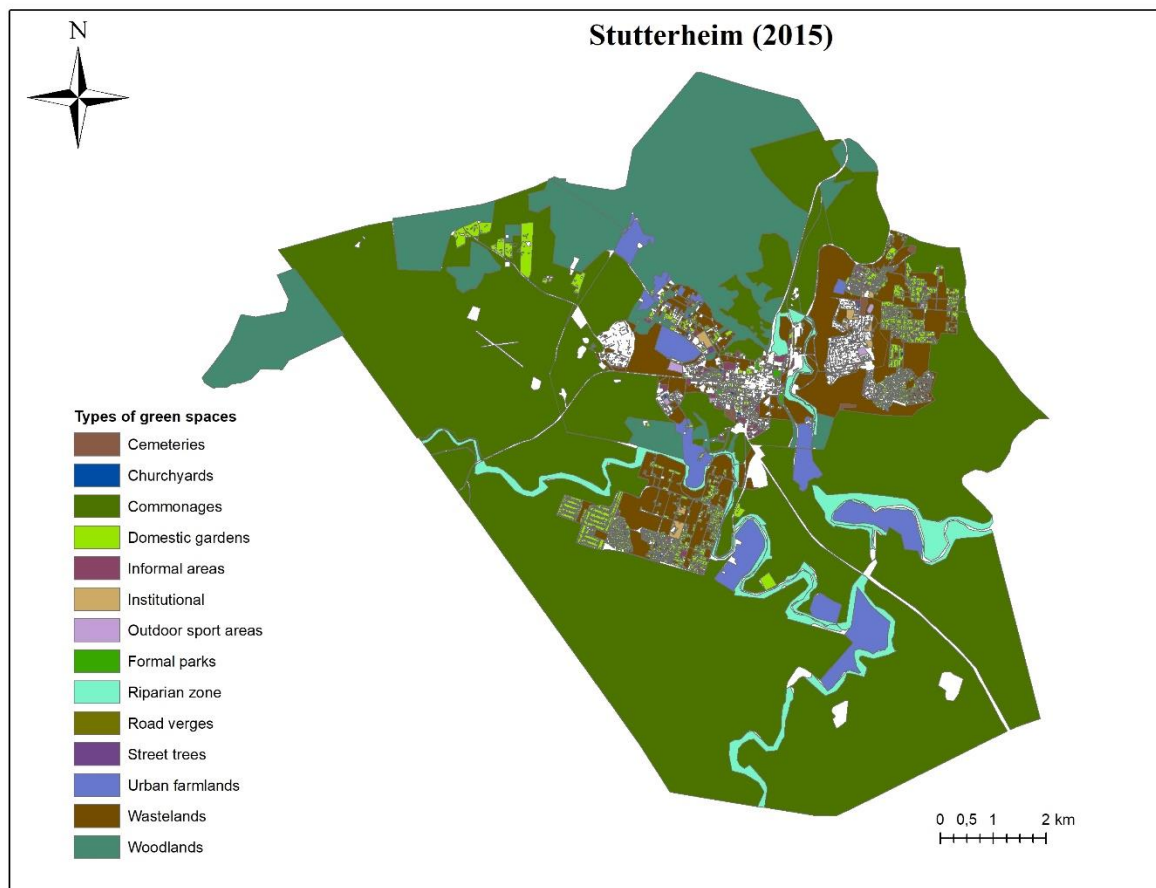
Appendix B: Latest maps of study towns



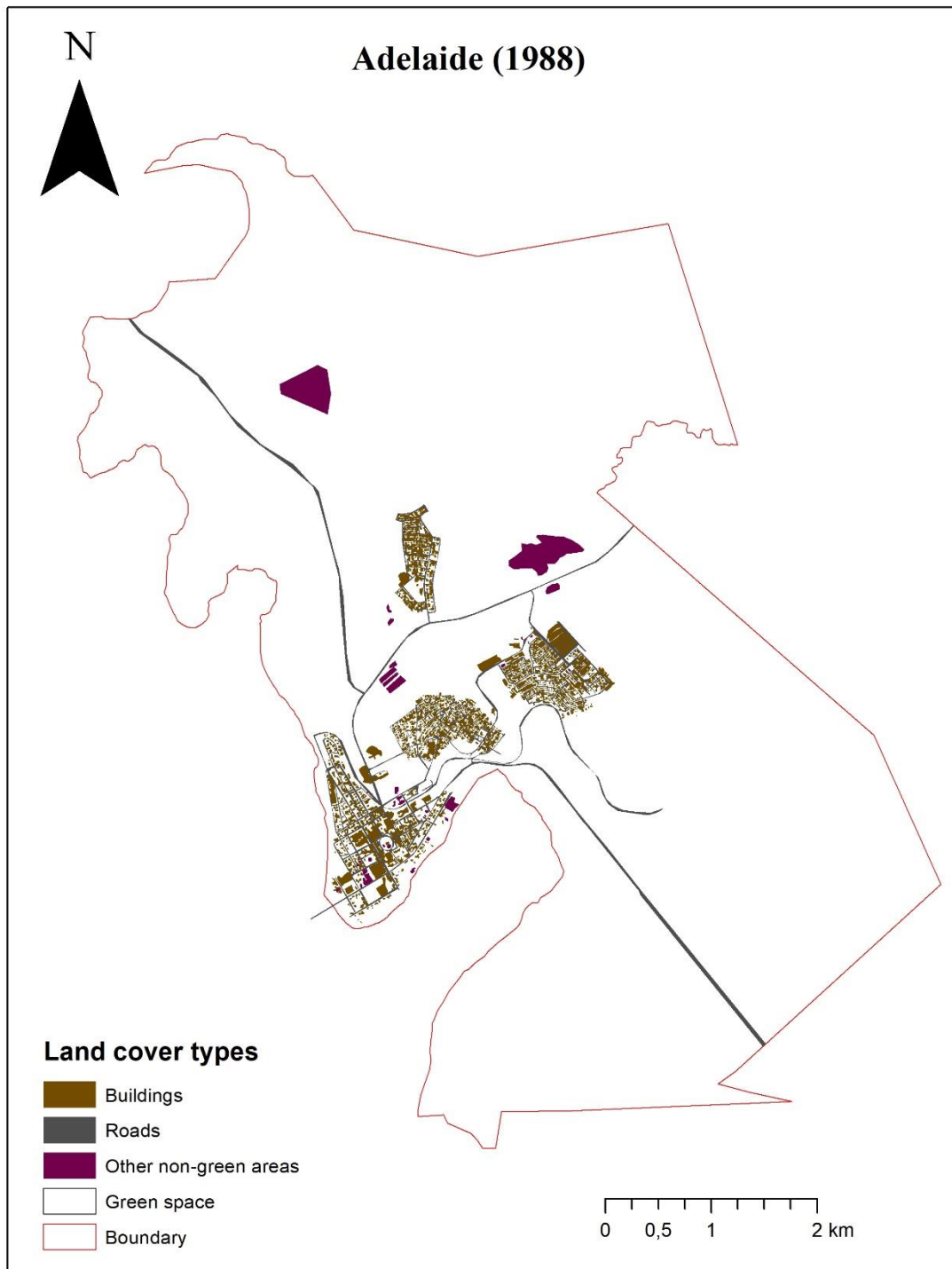


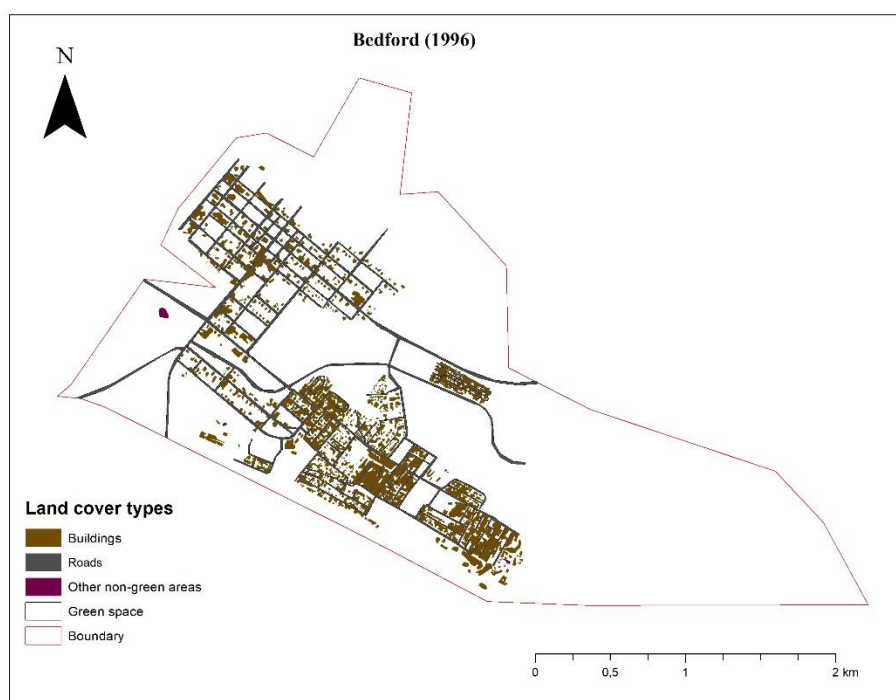
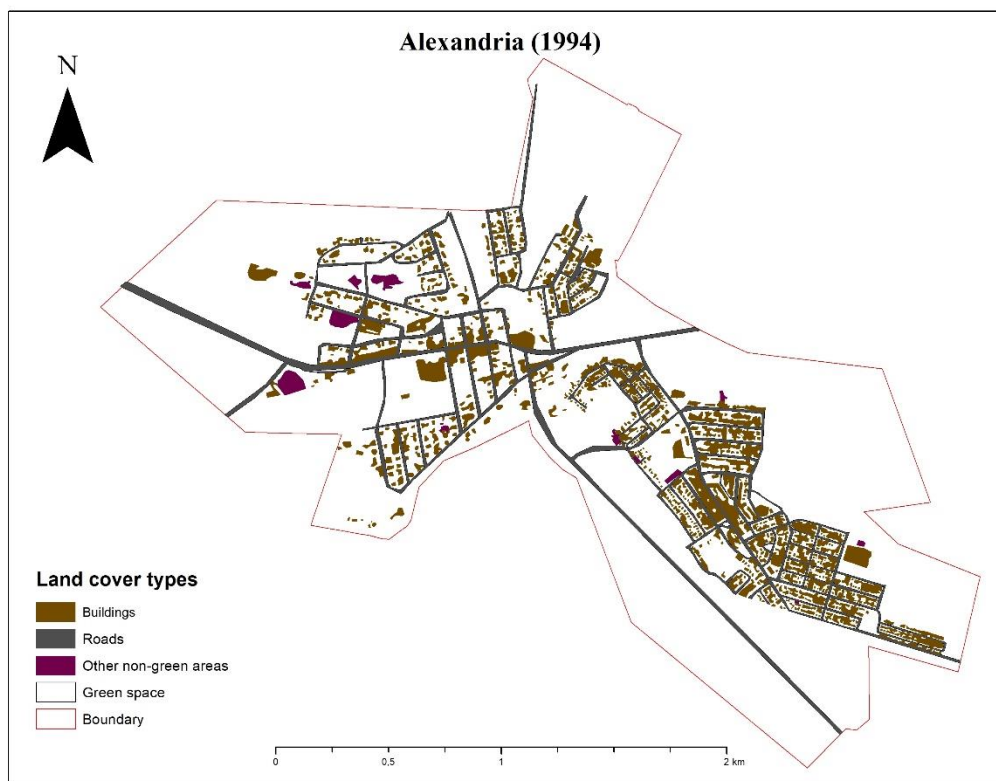


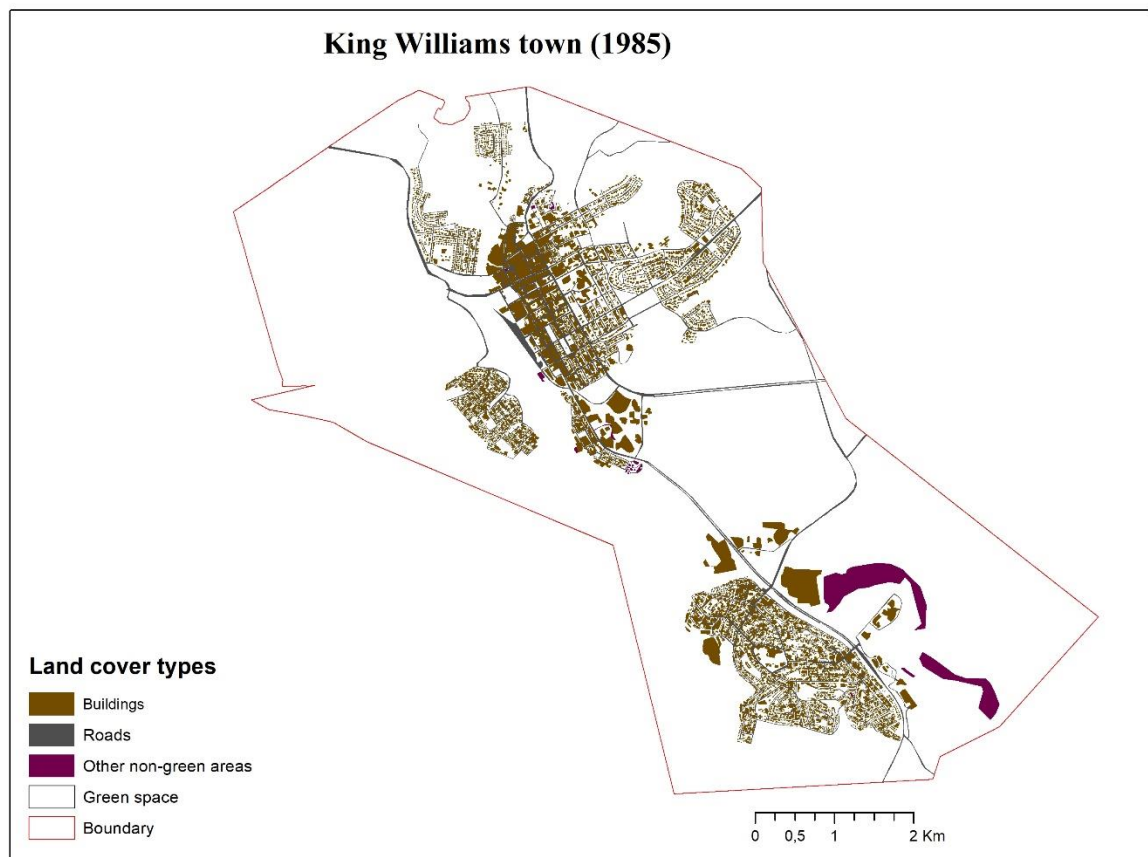
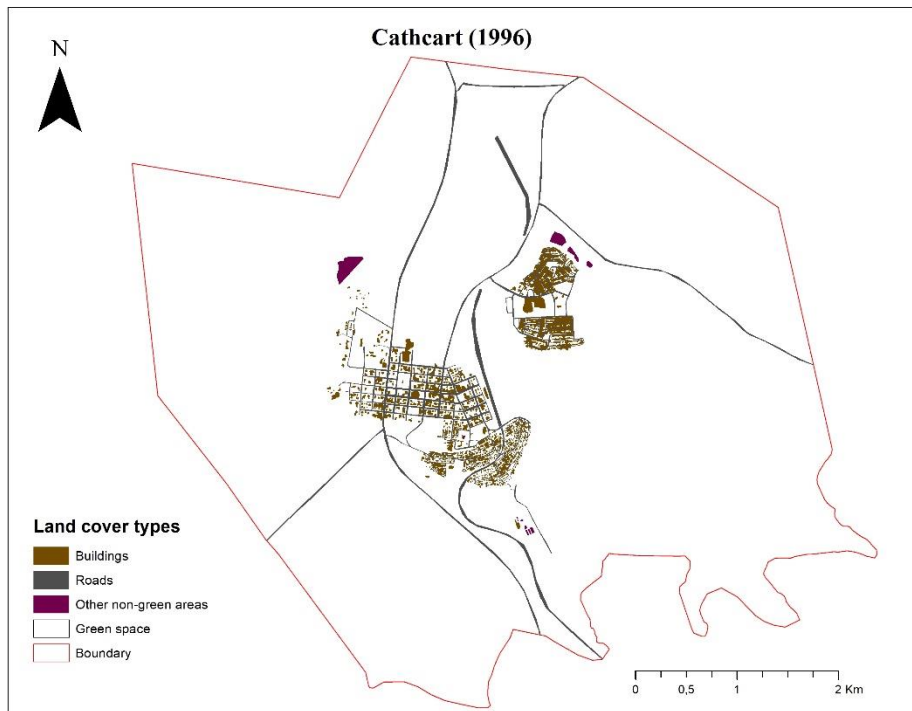


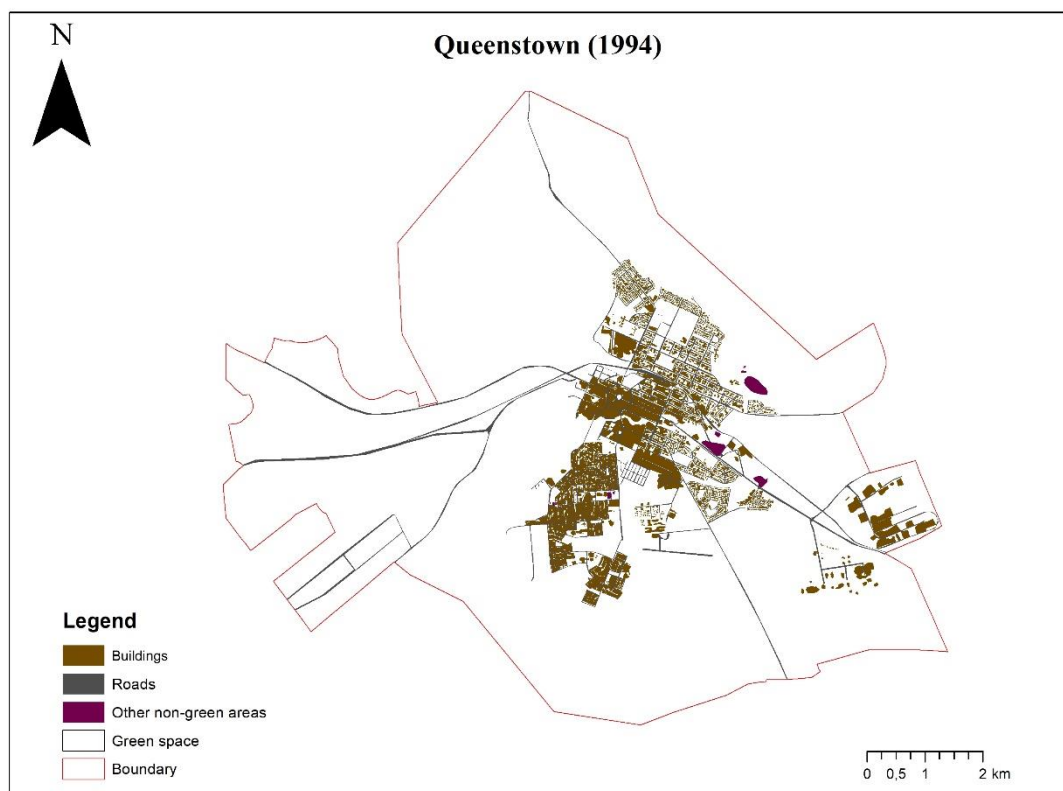
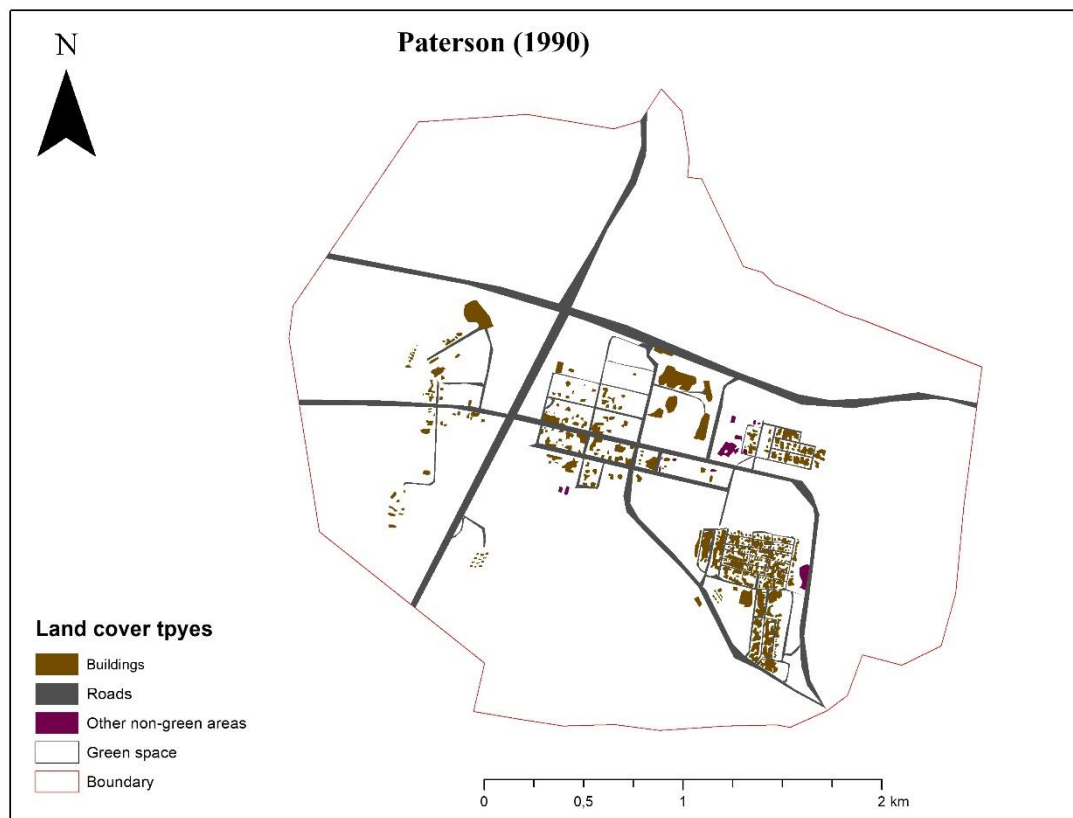


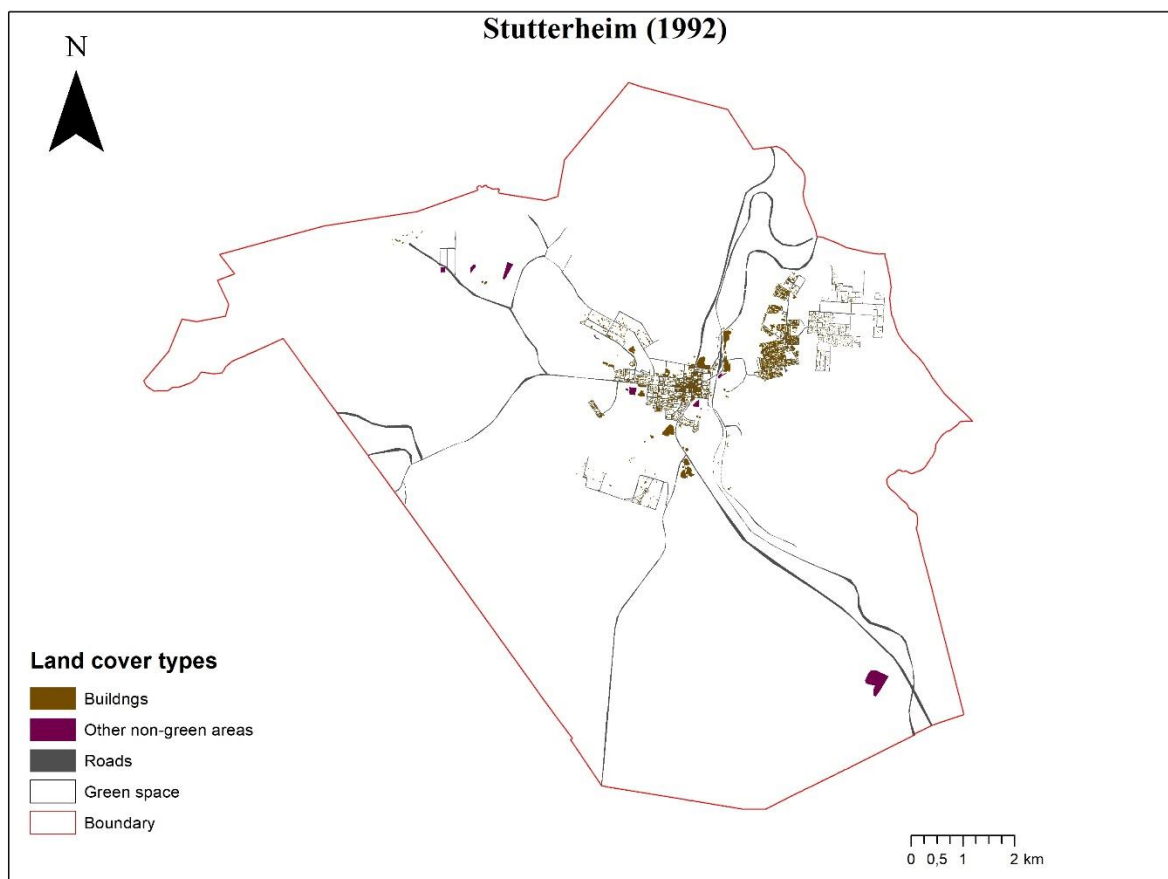
Appendix C: Historical maps











Appendix D: Coordinates of green spaces sites examined in this study

Town: Adelaide

Type of green space	Site no	Y(DD)	X(DD)	Types of green space	Site no	Y(DD)	X(DD)
Domestic gardens	1	-32.70022	026.28988	Street trees	1	-32.70687	026.29878
	2	-32.69917	026.29040		2	-32.70824	026.29463
	3	-32.71342	026.29323		3	-32.71111	026.29439
	4	-32.70966	026.29699		4	-32.70109	026.29103
	5	-32.70676	026.29903		5	-32.70724	026.29850
	6	-32.68829	026.30241	Formal parks	1	-32.71324	026.29234
	7	-32.69959	026.30626		2	-32.70734	026.29865
	8	-32.68829	026.31094		3	-32.70609	026.29926
	9	-32.69490	026.31632		4		
	10	-32.69397	026.31715		5		
Road verges	1	-32.69330	026.31746	Churchyards	1	-32.69941	026.30477
	2	-32.69601	026.31384		2	-32.69846	026.30548
	3	-32.69494	026.31256		3	-32.69204	026.31372
	4	-32.70530	026.29844		4	-32.69756	026.30087
	5	-32.70613	026.29940		5	-32.70940	026.29433
Informal areas	1	-32.69490	026.31632	Outdoor sport areas	1	-32.69307	026.30690
	2	-32.69633	026.31346		2	-32.69119	026.31350
	3	-32.69676	026.30162		3	-32.69255	026.31379
	4	-32.70441	026.29597		4	-32.70412	026.29588
	5	-32.70342	026.29888		5	-32.71141	026.29571
Wastelands	1	-32.69757	026.28801	Riparian zone	1	-32.70536	026.29002
	2	-32.68798	026.31001		2	-32.70536	026.29041
	3	-32.69591	026.30609		3	-32.71339	026.29000
	4	-32.69510	026.31665		4		
	5	-32.69556	026.31607		5		
Institutional	1	-32.69599	026.30638	Cemeteries	1	-32,8527	026.31396
	2	-32.69027	026.30933		2	-32,69222	026.30503
	3	-32.71057	026.29067		3	-32,70101	026.29962
	4	-32.70792	026.29612	Urban farmland	1	-32,68975	026.31681
	5	-32.70755	026.29397		2	-32,71342	026.28951
Woodlands	1	-32.68366	026.31595	Commonages	1	-32.68944	026.31779
	2	-32.68201	026.30881		2	-32.69708	026.31465
	3				3	-32.68744	026.30674
	4				4	-32.68827	026.30300
	5				5		

Town: Alexandria

Type of green space	Site number	Y(DD)	X(DD)	Types of green space	Site number	Y(DD)	X(DD)
Domestic gardens	1	33.64963	026.41094	Commonages	1	33.64563	026.41955
	2	33.65697	026.40520		2	33.64706	026.41880
	3	33.65397	026.41752		3	33.66668	026.42532
	4	33.65820	026.40785		4	33.66174	026.43289
	5	33.65838	026.40596		5	33.66658	026.42327
Road verge	1	33.64523	026.41866	Street trees	1	33.64729	026.41561
	2	33.64582	026.41648		2	33.65442	026.40520
	3	33.64851	026.41524		3	33.65844	026.40808
	4	33.66684	026.42564		4	33.65767	026.40773
	5	33.66035	026.42622		5		
Informal area	1	33.64683	026.41508	Formal parks	1	33.64836	026.4046
	2	33.64893	026.41577		2	33.65118	026.4140
	3	33.66048	026.42837		3	33.65309	026.40454
	4	33.65389	026.41781		4		
	5	33.66560	026.42269		5		
Wastelands	1	33.64389	026.41501	Churchyards	1	33.65686	026.40755
	2	33.66130	026.43338		2	33.90032	026.42007
	3	33.65553	026.41588		3	33.66242	026.41425
	4	33.66090	026.42152		4	33.66019	026.42432
	5	33.65584	026.41209		5	33.65208	026.41091
Institutional	1	33.64893	026.41543	Outdoor sport areas	1	33.64632	026.41915
	2	33.65064	026.40212		2	33.66126	026.43065
	3	33.66099	026.42894		3	33.65556	026.41679
	4	33.65396	026.40785		4	33.65655	026.40750
	5	33.65819	026.42096		5	33.65183	026.40235
Woodlands	1	33.64839	026.41393	Riparian zone	1	33.64738	026.41492
	2	33.65194	026.41199		2	33.67367	026.43393
	3	33.65415	026.41945		3	33.65506	026.41012
	4	33.64940	026.40717		4		
	5				5		
Commonages	1	33.64793	026.41204	Cemeteries	1	33.64304	026.41301
	2	33.68671	026.42952		2	33.65831	026.42366
	3				3	33.65536	026.40603
	4				4		
	5				5		

Town: Bedford

Type of green space	Site number	Y(DD)	X(DD)	Types of green space	Site number	Y(DD)	X(DD)
Domestic gardens	1	32.67371	026.08581	Commonages	1	32.69836	026.10072
	2	32.67518	026.08629		2	32.68958	026.08074
	3	32.67843	026.09092		3		
	4	32.68999	026.08280		4		
	5	32.69151	026.08586		5		
Road verge	1	32.68957	026.09322	Street trees	1	32.68317	026.08335
	2	32.69700	026.10225		2	32.68351	026.08399
	3	32.69570	026.10173		3	32.68216	026.08558
	4	32.69597	026.09989		4	32.67564	026.08685
	5	32.68765	026.09110		5	32.67971	026.09357
Informal area	1	32.68116	026.08718	Formal parks	1	32.68987	026.08769
	2	32.68683	026.08889		2	32.68102	026.08664
	3	32.69157	026.09997		3	32.67838	026.08769
	4	32.69173	026.10136		4		
	5	32.09016	026.08586		5		
Wastelands	1	32.68996	026.08845	Churchyards	1	32.67530	026.08526
	2	32.69173	026.08937		2	32.67659	026.08503
	3	32.69290	026.09958		3	32.69046	026.08814
	4	32.68175	026.08384		4	32.69494	026.09991
	5	32.69161	026.08775		5	32.68973	026.08838
Institutional	1	32.68996	026.08845	Outdoor sport areas	1	32.68433	026.08622
	2	32.68415	026.08486		2	32.67652	026.09738
	3	32.69250	026.09843		3	32.69074	026.09836
	4	32.69466	026.09987		4	32.68908	026.08360
	5	32.69173	026.08937		5	32.69334	026.09919
Woodlands	1	32.67472	026.08917	Riparian zone	1	32.68148	026.0889
	2				2	32.67823	026.09254
	3				3	32.67842	026.09482
	4				4		
	5				5		
Urban farmlands	1	32.69737	026.10529	Cemeteries	1	32.69472	026.10324
	2	32.68139	026.09506		2	32.67669	026.09293
	3	32.6767481	026.08334		3		
	4				4		
	5				5		

Town: Cathcart

Type of green space	Site number	Y(DD)	X(DD)	Types of green space	Site number	Y(DD)	X(DD)
Domestic gardens	1	32.29837	027.13805	Commonages	1	32.30613	027.13936
	2	32.29549	027.13747		2	32.28533	027.15535
	3	32.29144	027.13810		3	32.28789	027.16725
	4	32.29637	027.14125		4	32.28685	027.16319
	5	32.29601	027.14639		5		
Road verge	1	32.30015	027.14243	Street trees	1	32.29996	027.13992
	2	32.29810	027.14534		2	32.29888	027.13879
	3	32.28703	027.16142		3	32.29762	027.13943
	4	32.28701	027.16022		4	32.29829	027.14544
	5	32.29878	027.15098		5	32.30241	027.15270
Informal recreation area	1	32.28717	027.15435	Parks	1	32.29860	027.14546
	2	32.28642	027.15879		2		
	3	32.29430	027.15811		3		
	4	32.29408	027.15750		4		
	5	32.29975	027.13819		5		
Wastelands	1	32.29616	027.13777	Churchyards	1	32.29437	027.13904
	2	32.29593	027.14579		2	32.29715	027.14420
	3	32.28917	027.15609		3	32.28963	027.15413
	4	32.28882	027.16061		4	32.28918	027.15613
	5	32.29317	027.16161		5	32.29745	027.14870
Institutional green spaces	1	32.29829	027.13728	Outdoor sport areas	1	32.30265	027.1376
	2	32.29831	027.14593		2	32.29160	027.16094
	3	32.28846	027.15592		3	32.30110	027.14545
	4	32.30096	027.15147		4	32.29136	027.14229
	5	32.30419	027.14947		5		
Woodlands	1	32.30045	027.13866	Riparian zone	1	32.28738	027.16729
	2	32.29758	027.13677		2		
	3	32.30273			3		
	4				4		
	5				5		
Commonages	1	32.57301	027.45027	Cemeteries	1	32.30970	027.13876
	2	32.30494	027.13958		2	32.28829	027.16300
	3				3		
	4				4		
	5				5		

Town: King Williams Town

Type of green space	Site number	Y(DD)	X(DD)	Types of green space	Site number	Y(DD)	X(DD)
Domestic gardens	1	32.89878	027.41673	Commonages	1	32.89508	027.42604
	2	32.89631	027.41528		2	32.89262	027.37170
	3	32.87626	027.41435		3	32.91375	027.41187
	4	32.87468	027.41550		4	32.90077	027.39268
	5	32.87168	027.40928		5	32.86689	027.38453
Road verges	1	32.89943	027.42190	Street trees	1	32.88625	027.40037
	2	32.92439	027.43401		2	32.86992	027.41377
	3	32.91908	027.43220		3	32.88022	027.37605
	4	32.89986	027.43220		4	32.87265	027.37503
	5	32.89503	027.39721		5		
Informal areas	1	32.89537	027.40575	Formal parks	1	32.88327	027.40242
	2	32.92630	027.43174		2	32.88059	027.38059
	3	32.92894	027.43127		3	32.86963	027.41367
	4	32.89140	027.39466		4	32.91358	027.42258
	5	32.86943	027.38351		5	32.87536	027.31531
Wastelands	1	32.89835	027.42836	Churchyards	1	32.87120	027.41661
	2	32.89945	027.38968		2	32.89245	027.38020
	3	32.89056	027.38699		3	32.89804	027.39880
	4	32.89999	027.41461		4	32.89328	027.37509
	5	32.89589	027.42664		5	32.89080	027.37476
Institutional	1	32.92186	027.42085	Outdoor sport areas	1	32.89699	027.42477
	2	32.90101	027.42657		2	32.89582	027.40761
	3	32.89383	027.38265		3	32.89381	027.39420
	4	32.89722	027.39643		4	32.87325	027.41044
	5	32.89743	027.39813		5	32.88162	027.404111
Woodlands	1	32.89278	027.42805	Riparian zone	1	32.90039	027.42380
	2	32.90004	027.41406		2	32.88606	027.40320
	3	32.87799	027.37038		3	32.89882	027.39751
	4	32.88711	027.37215		4	32.87671	027.41463
	5	32.86712	027.40860		5	32.92695	027.43130
Comanages	1	32.92807	027.42091	Urban farmland	1		
	2	32.88317	027.40338		2		
	3	32.88042	027.37593		3		
	4				4		
	5				5		

Town: Paterson

Type of green space	Site no	Y(DD)	X(DD)	Types of green space	Site no	Y(DD)	X(DD)
Domestic gardens	1	-33.45058	025.97526	Commonages	1	-33.43404	025.97679
	2	-33.43917	025.96429		2	-33.44069	025.96890
	3	-33.44060	025.96706		3		
	4	-33.43938	025.96596		4		
	5	-33.44198	025.96771		5		
Road verge	1	-33.45037	025.97568	Street trees	1	-33.43957	025.96675
	2	-33.44772	025.97200		2	-33.43994	025.96770
	3	-33.44521	025.97728		3	-33.43994	025.96868
	4	-33.43727	025.97662		4	-33.43870	025.96846
	5	-33.43725	025.97368		5	-33.43879	025.96778
Informal recreation area	1	-33.45013	025.97747	Parks	1		
	2	-33.44722	025.97446		2		
	3	-33.44220	025.97053		3		
	4	-33.43844	025.97467		4		
	5	-33.43958	025.97544		5		
Wastelands	1	-33.44868	025.97232	Churchyards	1	-33.44570	025.97254
	2	-33.44484	025.97333		2	-33.44504	025.97386
	3	-33.44261	025.97449		3	-33.43803	025.97527
	4	-33.44127	025.96582		4	-33.44253	025.97255
	5	-33.44476	025.97414		5	-33.44057	025.96859
Institutional green spaces	1	-33.44515	025.97369	Outdoor sport areas	1	-33.44973	025.97803
	2	-33.44522	025.97421		2	-33.44236	025.97454
	3	-33.44545	025.97531		3	-33.43887	025.97816
	4	-33.44519	025.97562		4	-33.43865	025.97860
	5	-33.43911	025.97477		5	-33.44148	025.96408
Woodlands	1	-33.43819	025.99306	Riparian zone	1		
	2	-33.43432	025.97124		2		
	3	-33.43719	025.95685		3		
	4				4		
	5				5		
Cemeteries	1	-33.44168	025.97383				

Town: Queenstown

Type of green space	Site no	Y(DD)	X(DD)	Types of green space	Site number	Y(DD)	X(DD)
Domestic gardens	1	31.90713	026.89025	Cemeteries	1	31.91501	026.85632
	2	31.92127	026.87103		2	31.88737	026.86374
	3	31.87927	026.87061		3	31.88480	026.86743
	4	31.87860	026.87155		4	31.90785	026.90824
	5	31.87763	026.87474		5		
Road verge	1	31.90715	026.89048	Street trees	1	31.88096	026.87129
	2	31.92516	026.88046		2	31.88042	026.87196
	3	31.89112	026.86165		3	31.87927	026.87061
	4	31.89053	026.85744		4	31.87479	026.87192
	5	31.89800	026.85805		5	31.89765	026.85439
Informal recreation area	1	31.90416	026.87007	Parks	1	31.89350	026.89712
	2	31.90426	026.87066		2	31.87408	026.92293
	3	31.91863	026.86035		3	31.89342	026.86218
	4	31.89219	026.87269		4	31.89809	026.85799
	5	31.89550	026.85467		5	31.89588	026.87103
Wastelands	1	31.93049	026.86616	Churchyards	1	31.92298	026.86972
	2	31.92033	026.87067		2	31.92341	026.87008
	3	31.92645	026.86987		3	31.92444	026.86901
	4	31.92101	026.89023		4	31.89416	026.87022
	5	31.88175	026.87249		5	31.89296	026.87290
Institutional green spaces	1	31.90381	026.87085	Outdoor sport areas	1	31.88230	026.86910
	2	31.90966	026.85819		2	31.90386	026.86978
	3	31.89051	026.87225		3	31.92494	026.86457
	4	31.89433	026.87361		4	31.91965	026.86442
	5	31.92374	026.87116		5	31.88575	026.87523
Woodlands	1	31.87373	026.86933	Riparian zone	1	31.89583	026.86214
	2	31.93372	026.89217		2		
	3	31.88300	026.86861		3		
	4	31.89036	026.85681		4		
	5	31.89791	026.85426		5		
Commonages	1	31.93116	026.86655				
	2	31.90602	026.86241				
	3	31.93047	026.89186				
	4	31.92719	026.87802				
	5						
Urban farmland	1	31.90752	026.84555				
	2	31.90784	026.84454				
	3	31.90760	026.84452				

Town: Stutterheim

Type of green space	Site number	Y(DD)	X(DD)	Types of green space	Site number	Y(DD)	X(DD)
Domestic gardens	1	32.56613	027.44622	Commonages	1	32.55672	027.46994
	2	32.56701	027.41443		2	32.57338	027.41251
	3	32.57041	027.42142		3	32.56131	027.39713
	4	32.57104	027.42142		4	32.55793	027.43743
	5	32.57632	027.43034		5	32.60729	027.41470
Road verges	1	32.56640	027.44445	Street trees	1	32.57118	027.42365
	2	32.56573	027.44815		2	32.57172	027.41959
	3	32.56910	027.41440		3	32.57032	027.42155
	4	32.57273	027.42803		4	32.57534	027.42774
	5	32.56910	027.44666		5	32.56477	027.43370
Informal areas	1	32.56680	027.41566	Forma parks	1	32.57131	027.41961
	2	32.56726	027.41671		2	32.58388	027.43515
	3	32.56141	027.41709		3		
	4	32.57244	027.42660		4		
	5	32.57656	027.42744		5		
Wastelands	1	32.56568	027.45083	Churchyards	1	32.56626	027.44530
	2	32.56032	027.44649		2	32.56594	027.44731
	3	32.55461	027.45104		3	32.57837	021.42407
	4	32.57320	027.42031		4	32.57206	027.42542
	5	32.56561	027.44917		5	32.57447	027.44796
Institutional	1	32.55692	027.44785	Outdoor sport areas	1	32.55652	027.44922
	2	32.55692	027.44785		2	32.57280	027.40862
	3	32.56385	027.41557		3	32.56600	027.43278
	4	32.57161	027.41947		4	32.59456	027.41101
	5	32.59509	027.41108		5	32.57304	027.45017
Woodlands	1	32.56046	027.40315	Riparian zone	1	32.58757	027.43998
	2				2	32.56380	027.43393
	3				3	32.59513	027.42077
	4				4	32.58877	027.42310
	5				5	32.58612	027.42363
Urban farmland	1	32.55576	027.40632	Cemeteries	1	32.55739	027.44801
	2	32.55112	027.40957		2	32.57521	027.42391
	3	32.55526	027.38540		3	32.60407	027.41673
	4				4	32.57309	027.44189
	5				5		