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THE CHANGING FACE OF THE CONSTANTIA VALLEY:

A TEMPORAL STUDY OF LAND USE CHANGE IN A HERITAGE LANDSCAPE

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University of Cape Town

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Abstract

The study of land use change and urban morphology requires a multi-layered approach. Case studies are needed to gain an understanding of the local factors that are driving land use change and forming urban landscapes. This study will provide a temporal perspective on land use change in the Constantia Valley, a high income suburb on the outskirts of Cape Town. It will contextualise the efforts to conserve its heritage and, furthermore, attempt to explain the factors underlying the observed changes in the urban form. This study, through the use of Geographic Information System (GIS) mapping and a series of interviews, examines how and why the urban form of the Constantia Valley has changed. Finally, based on the findings the possible future urban form of Constantia will be considered.

It is found that the dominant historical trend of land use change has been the loss of vineyards to built land. The urbanisation that Constantia has experienced over the last fifty years has been a result of both local factors, such as increased accessibility, and global factors, such as changes in the international economy. Cape Town is a growing city and this fact affects its sustainability and the sustainability of its surroundings areas. However, Constantia has been somewhat immune to the ecological, social and economic pressures that Cape Town has been facing since the democratic dispensation in 1994. This is largely because of the local community's resistance to change, a lack of effective government intervention and the neo-liberal economy. Residents argue that it plays an important role in linking Cape Town and the whole of South Africa to its early colonial history. However, the heritage landscape of Constantia has been carefully constructed by residents to preserve a semi-rural and elite residential area.

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Glossary of relevant organisations and plans

The City of Cape Town Municipality – The local planning authority who run the Constantia Valley.

Constantia Property Owners Association (CPOA) – A residential body with 1200 members in the community. The head of the organisation is Mr Alan Dolby. Their aim is to protect the Constantia Valley in partnership with the local and provincial government from developments that will reduce the historical, natural and cultural value of Constantia.

Friends of Constantia Greenbelts - Founded in 1996, it is associated with the Wildlife Society of South Africa. Their goal is to promote and protect the greenbelts (areas of parkland along river courses in Constantia).

Heritage Western Cape – A provincial heritage resource authority. Established in January 2003, this public entity seeks to identify, protect and conserve the rich and diverse heritage resources of the Western Cape.

Ko-operatieve Wijnbouwers Vereniging van Zuid-Afrika Beperkt (KWV) – A co-operative that controlled the wine industry in South Africa for much of the 20th century. Their control was relinquished in 1997.

Mountain to Oceans – The former managers of the Tokai forest who relinquished control to SANParks in 2005 but continue to harvest the plantation.

The Spatial Development Plan – A plan developed by the City of Cape Town to assist city officials when assessing development applications.

South African Heritage Resources –A statutory organisation established under the National Heritage Resources Act, No 25 of 1999, as the national administrative body responsible for the protection of South Africa's cultural heritage.

South African National Parks – The organisation in charge of the management of Table Mountain National Park.

Southern District Plan – A plan that aims to ensure that the heritage of all urban areas is managed in a sustainable manner.

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1 Literature Review

1.1 Introduction

The study of land use change and urban morphology requires a multi-layered approach. Case studies are needed to gain an understanding of the local factors that are driving land use change and forming urban landscapes (Whitehand, 2009). This study will provide a temporal perspective on land use change in the Constantia Valley, a high income suburb on the outskirts of Cape Town. It will contextualise the efforts to conserve its heritage and, furthermore, attempt to explain the factors underlying the observed changes in the urban form. This study, through the use of Geographic Information System (GIS) mapping and a series of interviews, examines how and why the urban form of the Constantia Valley has changed. Finally, based on the findings, the possible future urban form of Constantia will be considered.

Research Question

How and why has land use changed in the Constantia Valley between 1909 and 2009?

Objectives

1. To determine how land use has changed in the Constantia Valley between 1909 and 2009.
2. To determine what social, economic and ecological factors have driven these changes in land use.
3. Explore possible future scenarios for the urban form of Constantia.

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1.2 Literature Review Introduction

'Inequalities of distribution can be read on the face of buildings, neighbourhoods and towns… The social structures, processes, and relationships that produce and reproduce these distributions however are not so visible on the surface of cities' (Young, 1990: 241). This thesis maps land use change in the Constantia Valley and seeks to uncover the 'structures, processes, and relationships' that produce and reproduce the urban form of the Constantia Valley through GIS mapping and a series of interviews (Young, 1990: 241).

1.3 Urban Morphology

Urban morphology is the study of urban form. It is not a widely recognised discipline because it lacks journals directly related to it or national organisation bodies. The International Unit for Urban Morphology was only founded as recently as 1994. Urban morphology is multi-disciplinary and it draws on geography, history, land use change, and planning amongst other subjects. Urban morphology has been studied in a piecemeal fashion in these disciplines for most of the twentieth century (Whitehand, 2009; Whitehand, 2012).

Methods of articulating historico-geographical structure of urban landscapes are fundamental to urban morphology and have considerable, but insufficiently recognised, potential for planning (Whitehand, 2009). Conzen, an early leader in the study of urban morphology, demonstrated how the historical landscapes of British towns and cities have different morphological regions (Whitehand, 2009). Conzen (1958 and 1960) made contributions in the recognition of form complexes of which the urban landscapes are composed. However, the urban processes that create these different urban forms have yet to be fully established (Whitehand, 2009). Whitehand (2009) argues that there has been a lack of research into the constituents of the physical form of urban areas. Therefore this thesis will contribute to a wider body of research which seeks to explain the urban form using the case study of the Constantia Valley.

1.4 Land Use Change

Many scholars, including Lambin et al. (2001), differentiate between land use change and land cover change. Land use change refers to changes in the actual use of the land whereas land cover changes are the observed changes to the land. Similar to other studies, this study combines the two and labels both types as land use change (Koomen and Stillwell, 2007).

Land use change is a complex process that links human and natural systems (Chhabra et al., 2006; Koomen and Stillwell, 2007). It has far reaching impacts on the world in which we live and is intimately connected to global environmental issues such as climate change, deforestation,

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biodiversity loss, vineyard loss and urbanisation (Koomen and Stillwell, 2007). As a result land use change affects the ability of the earth to support human needs (Lambin et al., 2003). Despite this land use change is often associated with social benefits such as increases in food production, wealth and housing (Lambin et al., 2003; Chhabra et al., 2006).

1.5 The Benefits of a Temporal Approach

Cities are dynamic and therefore require a temporal approach to understand the drivers of land use change and urban morphology. Since the 1950s, cities have been rapidly expanding in a complex and non-linear manner. A historical perspective highlights the role of land use legacies and transitory factors (Ramalho and Hobbs, 2011).

The geographical structure of an urban landscape can be interpreted as a mosaic made up of a variety of units created at different times. Each unit represents a different morphological region. As a result the urban landscape is a continuously developing record of human activity. The landscape becomes the 'objectivation of the spirit of society in a particular locale and in time develops its specific genus loci' (Whitehand, 2009: 8). As a result the landscape reflects the work of past and present generations.

Factors that differentiate different morphological regions are threefold (Whitehand, 2009):

1. Type of land use - Commercial activities tend to congregate and have forms distinctive from residential areas.
2. Socio-economic character – Richer areas have distinct characteristics from poorer areas because units of property ownership are significant influencers of the shape and form of urban development.
3. Development period - Morphological regions are formed through periods of rapid urban growth. Periods where large numbers of similar form buildings are produced are normally separated by intervals where new types are introduced. The new types in turn become the dominant type over a subsequent morphological period (Whitehand, 2009).

1.6 Globalisation

It is a common misconception and simplification that population growth and increased consumption are the sole drivers of land use change and modifications of the urban form. They are complex and require in-depth analysis (Lambin et. al., 2001). Lambin's (2001) paper, *The Causes of Land Use and Land Cover Change: moving beyond the myths,* attempts to disprove that increased population and increased rates of consumption lead to land use change. Lambin et al. (2001), analyses some of the factors that they believe influence land use change, such as urbanisation, agricultural intensification

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and rangeland modification. Lambin et al. argue that these factors are all accelerated by globalisation as nations become part of a global economy. Globalisation is the 'inter-connectedness of people and places' through 'global markets, information flows and / or international conventions' (Lambin et al., 2001: 266). Globalisation causes intensification of agriculture and an increase in market size which in turn drives land use change (McMichael 1996; Lambin et. al., 2001; Lambin et al., 2003). Any study of land use change must engage in this complexity.

1.7 Urbanisation

Urbanisation is a major driver of land use change and changes to the urban form (Lambin et al., 2001; Wu et al., 2006). It is a 'continuous process of the shift of a country's population to built-up areas' (Frey, 2000). Currently urban areas are growing five times faster in the developing world than in the developed world (Lopez et al., 2001). In Africa the urban population is expected to treble by 2050 from 400 million to 1.3 billion. This is the fastest urban growth rate of any continent (Crosette, 2011; Turok, 2012). Urban areas have wide ecological footprints. The affect that urbanisation has on land is not limited to urban land but to land surrounding the city. This is viewed as a key driver of broader land use change (Folke, 1997; Lambin et al., 2001).

Urbanised areas cover less than 2% of the earth's surface and thus, from this perspective, urbanisation does not represent a major threat to land use change (Lambin, 1997). Despite this, urbanisation increases a city's ecological footprint which is much larger than the land occupied by built land coverage (Folke et al., 1997; Lambin et al., 2001). Folke et al. (1997), uses the Baltic region of Eastern Europe as an example of this. The urban population of the region is heavily dependent on the Baltic drainage basin. This includes its forests, wetlands, agricultural and marine systems. This ecological footprint is a thousand times larger than the size of the urban area in which the bulk of the population lives (Folke et al., 1997). The threat of urbanisation to biodiversity is set to become an even greater issue in Africa (Crosete, 2011).The need to understand the affect that land use change has on all urban areas is now greater than ever.

1.8 Ecosystems

Ecosystems provide provisioning, regulatory, cultural and supporting services. The services that they provide form part of the foundation of society. They follow cycles of succession and climax, and to understand how ecosystems function over time a temporal approach needs to adopted (Anderson and O'Farrell, 2012). Land use change and changes to the urban form represent a global threat to ecosystem goods and services (Boland and Hunhammer, 1999). Examples of these goods and services are fresh water, pollination of crops, climate regulation and pharmaceutical products (Maclaurin and Sterelny, 2008; Elmqvist and Maltby, 2010). The importance of functioning

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ecosystems can be demonstrated by their ability to moderate extreme events. For example, natural vegetation cover is a key factor in preventing soil erosion and providing flood mitigation. Resilience theory dictates that heavily managed and disturbed ecosystems have low levels of biodiversity and often become monocultures. After prolonged periods of heavy disturbance ecosystems reach a tipping point. This is when the ecosystem can no longer provide the goods and services that it once did (Elmqvist and Maltby, 2010; Gunderson and Holling, 2002).

Internationally the importance of biodiversity is recognised in various international conventions such as the 1992 Convention on Biological Diversity (CBD), the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora, the 1971 RAMSAR Convention on Wetlands, the World Heritage Convention and the 2001 International Treaty on Plant Genetic Resources for Food and Agriculture (Glazewski, 2005). The most important of these is the CBD. It was formed at the First World Summit on Environment and Development in Rio de Janeiro, Brazil, and it acknowledges that environmental protection is an integral part of sustainable development (United Nations, 1992; Treweek et al., 2005). Literature has focused on the loss of biodiversity through the spread of urbanisation (Wackernagel and Rees, 1996), but with an increasing number of people living in cities there needs to be renewed focus on restoring and preserving ecosystems within cities (Savard, 2000).

O'Farrell et al. (2012) find that important regulatory services in Cape Town have been serverly reduced. Regulatory services are ecosystem services which cannot be sourced elsewhere and can only be delivered at a certain location. The infestation of fynbos by alien vegetation, particulalrly Acacia and Pines, poses a severe threat to ecosystem services in Cape Town. They reduce the water runoff by 30% to 70% lower than un-invaded fynbos and create monocultures (Richardson, 1998). The preservation of functioning ecosystems is critical for ensuring a city's sustainability (O'Farrell et al., 2012). Ecological diminishment threatens the sustainability of Cape Town and increases its vulnerability to wave surges, climate change and flooding (O'Farrell et al., 2012). There are many historical examples of the problems associated with heavily altered ecosystems. For example in Mongolia and China the overgrazing of pastureland has resulted in dust and sand storms, and desertification (Jigjidsuren and Oyuntsetseg, 1998; Normile, 2007).

1.9 Heritage

Heritage is defined as the meanings that we attach to the past within a social, political and cultural context (Graham 2002). Heritage landscapes are created through the continuous collective reorganisation of the landscape to best suit the changing needs of the society (Graham 2002). They thus create a mosaic of varying urban units of distinctiveness and this leads to morphological

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regionalisation (Whitehand, 2009). Heritage landscapes are continuously modified by accessibility, urbanisation and globalisation. Additionally, changing values and perceptions are pivotal in influencing the landscape of an area (Antrop, 2005).Today, land use change is viewed as a major issue because it causes changes to the urban form and thus the heritage landscape.

Historical landscapes contribute to creating a sense of place, add credibility and give heritage to an area (Lowenthal, 1985). Landscapes have visible memories and it is this memory which forms heritage landscapes. Landscapes reflect the many different communities that have lived and worked in them throughout history. As a result they have multiple layers reflecting different periods in the past (Hall, 2006; Whitehand, 2009).

Heritage plays an important role in strengthening a community, attracting tourists and creating a sense of place. A shared sense of history gives the community something to unite around (Lowenthal, 1985). Understanding the history of a neighbourhood enables people to see where they fit into the history of an area. It also encourages residents to romanticise about the past (Lowenthal, 1985). The importance of history to people can be seen with the birth of the 'mock-Tudor' house in Britain and America in the 1920s and 1930s. These houses were constructed in a 'quaint' and 'old-fashioned' manner to look as old as possible and link the neighbourhood to an imagined past (Lowenthal, 1985).

Nasser (2003) argues that recently the creation of heritage areas has been prioritised over scientific concerns for conservation and socio-economic needs. For example the creation of these areas has come to be seen as a way of generating income through tourism. The heritage of an area is often designed in a way that excludes the poor. Hall (2006) argues that Cape Town is now managed as an entertainment and tourist city and this excludes the needs of poorer communities. Campbell (1996) discusses how planners have a responsibility to balance economic concerns, such as the demands of tourism with social justice. They have the responsibility to create, 'green and growing cities, but also – just cities.' Creating a sustainable city requires heritage to be intrinsically linked to socio-economic needs. This is especially important in South Africa given the history of repression.

1.10 The Value and Historical Importance of Open Space in Urban Areas

Nature is a social construction because it is shaped and created by those who experience it (Dermeritt, 2002). Nature in urban areas is heavily influenced by society, who moderate and determine what ecosystem services get generated and who in society can enjoy them (Ernston, 2008).

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The loss of farmland and its importance to residence is well studied in the United States and the United Kingdom (Beasley et al., 1986; Kline and Wichelns, 1996; Ready et al., 1997; Geoghegan, 2002; Grant et al., 2011). The first concerns for farmland loss developed in England in the 1930s. The 1936 Restriction on Ribbon Development Act and the 1938 London Green Belt Act were the first pieces of legislation to be put in place limiting urbanisation in an attempt to preserve farmland (Grant et al., 2011). The concept of the greenbelt was seen as a solution to limiting urbanisation and was adopted across Britain in the post-World War II era when there was rapid development (Grant et al., 2011). The United States also experienced rapid urbanisation during this period. Farmland was lost as a result of urban growth. At the time this was not a major concern as there were large food surpluses and people held the impression that farmland was an unlimited resource. It was not until the 1960s and early 1970s that this loss became a major concern in the United States. Maryland was the first state to adopt measures to limit farmland conversion in the late 1960s. It was not until the 1970s that significant academic research was carried out on the issue and legislation was put in place to limit farmland loss (Bunce, 1998).

Prior to 1980 the focus of farmland loss was on the threat of urban sprawl reducing agricultural land and limiting production volumes. It was not until the 1980s that the social benefits of preserving farmland were explored (Fischel, 1982, Bryant et al. 1984; Bunce, 1998). Farmland has far reaching benefits; it provides a place for recreation, creates a sense of place and preserves a farming culture (Ready, 1997). A similar trend of rapid urbanisation replacing farmland has been studied by scholars in China. Tan et al., (2005) looked specifically at the Beijing-Tianjin-Hebei region and the rapid increase of urban land uses replacing, predominantly, arable land.

1.11 The Spatial Dimensions of the South African City

Traditionally urban space has been considered purely geographical but recent interpretations are increasingly steeped in historical, social and political economy disciplines (Spinks, 2001). There is a complex and inextricable link between a person's identity and his or her place in the urban landscape. Social activity shapes cities (Western, 1981). However, through the manipulation of space, society can be modified. 'Spatial fetish' (Spinks, 2001: 6) implies that urban space can be manipulated and controlled to create a new social order. Social order via spatial control was a key element of the apartheid city. However, the apartheid government failed to acknowledge that society can also create a space. Urban spaces and social mechanisms share a reciprocal relationship. Space is both a cause and a consequence of social relationships (Spinks, 2001).

The economic system underpinned by political and ideological forces served as a unique space forming process within Cape Town (Davies, 1981). Residential areas were systematically segregated

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under the Group Areas Act of 1950 (as amended). The system was justified by the government as a form of conflict management. Beyond the basic bid rent process the spatial formation of the South African apartheid city was significantly different from the conventional spatial model of the western capitalist city. It more closely resembled capitalist colonial societies and contained spatial elements of cities in the developed and developing world (Davies, 1981).

Davies (1981) argues that 1948 represented a shift from the segregated city to the apartheid city and developed models of both. 1948 was when the Nationalist Party, the architects of apartheid, took power from the United Party. Figure 1 demonstrates the difference between the two types of city (Davis, 1981).

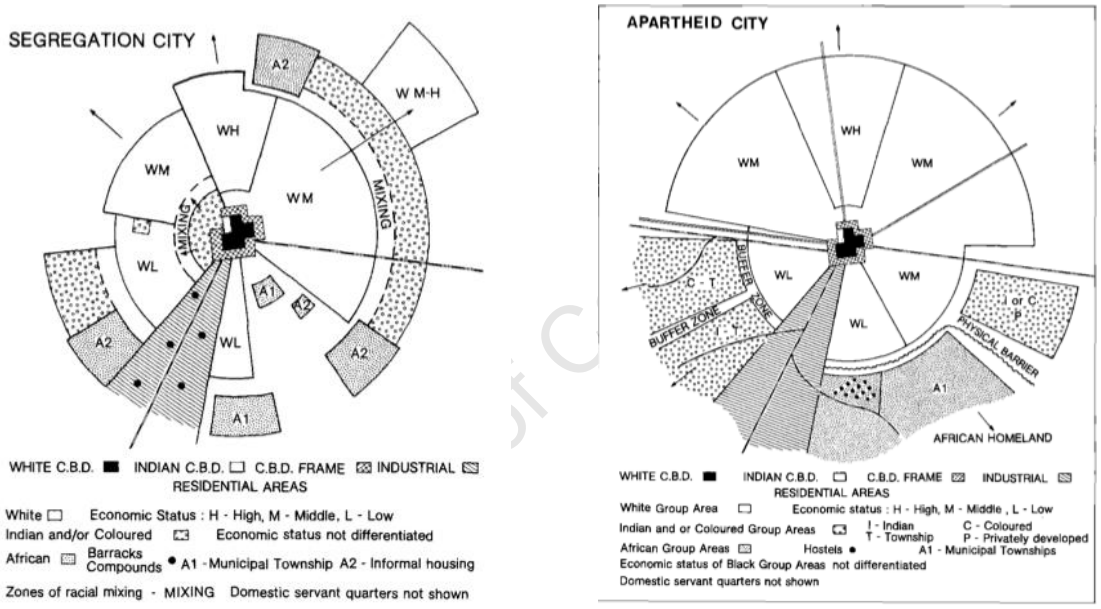

Figure 1 The segregated city and the apartheid city (Davies, 1981)

Davies (1981) develops a theoretical framework for an apartheid city. His model has a white business district surrounded by segregated residential areas. A key characteristic of the white residential areas are that they are located in 'desirable environment(s), strongly differentiated by socio-economic status' (Davies, 1981: 64). Davies applies the model to Durban where it is found that white residential areas are located on 'land conveniently and strategically related to the centrally located economic, social and political functions of the city' (Davies, 1981: 65). Whites thus occupied land with sea views, good aspects, ventilation, and transportation links (Davies, 1981).

Western (1981) also developed a model for the ideal apartheid city (Figure 2). The model uses the Durban city council technical planning committee's principles of 1951 as a framework. Principle 6 states that, 'differing race groups have differing needs in respect of building site development. In allocating zones to each race, due account must be taken of the topographical suitability of the land and of the extent to which the race group concerned can utilise existing sites and building development.' Western concludes that in the ideal apartheid city, white residential areas would be located on a gentle western slope. This would give the white neighbourhood (1) strategic defensibility, (2) a psychological domination of the other non-white residential areas from an overlooking height and, (3) residential amenity.

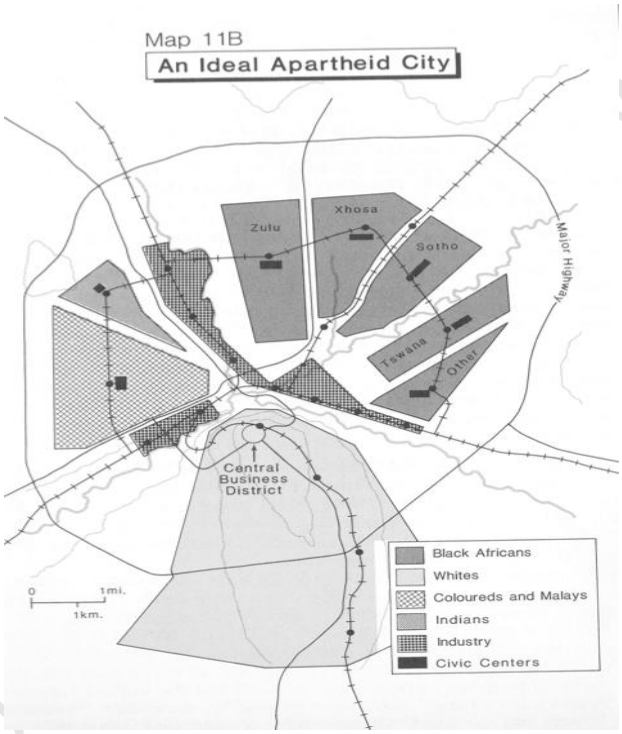

Figure 2 Western's model of an apartheid city (Western, 1981)

1.12 The Legacy of the Apartheid City

Since the African National Congress came to power their system of governance has been underpinned by a neo-liberal approach. This has led to the prioritisation of South Africa's global economic standing above the needs of the poorest members of society and has increased socio-spatial inequality (Harrison, 2003). The core characteristic of post-apartheid society has been a movement away from structured spatial racism towards class apartheid, fuelled by the neo-liberal economy that perpetuates poverty and underdevelopment of non-white areas and encourages the prosperity of white areas (Harrison, 2003). The South African social formation and city continues to be dominated by a large social distance (Davies, 1981; Christopher, 1990). Looking towards the

future South African cities need to become more integrated in an effort to overcome the dysfunctional apartheid city that continues to dominate today.

1.13 Conclusion to the Literature Review

The literature review has explored urban morphology as a form of analysing the urban landscape. It has drawn on land use change literature to help explain the drivers of changes to the urban form. It has also drawn upon other drivers such as urbanisation and globalisation. It has discussed the importance of a historical perspective, it has defined what constitutes a heritage landscape and looked at the importance of open space in urban areas. Finally, it has presented literature on the spatial dimensions of the South African city, and explored the segregated apartheid city and its legacy.

In the developing world where urbanisation is occurring at an unprecedented rate, driven by economic needs, it is now more important than ever for societies to remain connected to their roots. Research on the historical development and future roles of inherited urban landscapes has an important place in conserving and promoting the cultural foundation of urban society (Whitehand, 2012). However, it is important that a balance is struck between conserving distinct morphological regions while creating a modern and just city that meets the needs of its citizens.

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2 Study Area

2.1 History of Urban Areas in South Africa

South African cities developed as cities without an indigenous urban tradition. Dominant white settler groups served as an urban host society into which the black African population were forced to provide labour for the capitalist economy (Davies, 1981).

South African liberal mythology falsely claims that when the Nationalist Party took power in 1948 from the United Party they reversed long standing liberal urban traditions (Parnell and Mabin, 1995). The roots of South Africa's present day urban landscape lie in its colonial history and the subsequent period between the end of colonialism and the entry of the National Party into power in 1948. The Group Areas Act of 1950 (as amended) was the first piece of legislation that regulated segregation in a 'uniform and countrywide basis' (Western, 1981: xi). It classified the population into four racial groups and designated them specific areas to live. White people were allocated the best land whereas black people were allotted the worst. However, only 0.7% of the white population were forced to move demonstrating how segregated the white population already was (Christopher, 2001). Urban segregation in South Africa developed over a long period of time in a 'haphazard and piecemeal manner' (Parnell and Mabin, 1995: 19). Various pieces of provincial legislation and informal social mechanisms throughout South African history, since the arrival of the colonists, have meant that the urban landscape of South Africa has always been blighted by segregation (Western, 1981).

By definition colonialism imposed a coercive rather than integrative social order. The role of white colonising groups was dominant and their power derived from allocative processes inherent in the power relations of colonisation. As a result whites regulated social and economic relations (Davies, 1981). Social relations induced by the colonial political economy were reinforced by cultural and technological factors. White self-identity inherited from a European value system strongly affected attitudes towards race, customs and the place of racial groups in the social system. Low incomes and limited access to technology increased social distance between races, fostered separate identities and created inherited poverty (Davies, 1981).

The discovery of diamonds in 1867 and gold in 1886 in the north resulted in Cape Town becoming a point of entry to the interior. Docks were constructed in 1870 further attracting investment in Cape Town. At the start of the twentieth century Cape Town went through rapid industrialisation. Its population grew from 33 239 in 1875, to 77 668 in 1904 to 168 257 in 1911. This resulted in unconstrained urban growth. Plots that were desirable by virtue of their amenity and aspect were sold to the highest bidder. At the time there was very little legislated segregation, instead it occurred

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along economic lines. In the suburbs of Bishopscourt and Constantia segregation was created through whites distancing themselves from industry (Western, 1981).

The situation changed with Cape Town's rapid industrialisation which threatened to blur boundaries of race, class and society. With increased urbanisation tensions between races increased which lead to a structured set of social relations that inhibited inter-group contact (Davies, 1981). Between 1901 and 1904 there was an outbreak of bubonic plague in Cape Town, mainly in black and coloured areas. This lead to the first calls for legislated segregation. Urban race relations came to be widely conceived and dealt with in the imagery of infection and endemic disease (Parnell and Mabin, 1995). As a result segregation came to serve a variety of interests under the guise of health and sanitation.

In Cape Town the white population reduced by a third between 1936 and 1960, during that same period the coloured population increased by half (Davies, 1981). English speaking, non-Nationalist Party whites had security and money with which to distance themselves, to places such as Constantia, from the penetration of the coloured population into the middle class. However, working-class poorer whites who could not afford to do this brought the Nationalist Party to power to secure their position in society against a coloured population that was threatening them economically (Davies, 1981). Ultimately, South African 'society compensated for blurred social distinctions by [creating] clear spatial ones – physical barriers, keep out signs, and property distinctions' (Sommer, 1969: 23). Apartheid, specifically the Group Areas Act, was created as a tool for an increasingly outnumbered white population to maintain a social and spatial distance from and hegemony over the rest of South African Society (Western, 1981). The Group Areas Act was the culmination of a history of efforts to inhibit the mixing of races in urban areas.

At the end of apartheid Cape Town was South Africa's most segregated city, with only 5.7% of people living outside of their designated racial zones, compared to a national average of 8% (Christopher, 2001). Since then urban areas have remained spatially stratified along racial lines (Christopher, 2001; Spinks, 2001; Harrison, 2003). No interventionist affirmative action has been implemented (Christopher, 2001). Income, social class and market forces have replaced race and state control in determining the pattern of urban development (Turok, 2001).

Prior to 2000 there were 6 relatively autonomous municipalities in Cape Town with a weak central strategic council. There was no city wide framework to promote, restrict or regulate development on the basis of specific criteria. This left the regulation of development to individual municipalities. In December 2000 local government was reorganised into one integrated system of government. This promised a more coherent and integrated approach to the city's development and management.

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There is agreement in principle amongst policymakers that Cape Town needs to become more integrated but in practice this has proved hard to implement with programmes and projects. Developing a coherent and integrated approach is difficult considering the divided geography of the city and the differing demands of the formal tax-based economy and the poor population (Turok, 2001). As a result desegregation continues to be extremely slow in South Africa. It is expected to occur at a similar rate to America where no interventionist policies were implemented and changes were left up to market forces (Christopher, 1990; Harrison et al., 2003).

Further segregating the South African city is the post-apartheid fear of crime which has created a new form of residential spatial order similar to the Group Areas Act style zoning. The fear of crime is universal in South Africa, however responses differ depending on socio-spatial identity. Richer, predominantly white citizens, can protect themselves better from crime and thus distance themselves from the poor non-white majority further entrenching residential segregation (Spinks, 2001).

2.2 Overview of the Constantia Valley

The Constantia Valley was one of the first places that early Dutch settlers farmed and it has been dominated by human activity since 1679 (Guelke, 1976). The Constantia Valley has changed significantly since its initial colonisation. Today, the area consists of a mosaic of different urban forms (Whitehand, 2009). There is a great variety of flora and fauna, agricultural and forestry land and high income residences (Guelke, 1976; Todeschini et. al. 1992; Todeschini and Blackenberg, 2007).

Constantia Valley is a district within the City of Cape Town Municipality that covers 25km² in area (COCT, 2009) and is situated approximately 13km south of the urban centre (see Figure 3). Figure 4 shows the study area, which differs from the legislative boundaries of the suburb of Constantia, and covers 43km² in area. This is because the study area covers the slopes of Table Mountain, which are not part of the district. Additionally, the limited coverage of historical aerial photographs also lead to parts of the more densely populated neighbouring districts of Plumstead, Tokai and Meadowridge to be included in the study area. I acknowledge that this may create some inaccuracy in the study as it may result in disproportionately high levels of urban land that does not directly reflect the nature of the Constantia Valley. Only five sets of aerial photographs were available that covered Constantia in enough detail for the GIS study to be carried out. The study area has four main land uses, which are residential property, conservation, forestry and vineyards. Figure 5 is a photograph that shows all four of the different land uses that occur in the Constantia Valley. It is a place of great natural and social heritage. Figure 5 shows the area retains a semi-rural feel with large plot sizes, open space and

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abundant greenery (Guelke, 1976; Todeschini et. al. 1992; Pape 2002; Todeschini and Blackenberg, 2007).

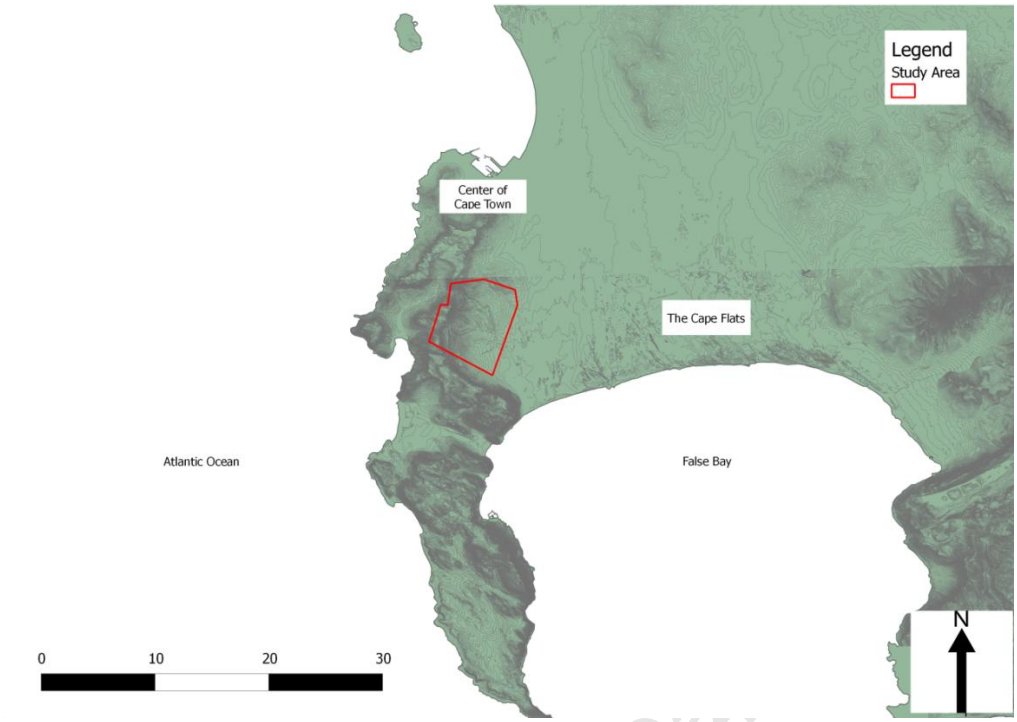

Figure 3 Map of Constantia in relation to the centre of Cape Town

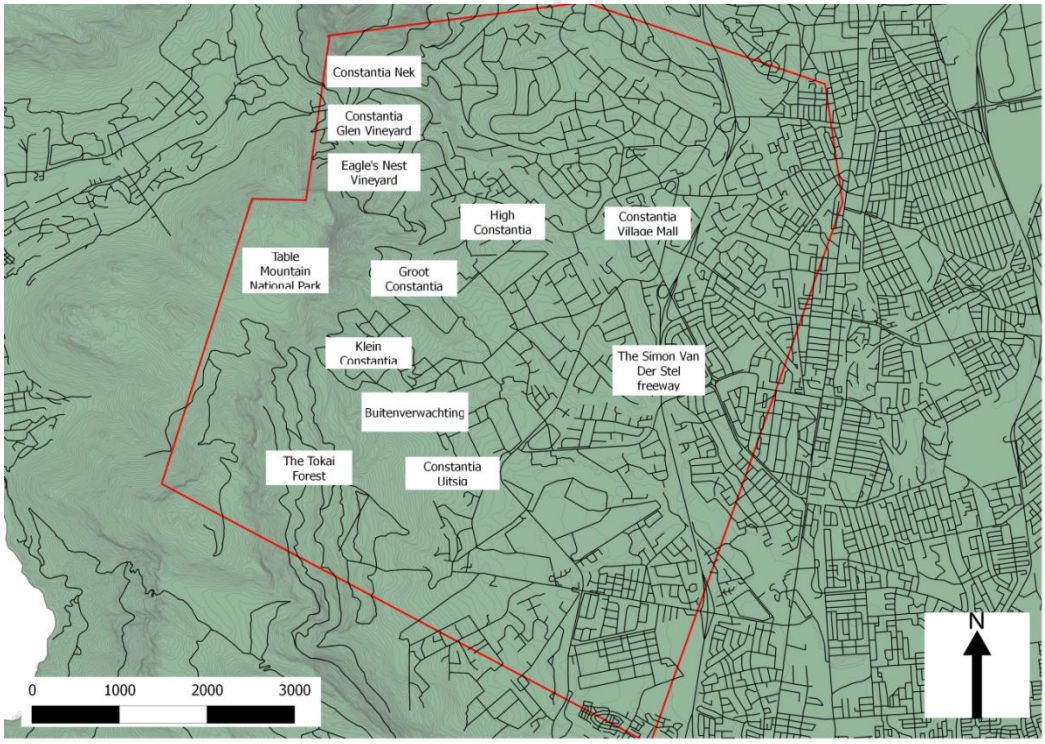

Figure 4 Map of study areas present day road network and important locations that are discussed in the study

Figure 5 View from Constantia Nek looking south over Constantia. It shows the different land uses: forestry, indigenous vegetation, vineyards and built land

2.2.1 Location, Geology and Climate of the Constantia Valley

Constantia Valley is located half way along the Cape Peninsula chain of mountains. It is formed where the back of Table Mountain meets Vlakkenberg at Constantia Nek. It extends down to the Cape Flats. The geology of the area is made up of Table Mountain sandstone and Cape Granite. The soil is typically sandy and nutrient poor. The climate of the region is Mediterranean with cool wet winters and hot dry summers (Rebelo et al. 2011).

2.2.2 The Community of the Constantia Valley

The 2001 census found that Constantia had a population of 6 924, of which 87% was white, 6% was black and 6% was coloured. In the suburb 16% earned more than R25 000 per month and 84% lived in free standing houses (COCT, 2001). Before apartheid, Constantia was a mixed community consisting of people then classified as 'Cape Coloureds' and 'Whites.' The Coloured community was well established in the area with many owning property and shops, and operating market gardens. The Group Areas Acts that started in 1950 changed the makeup of Constantia. There had been an influx of white Europeans after World War II as part of government efforts to recruit more of this population group to South Africa. As part of this scheme of development along racial lines thousands of non-white people were forcibly removed from Constantia to the remote and desolate Cape Flats (Pape, 2002, Western, 1981 and Davies, 1981). Since the advent of democracy a Constantia claimants association was set up. Thirty former Cape Coloured landowners attempted to

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reclaim their land. The majority of the lands that they lay claim to was still open space as they formed part of the greenbelt and therefore they saw no obstacles in preventing their claim from being successful. Despite, this the claimants have faced many obstacles, especially from the Constantia Property Owners Association (CPOA), who opposed their claims because it would supposedly impact Constantia's rural heritage. However, many of the claimants feel that they were actively trying to prevent non-whites from living in Constantia (Pape, 2002).

The CPOA's constitutional mandate is 'to promote and safeguard the interests of the registered property-owners in the Constantia Valley… [and] to preserve the beauty and rural character of Constantia' [i.e. the heritage landscape] (Pape, 2002). A previous study of Constantia found through a series of interviews that the CPOA has near complete control of the local council and any development that is to be approved by the council needed to be first approved by the CPOA. This control is used to limit the spread of urbanisation and preserve Constantia's heritage landscape. Furthermore, the CPOA is a predominantly white organisation. Other racial groups, many of whom work as maids, farm labourers and shop attendants are underrepresented in the politics of Constantia (Pape, 2002). Pape's (2002) study revealed that the CPOA had fought hard to keep street lights and sidewalks out of Constantia and to regulate taxi operating hours and this had been to the detriment of the working class population of Constantia. They often have to walk long distances along roads without pavements and the security of streetlights to get to and from work. Yet they had not been consulted in the Councils and CPOA's decision to keep these amenities out of Constantia (Pape, 2002).

The CPOA has opposed commercial expansion and urbanisation. The CPOA was heavily involved in the construction of the Constantia Village Mall in the 1980s. They ensured that strict regulations were obeyed by shop owners, such as no shop is allowed to have a sign that faces the main road and signs that they do have are not allowed to be electrified. This ensured that the mall is intensively managed so that it caters for the high income market. The CPOA has opposed the cross subsidisation of rates between districts and have also played an influential role in shaping the city's development strategy for Constantia (Pape, 2002).

Another organisation in Constantia that has fought against development is the Friends of Constantia's Greenbelts (FCGB). The greenbelts of Constantia are a series of interconnected parks that run along river courses. They act as reserves to ensure adequate conservation of the watercourses and their immediate bounding land and to prevent built up uses from siting too closely to the watercourses. There are nine greenbelts in total and they are well used for recreation

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purposes. The FCGB are affiliated with the Wildlife and Environment Society of South Africa and they promote a wilderness agenda for the area (Friends of Constantia of Greenbelts, date unknown).

2.2.3 The Heritage Landscape of Constantia

The heritage landscape of Constantia and the greater Cape Town area has been created by a long history of human interference on the environment. It has been occupied for thousands of years by San hunter-gatherers (Mountain 2003). Archaeological evidence shows that they used fire to manage the environment and deliver ecosystem services. Fire was used to encourage certain bulb species to grow in an area for foraging food (Richardson et al. 1992; Deacon 1983). About 2000 years ago the Khoekhoen arrived, a semi-nomadic group of herders. They also practiced fire management to create better pastureland for their sheep and cattle. The Khoekhoen came into direct conflict with the San over land and the San were eventually dominated by the Khoekhoen (Mountain 2003; Deacon 1983; Anderson and O'Farrell, 2012).

After various attempts by Europeans the Dutch East India Company were the first Europeans to establish a successful colony at the Cape in 1652. It acted as a supply post for the long sail to the East Indies and was originally only designed to be a temporary settlement (Worden et al. 1998). However, over time the supply post became better established and more permanent. This led to an era of intense exploitation and efforts to dominate and subdue the wilderness of the Cape Peninsula. This had severe environmental consequences (Hall, 2001; Hall, 2008). Protea's and the Afro-montane forests in the gorges of Table Mountain were extensively exploited for fire wood and construction. After fifty years of European settlement they were nearly gone (Luckhoff 1951; Hall et al. 1993). Significant numbers of livestock were introduced with the free burghers, the first farmers who were not under the command of the Dutch East India Company (Skead 1980). They used fire to try and manage the environment but lacked knowledge of how to control it and a nuanced understanding of the indigenous vegetation (Skead 1980). Increasingly, Cape Town came to be seen as the gateway to Southern Africa and an important city in the colonial network. Over time issues of farming in the Cape such as, the strong south-easterly wind, long hot and dry summers, and the acidic and infertile soil were overcome. This resulted in further environmental degradation and the exploitation of provisioning services (Cowling et al. 1997; Anderson and O'Farrell, 2012).

When the British gained control of the colony in 1814, Cape Town's population grew and with it its urban footprint. It was during this period that the first suburbs were built along the eastern slopes of Table Mountain, away from the pollution of the city centre. The improvement of transport links throughout the century coupled with the discovery of gold and diamonds in the interior resulted in further urbanisation and the subdivision of the original Dutch East India farms for housing.

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Provisioning services were utilised to supply the increasingly growing city (Rassool and Thorne 2001; Anderson and O'Farrell, 2012).

Since the union of South Africa in 1910 urbanisation has continued but in the latter half of the century there has been an increased awareness of the importance of conservation. It wasn't until 1951 that Table Mountain became a protected monument. This gave it cultural rather than ecological recognition (Hey 1978; Anderson and O'Farrell, 2012). It was only in 1989 that it was given ecological protection. An area of 29 120ha (291km²) which included Table Mountain became the Cape Peninsula Protected Natural Environment. Eventually, the Cape Peninsula National Park, now known as Table Mountain National Park, was gazetted on 29 May 1998, it consisted of the Cape Point Nature Reserve and nearly all of the Cape Peninsula Protected Natural Environment (Daitz and Myrdal, 2009).

The current understanding of biodiversity has realised the significant conservation value of lowland areas. These areas contain diverse, endangered and endemic vegetation types which are severely threatened by urbanisation and alien vegetation (van Wilgen 2012; Anderson and O'Farrell, 2012). The responsibility of conservation rests with the City of Cape Town authorities. They have set aside important areas of remnant vegetation in lowland areas under the Biodiversity Network scheme (Anderson and O'Farrell, 2012).

Hall (2006) found that Cape Town's landscape has been marked by many different layers of history which express the identities of the different people who have controlled and occupied the land. The landscape of Constantia contains many different layers, its vineyards, colonial buildings, the wilderness of Table Mountain and upmarket modern housing developments. This gives the area historical significance and heritage. The elite of Constantia, through the Constantia Property Owner's Association (CPOA), have limited urbanisation in the Valley in an effort to preserve this heritage (Pape 2002).

2.2.4 Biodiversity in the Constantia Valley

The Constantia Valley forms part of a unique environment that is a global conservation priority (Myers et al., 2000). It is situated in the Cape Floristic Region (CFR) an area of exceptionally high biodiversity (Cowling et al., 1996). Myers et al. (2000) identified the CFR as a global biodiversity hotspot for conservation. The CFR is highly threatened from agriculture, urbanisation and alien invasive plants (Cowling et al., 1996; De Villiers and Hill, 2008; Rebelo et al., 2011).

The CFR is often mistakenly thought of as being synonymous with the fynbos biome. The Floristic Region is made up of a number of vegetation types, of which Fynbos and Renosterveld are

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respectively the most dominant. These broadly defined vegetation types are again divided into smaller vegetation units. Fynbos, and various vegetation types within this, are most relevant to this project. Fynbos is found on nutrient poor soil but contains an impressive 7 700 different plant species with a very high level of endemism. To the untrained eye fynbos is unimpressive because it is made up of shrubby, fire-adapted, shallow-rooted, heath and reed like plants. All fynbos plants are evergreen and most have small and tough narrow leaves. It is dominated by low growing and patchy over-storey plants and broad-leaved Protea species. Fynbos has been subjected to degradation, species loss and transformation from agriculture, forestry and urbanisation since the arrival of the colonists. Currently only 15% of fynbos in lowlands is protected and 60% of mountain fynbos is conserved because it is located in more inaccessible regions. A defining characteristic of the fynbos biome is that there are very few trees, although a small number are found in ravines. Fynbos is extremely susceptible to invasion by alien tree species, which have further contributed to the biome's degradation (Cowling and Richardson, 1995; Cowling et al., 1997; Manning, 2007; Moran and Hoffman, 2012).

Of the twenty-four vegetation types rated as 'critically endangered' in South Africa, half of them are located within the city limits of Cape Town (Higgins et al., 1996; Manning and Paterson-Jones, 2007). One of the most endangered species that occurs in Constantia is *Leaucadendron argenteum*, the Silver tree, which was heavily exploited for firewood on the Cape Peninsula in the 17th and 18thcenturies. Some of the few clusters that remain are found on the slopes of Vlakkenberg in Constantia (Manning and Paterson-Jones, 2007).

The conservation of indigenous vegetation is hampered by a lack of understanding of its importance. Indigenous vegetation and its biodiversity sustain vital ecological services, such as maintaining a clean water supply, pollination and protecting against storm surges (Manning and Paterson-Jones, 2007). In the CFR 80% of endangered vegetation types occur on privately owned agricultural land making conservation difficult (Winter et al., 2005). Indigenous vegetation in the CFR is poorly understood by farmers. As a result there is a lack of motivation to conserve endangered vegetation types in the CFR by private landowners (Winter et al., 2005). Despite how threatened certain types of indigenous vegetation are in the CFR, the broader economic value of Cape Town's natural assets and the goods and services that they provide the city, such as clean water and storm surge prevention, are also poorly understood and overlooked by local government (De Wit et al., 2009). Examples of these goods and services are coastal protection, flood prevention and slope stability (O'Farrell, 2012). The services that they provide benefit the economy both directly and indirectly however there is little real investment in them from the government. Furthermore, little

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consideration of the cost of environment degradation as result of the expansion of the City of Cape Town is included in budgets (De Wit et al., 2009). De Wit et al. (2009) found that the ecosystem services that Cape Town provides are poorly understood by decision makers in government and therefore are not included into the management plans of the city. Instead short term financial gains are considered over long term sustainability. The study develops a methodology for valuing ecosystem goods and services for Cape Town. It concludes that the city needs to invest more into Cape Town's natural environment to avoid financial loss in the future as a result of ecosystem goods and services changing or stopping completely (De Wit et al., 2009).

2.2.5 The Emergence of Vineyards in the Constantia Valley

Since the arrival of Jan Van Riebeeck in the Cape in 1652 vineyards have been part of the landscape of Constantia. Wine was first produced in the region because of its ability to ward off scurvy during the long passage to the East Indies. Since then, the area has developed a strong tradition of wine making and become world renowned (Guelke, 1976).

For much of the 20th Century the, Ko-operatieve Wijnbouwers Vereniging van Zuid-Afrika Beperkt (KWV) have controlled the South African wine industry. This had a negative effect on the South African wine industry because the KWV pushed the industry towards a quantity-not-quality approach (Ewert and Du Toit, 2005). This did not fit with the Constantia vineyards which can at best make a small amount of high quality wine (Platter and Van Zyl, 2012). Furthermore, international sanctions against the apartheid government severely limited the export market (Fairbanks et al., 2004).

Since 1992 and the lifting of international trade sanctions the South African wine industry has faced the world markets for the first time in decades (Fairbanks et al., 2004). The wine industry has had to catch up with high international standards. This has led to the transformation of the industry. The KWV became a public company in 1997 and in 1999, with the assistance of the government, the KWV gave up their regulatory rights (Ewert and Du Toit, 2005). For the decade between the mid-1990s up until the recent financial crisis, which started in 2007, the South African wine industry boomed because of a growing domestic economy, a strong export industry and affluent South African consumers (Fairbanks et al., 2004). Additionally, Cape Town has become an international tourist destination further boosting its wine industry (Bruwer, 2003).

2.2.6 The Tokai Forest

The Tokai forest was first planted in 1895 and was listed as a Grade 2 heritage site in 2007 (See Table 1) (Todeschini and Blackenberg, 2007). The forest was planted as part of a mass afforestation effort

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started by the British in the Cape at the end of the 19th century to meet the growing demands for timber in the colony and abroad. Pine and eucalyptus species were planted on state, local authority and private lands. Additionally to the supply of wood, there was the false belief that afforestation would improve the water supply by creating rainfall, supress fire and improve the aesthetics of the colony (Anderson and O'Farrell, 2012). On the peninsula today two areas of plantation remain, the Tokai Forest and Cecilia Forest. Nearly all of the Tokai forest is included in the study area. A visit to it today reveals that it is a popular recreational space because it has a series of hiking, equestrian and mountain biking trails. In 2005 the management of the Tokai plantation was handed from Mountains to Oceans, a subsidiary of Cape Timber Resources, to SANParks. Despite this Mountains to Oceans still harvest the plantation, but are no longer commercially planting. SANParks now manage the Tokai forest and aim to convert it back to indigenous vegetation (Geostratics, 2006). The land use change in the forest has been the centre of a hotly contested debate. The Shout for Shade Campaign have fought hard to preserve the alien vegetation of the forest because it provides aesthetic and recreational value, and creates jobs through the harvesting of the timber. On the other side of the debate sit the fynbos fanatics who argue that the Tokai forest represents an important opportunity to conserve critically endangered fynbos species (Rattle, 2011).

2.2.7 The History of Planning Legislation in the Constantia Valley

The South Peninsula District Municipality implemented the 1958 Plan TPR 2400 which put in place a residential density gradient across the Constantia Valley (Todeschini et. al. 1992). This meant that plot size varied depending on the location of the plot. In 1960, Plan A 20 D/2G and 1964 Plan 1 B stated that plot sizes would vary from 750 m^2 to 8000 m^2. The Beinart Proposal TPC-8, in 1971, brought the minimum plot sizes down to 300 m^2 and advocated for village developments surrounded by agricultural zoned land (Todeschini et. al. 1992). The 1992 *Local Area Growth Management and Development Plan,* blames these two plans for the rapid urbanisation in Constantia during the post-World War II period. By 1990 residential subdivision had reached 5 500 plots and the population of the Constantia Valley had increased from 7000 in 1970 to 30 000 in 1990 (Todeschini et. al. 1992).

Some legislative and structural changes took place when the Land Use Planning Ordinance (LUPO) No 15 of 1985 came into effect, replacing the 1934 Township ordinance. This meant that all local authorities had to have zoning schemes, structure plans and frameworks for development (Todeschini et al., 1992; Glazewski, 2005). *The Constantia – Tokai Valley Local Area Growth Management and Development Plan* written in 1992 was in part fulfilment of this obligation (Todeschini et. al. 1992). It forms part of a long line of planning studies that date back to the 1940s. The recommendations of the report were not implemented and none of the proposed conservation

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areas were proclaimed. The report advocated for a shift away from prioritising protected buildings to protected natural areas but this has not been implemented by the City of Cape Town (Todeschini et. al. 1992; Todeschini and Blackenberg, 2007).

The Spatial Development Framework (SDF) (City Space, 2012) for the city of Cape Town, and the Southern District Structure Plan (City Space, 2011) will affect the future development of the Constantia Valley and ensure the preservation of its heritage when it is implemented by the city of Cape Town. These plans identify where development should and should not take place. They also guide decision and policy making. The Spatial Development Framework does not give or take away zoning rights. When assessing development applications city officials will need to assess whether an application is consistent with the Spatial Development Framework. It will be reviewed and updated every ten years (City Space, 2012; MLH Architects et al., 2002). The structure plan for the southern district, which includes Constantia, states that it is: 'a district renowned for its natural and cultural beauty with a dynamic tourism centred economy, recreation opportunities, accessible to all Capetonians' (City Space 2011: 46). The plan aims to ensure that the heritage of all urban areas is managed in a sustainable manner (City Space, 2011).

2.2.8 Environmental Legislation

Currently the key legislation protecting the environment in Constantia is the National Environmental Management Act of 1998 (NEMA) (South Africa, 1998) and the Agricultural Resources Act, No. 43 of 1983 (CARA) (South Africa, 1983). As well as the Environmental Conservation Act, No. 73 of 1989 (South Africa, 1989), the National Water Act, No. 36 of 1998 (South Africa, 1998), National Environmental Management: Protected Areas Act, No. 57 of 2003 (South Africa, 2003) and the National Environmental Management Biodiversity Act, No. 10 of 2004 (South Africa, 2004).

The Conservation of Agricultural Resources Act (South Africa, 1983) attempts to curtail the spread of invasive plants in South Africa and thus limit the loss of indigenous vegetation. The invasion of alien plant species is estimated to be high and this poses a serious threat to South Africa because of the scarcity of water. It is only recently that widespread concern about the problem has appeared. CARA categories plants into three different groups. The act imposes tight restrictions on where these plants may occur. Category 1 plants must be removed immediately otherwise the person who owns the plant faces criminal prosecution. The other two categories allows these plants to grow only in a limited way, e.g. for commercial purposes (South Africa, 1983). This is an important piece of legislation that is attempting to combat land use change by limiting the spread of invasive alien plant species. For example the *Eucalyptus lehmannii* or Spider Gum, uses a large amount of water and have a negative effect on the natural environment. The Spider Gum is considered a category 1

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species in the Western Cape and therefore should be removed immediately. However, they are still prevalent in Constantia, a sign that CARA is not being properly enforced (Forsyth et. al., 2004; The Agriculture Research Council, 2012).

The southern district plan includes an environmental management plan which guides planners and assists with decisions over development proposals. It states that the Constantia winelands cultural landscape should be protected and inappropriate urban development should be avoided (City Space, 2011).

Despite South Africa having strong environmental regulations in place Holmes et al., (2012) and O'Farrell et al., (2012) argue that biodiversity is poorly conserved in Cape Town. This is a result of national government being too slow to implement policies that have been developed to meet international obligations as well as local government being overlooked as a tool for conserving biodiversity. Additionally Holmes et al. (2012), sees other national policies, such as the provision of government housing, as conflicting with the goal of conserving biodiversity in Cape Town.

2.2.9 Heritage Legislation

The Constantia Property Owners Association, Heritage Western Cape and the South African Heritage Resources Agency (SAHRA) approached city planner Fabio Todeschini and others to write an inventory of the heritage resources in the Constantia Valley because it had been earmarked as a potential world heritage site and the 1992 study had become outdated and had not been implemented (Todeschini and Blackenberg, 2007). In their report, *Tangible Heritage resources of the Constantia-Tokai Valley* (Todeschini and Blackenberg, 2007), they advocate for a cultural landscape approach that preserves the heritage of Constantia. The desktop study identified large parts of Constantia as a heritage landscape. Most importantly, the report lists the Constantia vineyards and the slopes of Table Mountain as Grade 1 heritage sites, the Tokai plantation as a Grade 2 heritage site and the open spaces and greenbelts as Grade 3a heritage sites. Table 1Table 1 levels of heritage grading below explains each heritage grading.

Table 1 levels of heritage grading (South African Heritage Resource Agency, 2004).

Grading	Provision
Grade 1	This is a national heritage site. Any alterations to Grade 1 sites need to be approved by SAHRA, Heritage Western Cape and the local planning authority.
Grade 2	This is a provincial heritage site. Any alteration to

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	Grade 2 sites need to be approved by Heritage Western Cape and the local planning authority need to be consulted.
Grade 3a	This is a site that is on the Provinicial Register of Heritage Resources. For changes to be made to Grade 3 listed sites the local planning authority needs to be consulted.

The grading attempts to secure the heritage landscape of Constantia from any further development. The grading of an area is a step towards the formal protection of a heritage resource. It deciphers whether the heritage resource should be governed by a national, provincial or local organisation and will eventually lead to formal protection (Todeschini and Blackenberg, 2007).

2.3 Conclusion to the Study Area

Constantia is a diverse landscape on the edge of the city of Cape Town. It remains a unique area unlike other suburbs in the city that have become much more urbanised. The next chapter explains the methods that were used to study land use change in this unique place.

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3 Methods

The primary aim of this study is to understand how and why land use has changed in the Constantia Valley between 1909 and 2009. A quantitative approach was followed to ascertain changes in area allocated to land use through time using a GIS analysis of historical maps and aerial photographs. To understand the drivers of these changes a qualitative approach was adopted in a series of interviews with key stakeholders.

3.1 Measuring Land Use Change Through Time

Two digital versions of historical maps were obtained from the Department of Land Affairs that date from 1909 and 1942. The 1909 map was created by the Geographical Section of the British War Office, while the map from 1942 was made by the South African Trigonometrical Survey Office. The two maps show what the land use of the study area was before the first aerial photographs were taken. While these were not included in the full GIS analysis they were georeferenced and used in a qualitative manner to inform earlier land use.

The study of land use change through the use of aerial photography is a well-established method that has been used frequently both internationally and in South Africa (Mast et. al., 1997; Hudak and Wessman, 1998; Lambin, 2003; Meadows, 2003; Munroe and Muller, 2007). However, the use of aerial photography has some shortcomings. These include, but are not limited to, the varying quality of the photographs which can make it difficult to accurately ascertain what the land use is, problems with different scales, and the seasonal timing of when the photograph was taken which can affect vegetation cover. Furthermore, comprehensive aerial photographs are not available for all areas in the same year.

The aerial photographs used in this study were obtained from the Department of Land Affairs: Surveys and Mapping in Cape Town. The coverage available over the period in question effectively defines the study area. Due to limitations of available historical aerial photographs the size and location of the study area does not match the legislative boundaries of Constantia. The size of the study area is 43km². For the Constantia Valley, the first aerial photographs that were of a sufficient scale and quality to be able to accurately decipher different land uses were taken in 1958. The earliest aerial photographs that were taken of the study area date back to 1948, but they were deemed unusable for a GIS study given their scale and lack of quality. Six sets of aerial photographs were obtained from the following years: 1958, 1968, 1977, 1988, 2002 and 2009.

The first step of the mapping process was to stitch together the aerial photographs from the same years into a photomosaic using the *Panorama* function of *Windows Live Photo Gallery.* The program automatically finds different control points and stitches the photographs together. Not all of the

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aerial photographs needed to be stitched because the study area on occasions was contained in one photograph. Figure 6 is an example of one of the photomosaics that was created.

Figure 6 Photomosaic of the study area in 1968. Source: Department of Surveys and Mapping

The aerial photographs as well as the historical maps were then uploaded into Quantum GIS (QGIS, www.qgis.org) and superimposed onto a shapefile of the present day road network of the study area, also obtained from Land Affairs. This was achieved using the QGIS *Georeferencer Plugin*. The plugin asks the user to select multiple points on the image and then select corresponding points on the map of the present day Constantia road network. Intersections of major roads were used for points because they remained constant throughout the study period. The plugin then overlaid the images on top of the shapefile. The photographs had differing original scales but QGIS was able to adjust the scale of the photographs and superimpose them accurately on top of the road network. The WGS84 / UTM zone 34s coordinate reference system was used to allow for accurate GPS coordinates on the map as well as distance measurements in meters and not digital degrees.

When the individual photographs and photomosaics had been georeferenced onto the shapefile of the Constantia road network it was then possible to create shapefiles of the four land use types that were to be analysed (built, vineyards, forestry and indigenous) for the series of photographs. When the land use was ambiguous or did not fall into one of the four categories no shape file was drawn over it. Figure 7 shows an example of an aerial photograph following classification.

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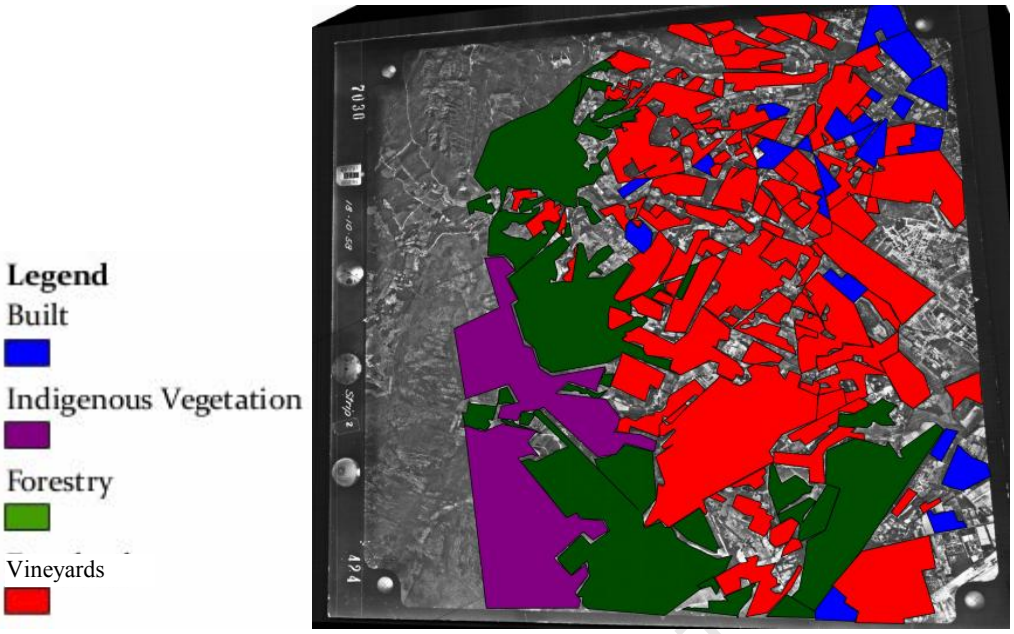

Figure 7 Categorised aerial photograph of study area from 1968. Source: Department of Surveys and Mapping and QGIS

After the shapefiles of the different land uses had been created the total areas were determined using the *field calculator* function in each of the shapefile attribute tables. The total area of each shapefile was then exported to Excel for further analysis. Maps were then created using the QGIS *map maker* tool to assist with the analysis. Figure 8 provides a summary of the steps that were taken

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to analyse the aerial photographs.

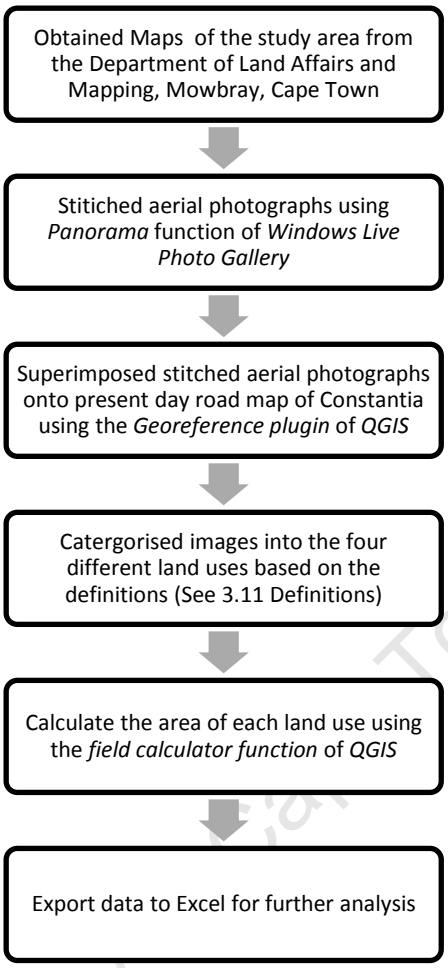

Figure 8 Steps taken to analyse aerial photographs

3.1.1 Definitions

Land use was classified into four major categories: built, vineyards, forestry and indigenous. A shapefile layer was created for each of the four categories. Shapefiles were drawn over the images assigning different parts of the image a different land use based on the tone, composition, granularity, and configuration of the area. If the land use was ambiguous or fell outside of the four categories it was left blank. Below are the definitions that were used when drawing the shapefiles.

Built land – This was land that was densely populated with buildings and little or no open. This does not include small holdings or farm buildings. Small holdings were found to be a major land use in 1958 but by 1968 had been engulfed by urban areas. Because they only figured briefly in the aerial photographs they were not considered significant enough to be afforded their own shapefile.

Vineyards – This included all fields, no matter what type of agriculture was being practiced, as well as hedgerows, minor roads that intersected the fields, farm tracks, small copses of trees within fields

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and farm buildings. They are labelled as vineyard as this is the overwhelmingly dominant form of agriculture that was being practiced throughout the study period.

Forestry - This category was exclusively for man-made plantations. It did not include small copses of trees, trees in greenbelts or people's gardens because these were too small to measure accurately from the aerial photographs.

Indigenous – Open land with no evidence of human influence, where it was assumed that there was the potential for the natural vegetation of the region to grow. This land was found in the western part of the study area, mainly on the slopes of Table Mountain.

Uncategorised – Land that was left uncategorised was because it could not be categorised as one of the above four land uses with any degree of certainty. The highest proportion of this type of land use was found in the earlier sets of aerial photography when sub-division was starting and the quality of the aerial photographs was lowest. This land use could best be described as small holdings, as the land was no longer a commercial farm and not densely populated enough to be considered residential. However, it is not possible to be certain that the land was being used as a small holding. Additionally, land was left as uncategorised if the quality of aerial photograph meant that it was impossible to accurately decipher the land use. I appreciate that having uncategorised land in the study area reduces the accuracy of the study, however, due to time constraints further investigation of land use was not possible and a cautious approach was adopted rather than assigning categorisation where the cover in question was uncertain.

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3.2 Understanding the Drivers of Land Use Change

In the second part of the study interviews were conducted with key stakeholders. Table 2 lists all those who were interviewed. The process identified the views of stakeholders on how and why land use was changing. Additionally, the interviews provided an insight of what it was like to live and farm in the Constantia Valley. Only a limited number of people were interviewed because of time constraints.

Table 2 List of interviewees

Interviewee	**Position**	**Organisation**
Peter Reynolds	Farm Manager	Buitenverwachting Vineyard
Andre Roussouw	Farm Manager	Constantia Uitsig Vineyard
Alan Cockroft	Farm Manager	Constantia Glen Vineyard
Jean Naude	CEO	Groot Constantia Vineyard
John van Niekerk	Former Owner	High Constantia Vineyard
Peter Stewart	CEO	Eagle's Nest Vineyard
Kobus Jordaan	Farm Manage	Formerly of Klein Constantia Vineyard and currently of Eagle's Nest
Stuart Botha	Winemaker	Eagle's Nest Vineyard
Brian Radcliffe	Former Head	Friends of Constantia Greenbelts
Carly Cowel	Chief Ecologist	SANParks
Fabio Todeschini	Built Environment Consultant	City Planner
Alan Dolby	Head of CPOA	Head of Constantia Property owners association

I carried out extensive internet research to establish the list of interviewees. I wanted to interview landowners, farm managers and heads of resident organisations as they represent the views of the community, would be able to effect land use change in the Valley and would have an understanding of the history of the Constantia Valley. I contacted potential interviewees via telephone and email to set up meetings. I contacted and interviewed managers or CEO's from every vineyard within the

study area. Contacting wine farmers was challenging because some were sceptical about the project whilst others were busy with harvesting the grapes. It often took three or four emails and the same number of phone calls to arrange an interview. The interviews were conducted in February and March of 2012. All but two of the interviews were conducted at the interviewee's place of work. The remaining two took place at the interviewees' home.

The initial email that was sent out to all potential interviewees included a basic overview of my project, (appendix I). This was done to remove any reservations the interviewees might have about the interviewer or the project and avoid interviewing inappropriate people who could not answer my questions. It also meant that the interviewee would have time to think about the interview topic before being interviewed. Often it also meant that he or she brought what they thought to be relevant material to the interview.

I prepared a list of interview questions along with figures to help the interviewer explain the findings from the historical maps and aerial photographs (appendix II). The syntax and order of questions remained the same for every interviewee but were slightly edited to fit the role of the interviewee. The interviews were digitally recorded. The interviews were conducted using open ended questions. As soon as possible after the interview minutes were written up, based on the digital recording.

3.2.1 Limitations

The main limitation of this study was time. The study had to be completed within a six month time period. This meant that a limited number of historical maps and aerial photographs could be analysed. Additionally, time restrictions meant that only a limited number of stakeholders within the Constantia community could be interviewed. Wine farmers are the largest users of land in the Valley along with residents. Alan Dolby head of the CPOA was interviewed, a representative from every vineyard as well as Carly Cowell, from Tokai forest.

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4 Results

This chapter first presents the results and findings from the GIS study of two historical maps and six sets of aerial photographs. Secondly, it presents the findings from twelve interviews that were conducted with key stakeholders in the community of Constantia.

4.1 Historical Maps

Figure 9 and Figure 10 are georeferenced historical maps of the Constantia Valley from 1909 and 1942. The two maps show a Constantia that is starkly different to what is found after 1958 in the aerial photographs. These maps indicate a rural Constantia, with almost entirely agricultural and forestry land uses. The 1942 map shows the first signs of urbanisation spreading from the north east, the direction of the adjacent suburb of Wynberg. Apart from this there is little land use change in Constantia between 1909 and 1942.

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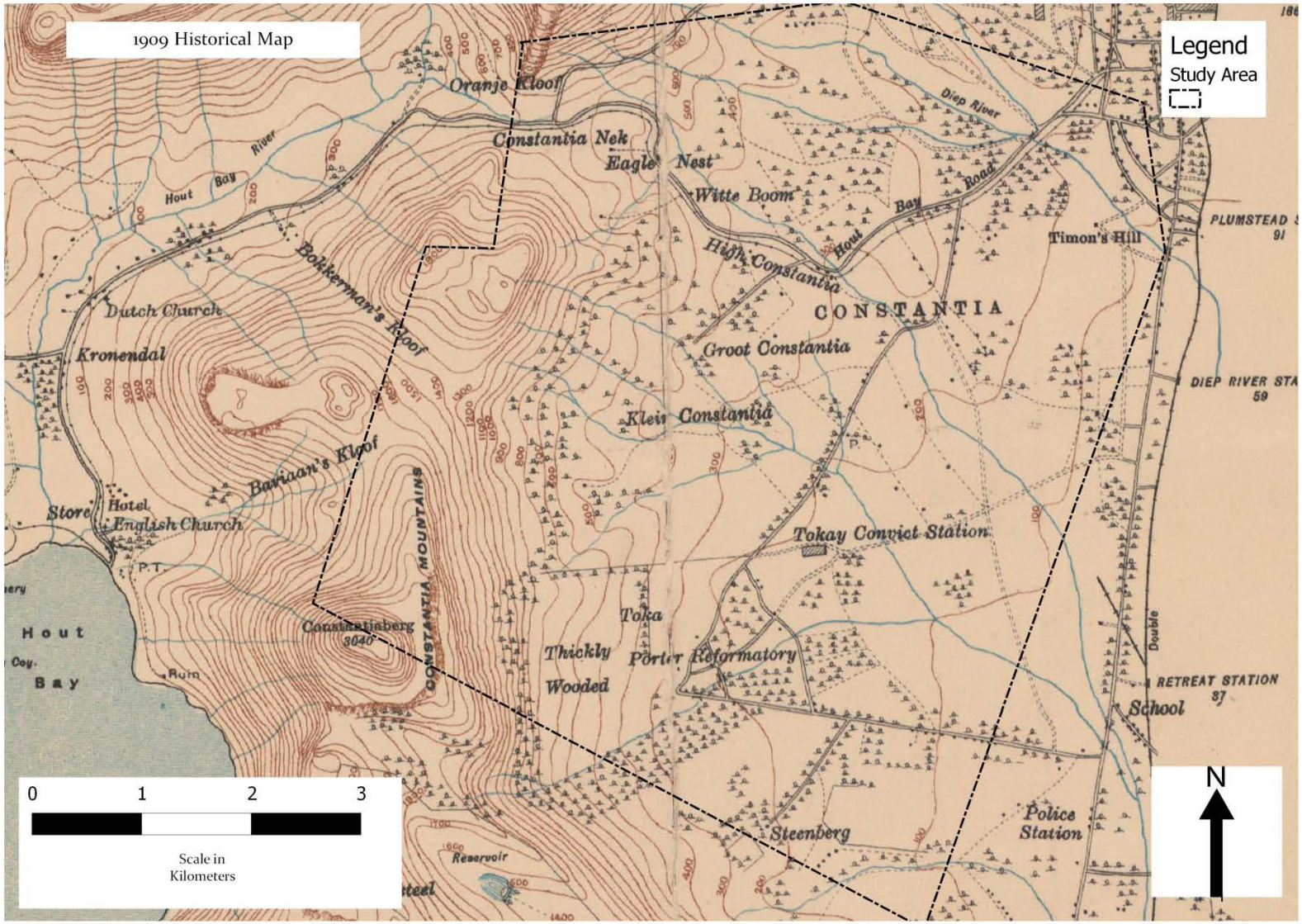

Figure 9 Historical map of Constantia 1909 (Department of Surveys and Mapping)

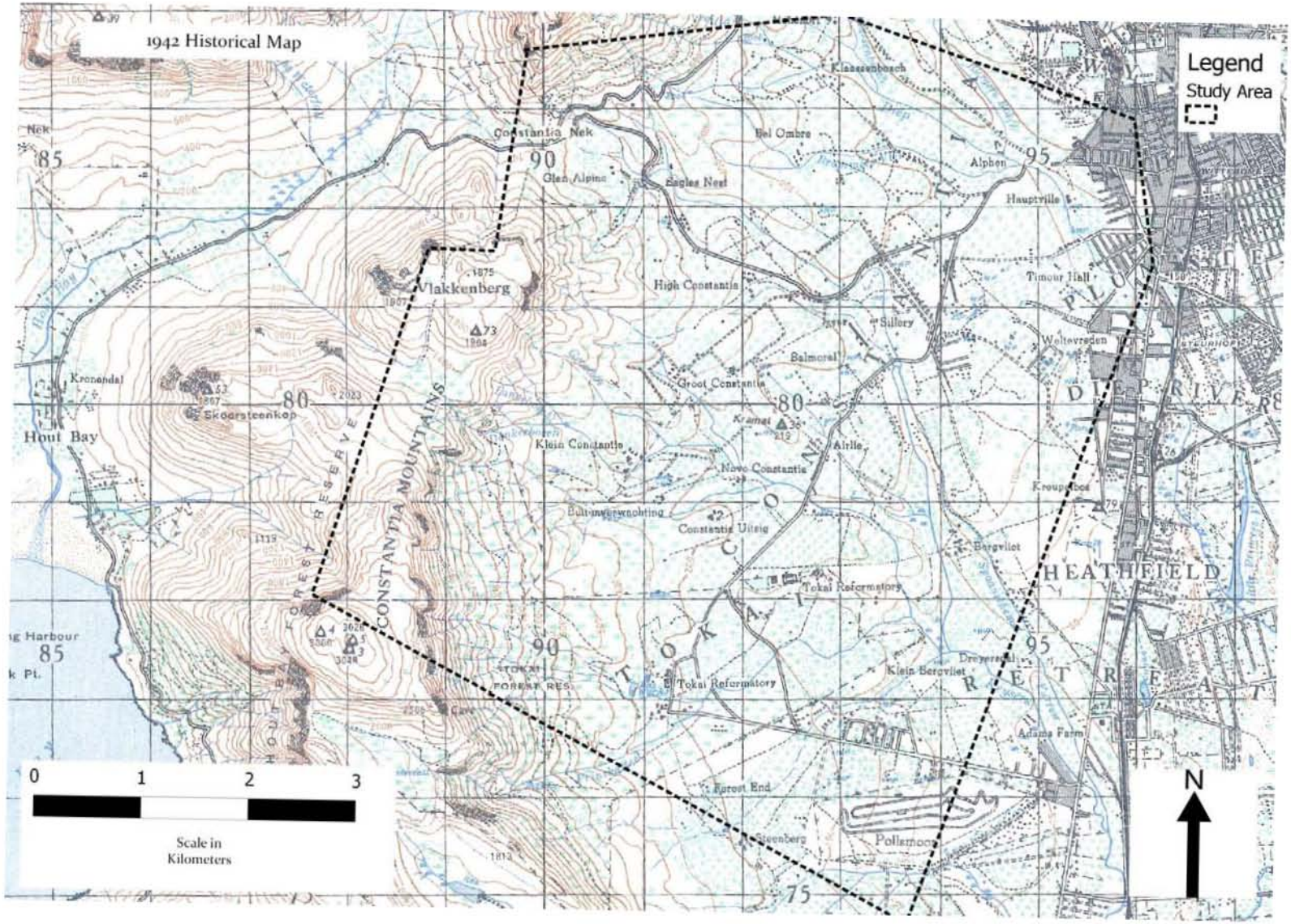

Figure 10 1942 Historical map of Constantia (Department of Surveys and Mapping)

4.2 Aerial Photographs

This historical analysis of aerial photographs between 1958 and 2009 shows a significant increase in built land coverage with a steady decline in vineyards. Finally, it can also been seen that forestry declined and indigenous vegetation remained relatively stable. An overview of the findings are presented in Table 3 and Figure 11.

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Table 3 Overview of results showing land use change in km² and percentage change

Land Use Coverage and Percentage Change									
	Built Land Use Area km²	Built Land as a percentage of the total area mapped	Vineyards Land Use Area km²	Vineyards as a percentage of the total area mapped	Forestry Land Use km²	Forestry as a percentage of the total area mapped	Indigenous Land Use Area km²	Indigenous Vegetation as a percentage of the total area mapped	Total Land Use
1958	1.9	7%	13.4	47%	9.7	33%	3.8	13%	28.9
1968	3.0	12%	11.1	45%	7.7	31%	2.9	12%	24.7
1977	16.5	47%	7.8	22%	9.8	28%	1.0	3%	35.1
1988	19.4	54%	6.5	18%	7.3	20%	2.8	8%	36.0
2002	18.3	57%	4.0	12%	5.8	18%	4.2	13%	32.3
2009	19.5	59%	4.7	14%	3.8	12%	4.9	15%	32.9

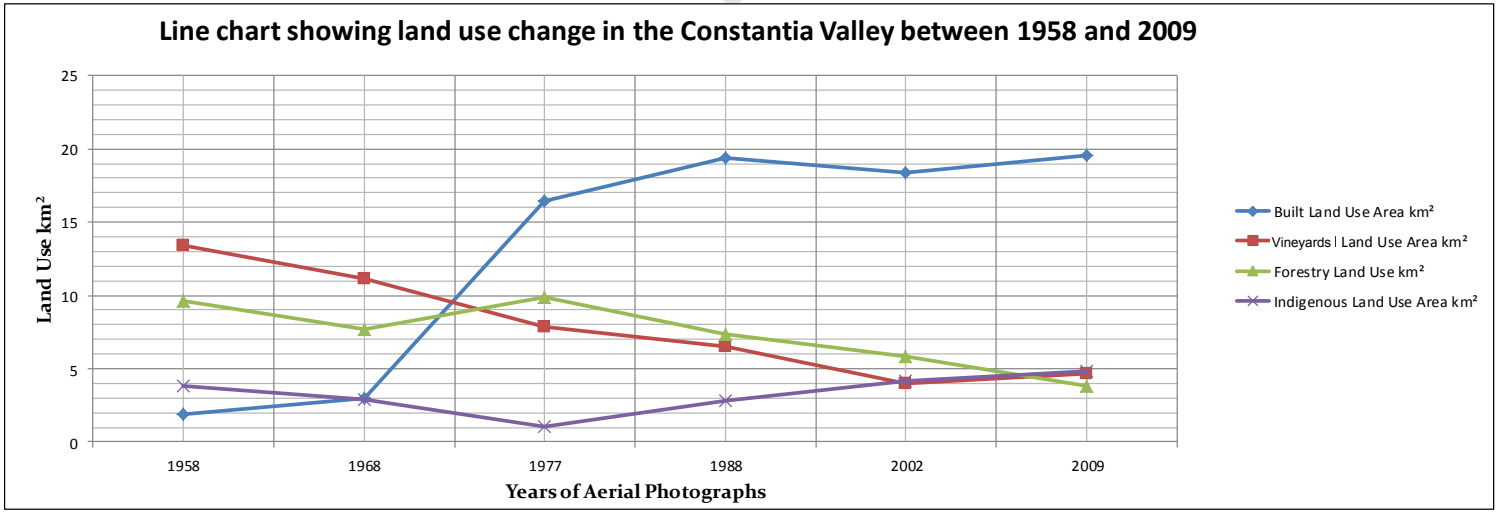

Figure 11 Land use change in the Constantia valley between 1958 and 2009

4.2.1 Overview of Findings from Aerial Photographs

Land use cover for each aerial photograph is shown in Figure 12 to Figure 17. The parts of the study area that are blank were left unclassified either because the land use fell outside defined categories or because of the poor quality of the photograph. This meant that the amount of land categorised differed depending on the year. In 1958 (Figure 12) the dominant land use is vineyards it is found throughout the study area except in the south west corner where there is forestry. Significant amounts of land are also under forestry and indigenous vegetation in the western and southern portions of the study area. Ten years later, in 1960 (Figure 13), built land use has expanded slightly. Most significantly, vineyards have declined in the central section of the study area. This is attributed to the subdivision and densification of smallholdings, although they had not been developed to the point where they could be categorised definitively as 'built'. Indigenous vegetation and forestry land has also been reduced. In 1977, (Figure 14), built land has grown significantly and vineyards have declined in the centre of the study area. Land under forestry is relatively stable while indigenous vegetation has been further reduced. In 1988, (Figure 15) built land spread throughout Constantia and has replaced vineyards. Forestry land has remained stable with some slight reductions. Indigenous vegetation recovered and expanded eastwards. There is little change in land use between 1988 and 2002. There is a reduction in urban land in the centre of Constantia, from 19.4km^2 to 18.3km^2, but this is attributed to the 2002 image being of a significantly higher quality than previous images and thus land use was easier to identify (Figure 16). Finally, in 2009 (Figure 17) vineyards have increased in the north east of the study area. Forestry has disappeared from the north east corner of Constantia and has contracted in the south. Indigenous vegetation has grown, spreading eastward.

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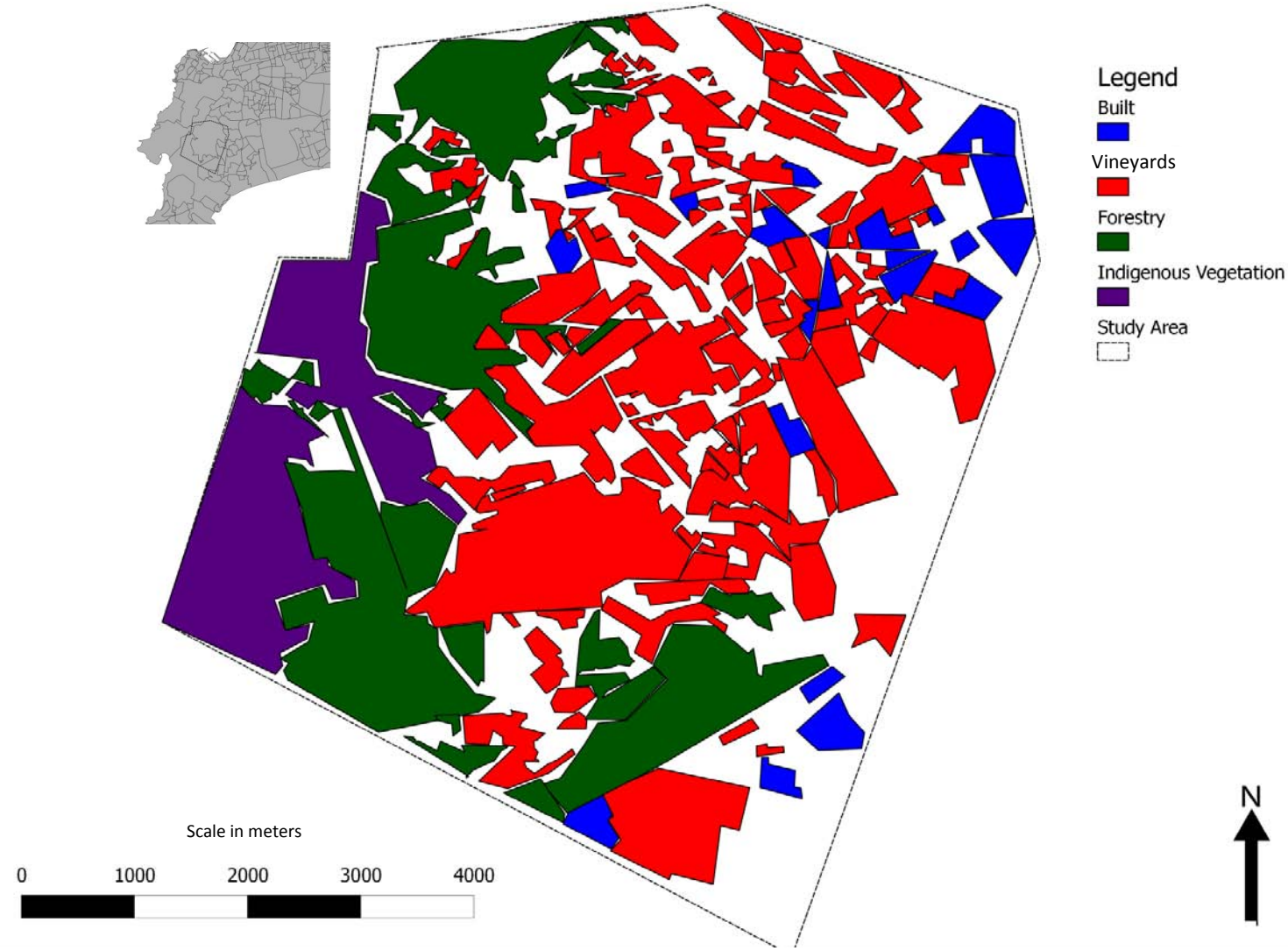

Figure 12 Land use coverage in the Constantia Valley, 1958

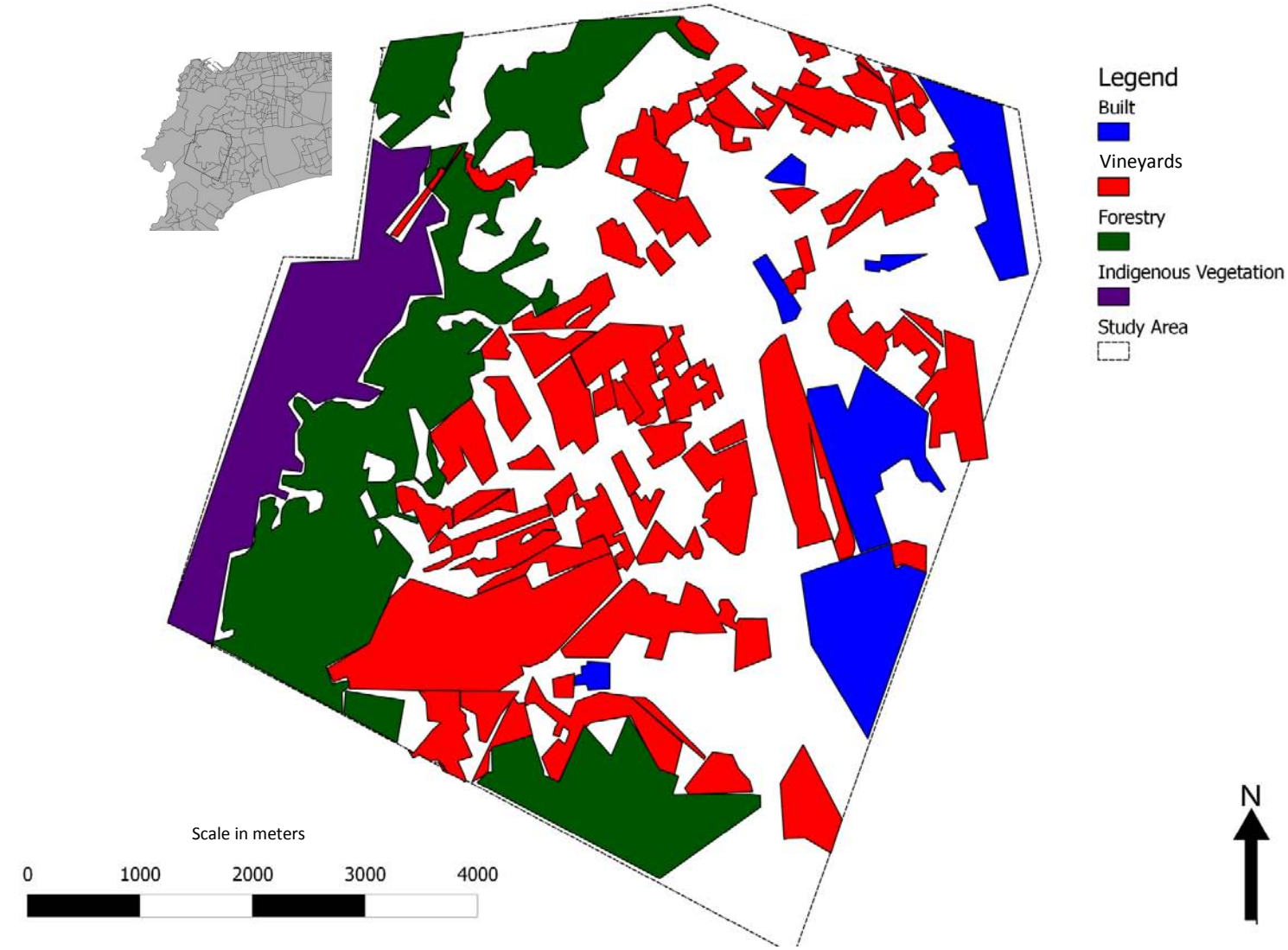

Figure 13 Land use coverage in the Constantia Valley, 1968

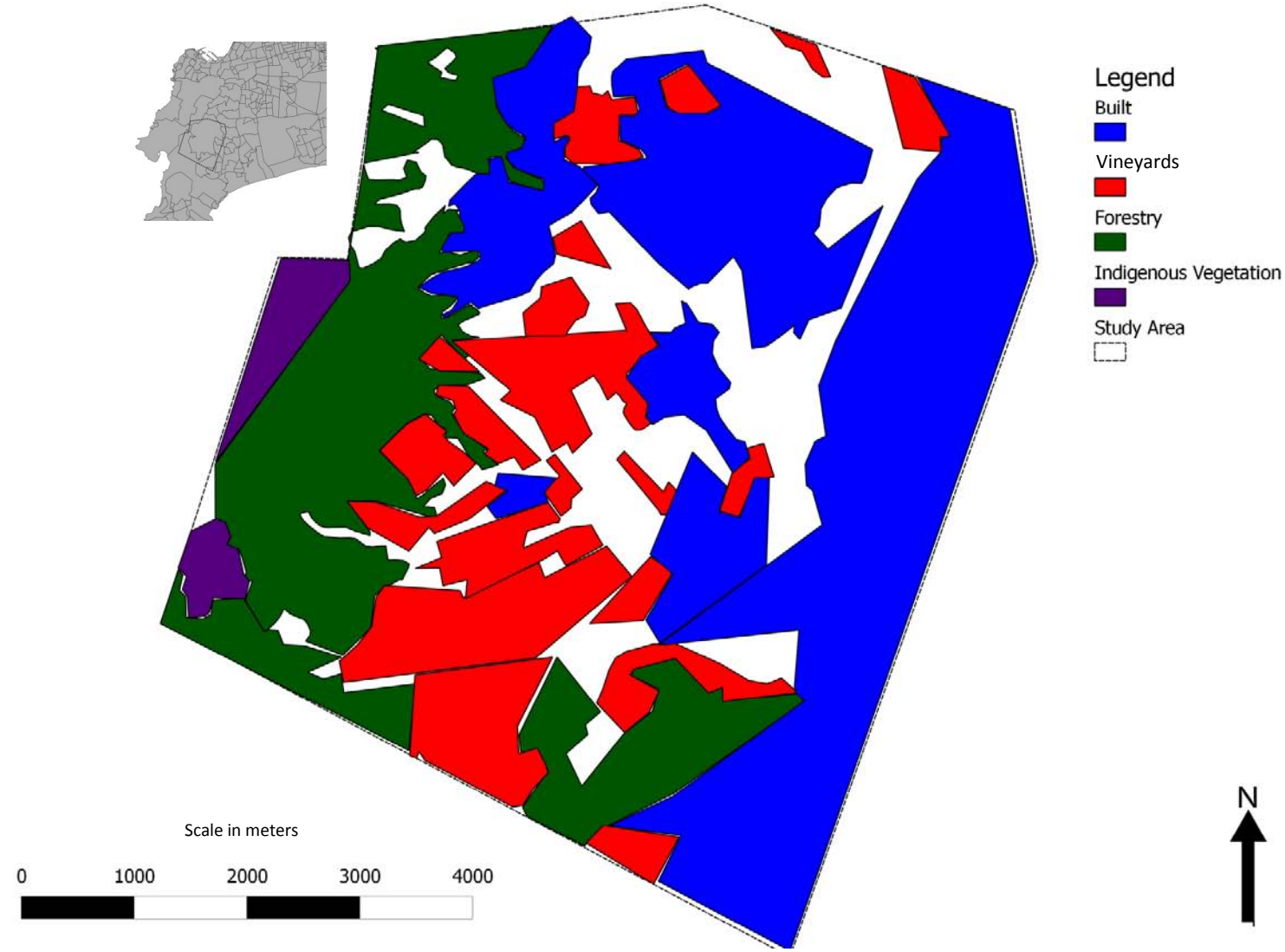

Figure 14 Land use coverage in the Constantia Valley, 1977

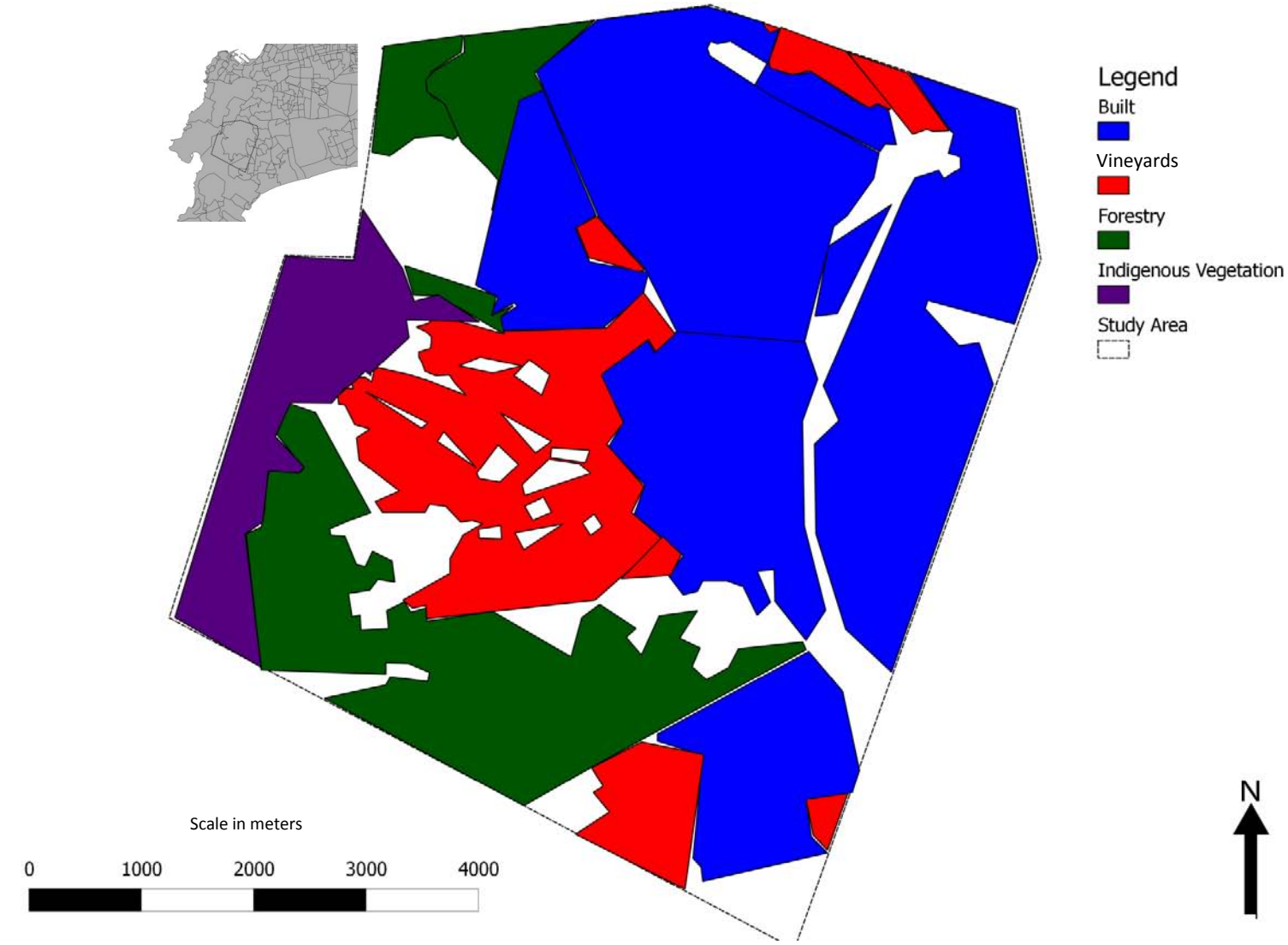

Figure 15 Land use coverage in the Constantia Valley, 1988

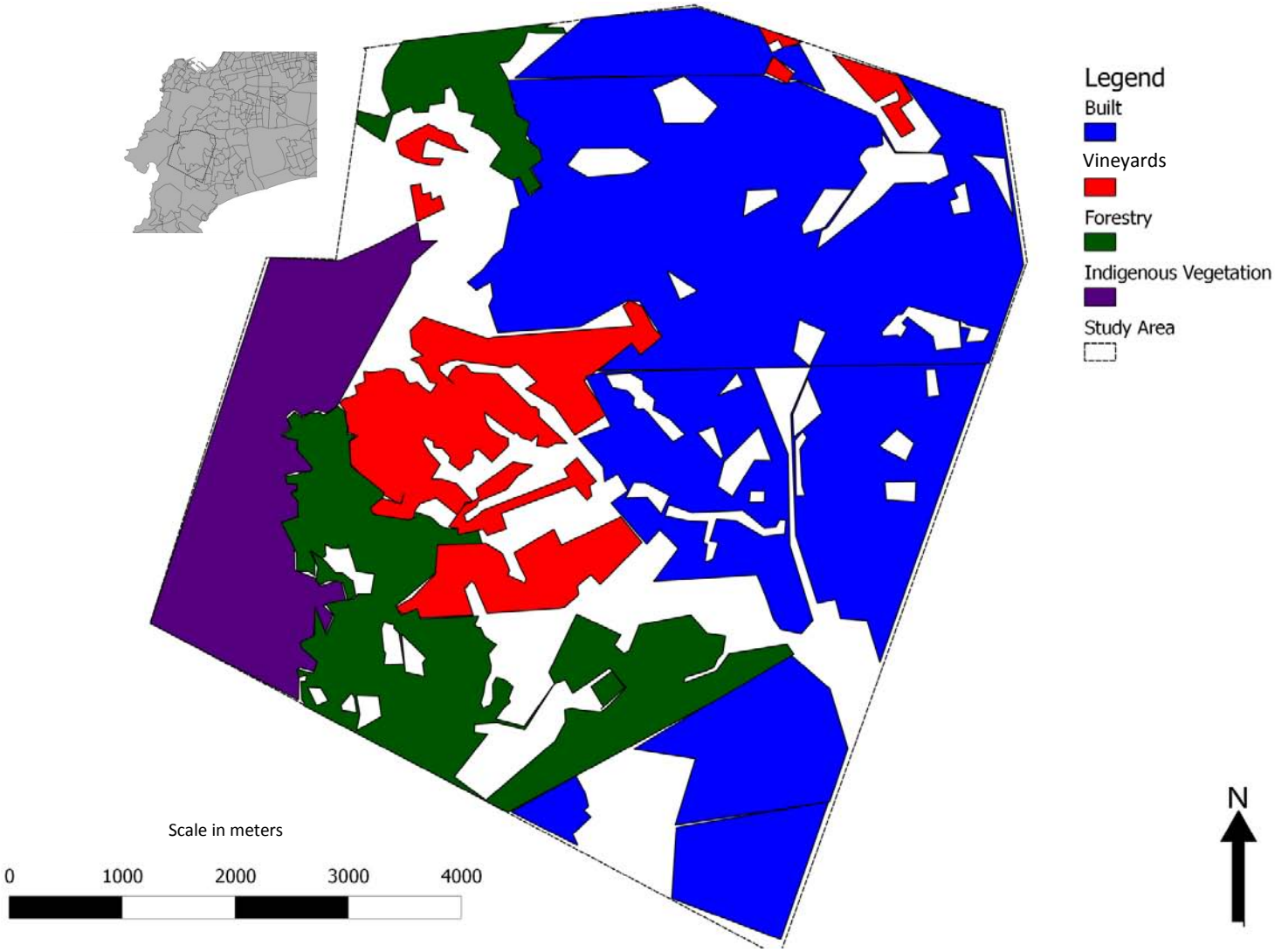

Figure 16 Land use coverage in the Constantia Valley, 2002

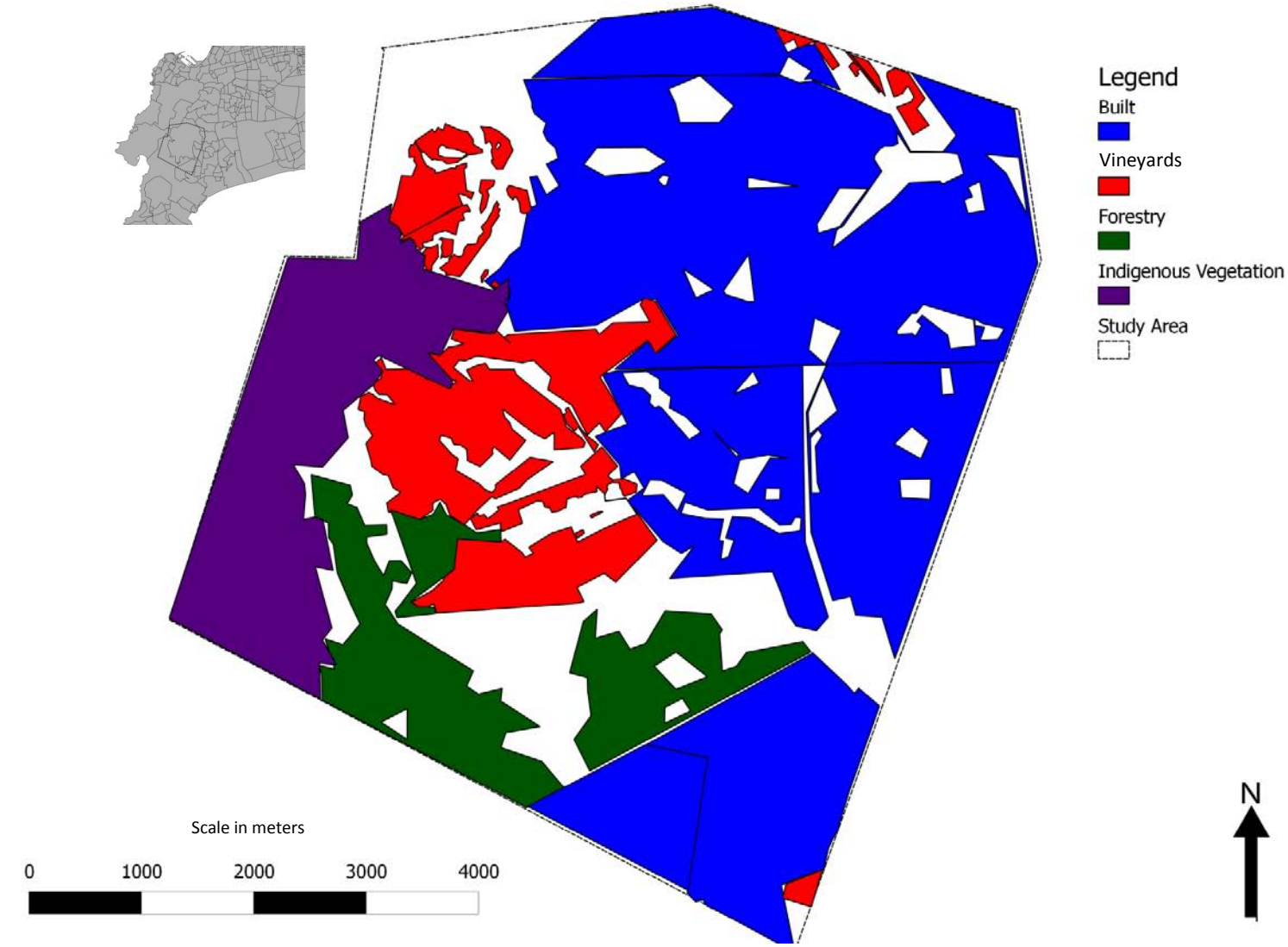

Figure 17 Land use coverage in the Constantia Valley, 2009

4.2.2 Vineyards and Urbanisation

Figure 18 illustrates that vineyards have declined dramatically between 1958 and 2009. In 1958 vineyards covered 13.4 km² but by 2009 they covered just 4.6 km². This represents a 65% decrease in vineyards over a period of 51 years. Also notable is the 17% increase in vineyards between 2002 and 2009. This was because of a decline of land under forestry.

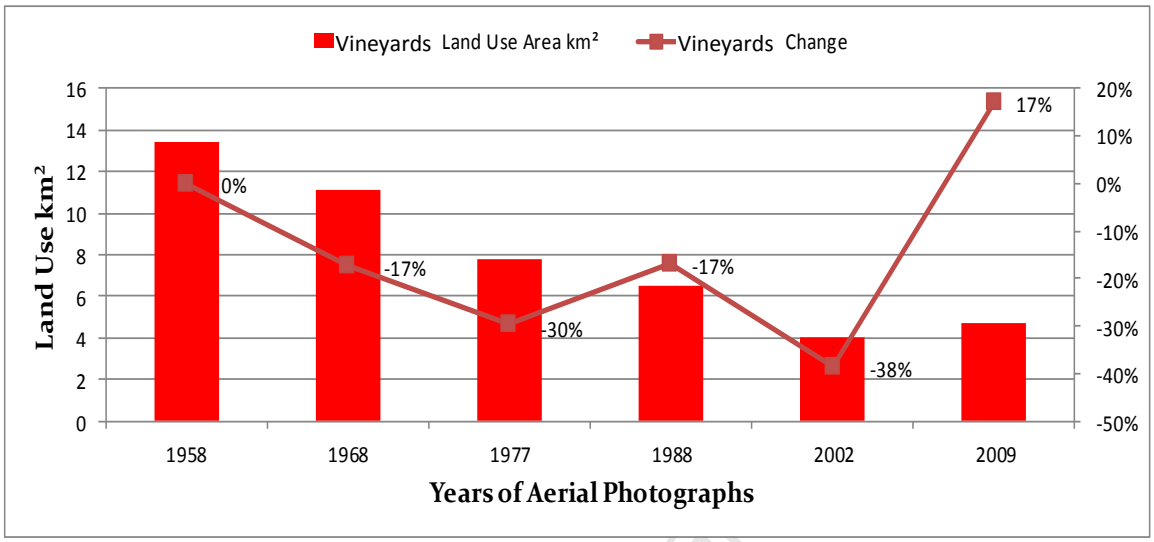

Figure 18 Changes in vineyards coverage

The reduction in vineyards is attributed to the growth in built land. Figure 19 illustrates that built land increased from occupying 1.9 km² of the study area in 1958 to covering 19.521 km² in 2009. This is an increase of approximately ten times.

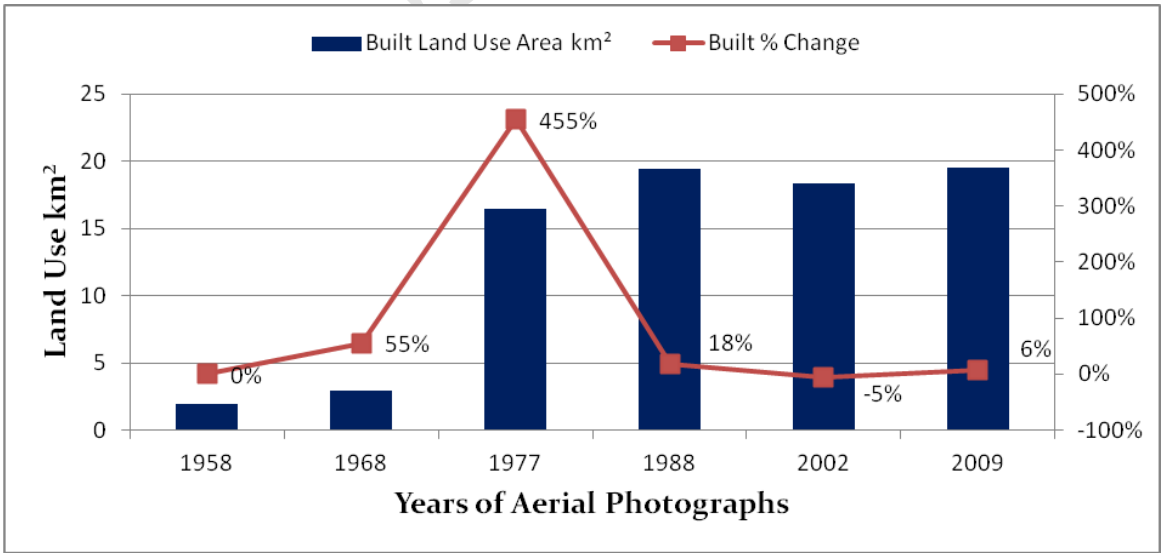

Figure 19 Changes in built land coverage

Figure 20 and Figure 21 demonstrate spatially the urbanisation that the Constantia Valley experienced between 1958 and 1977.

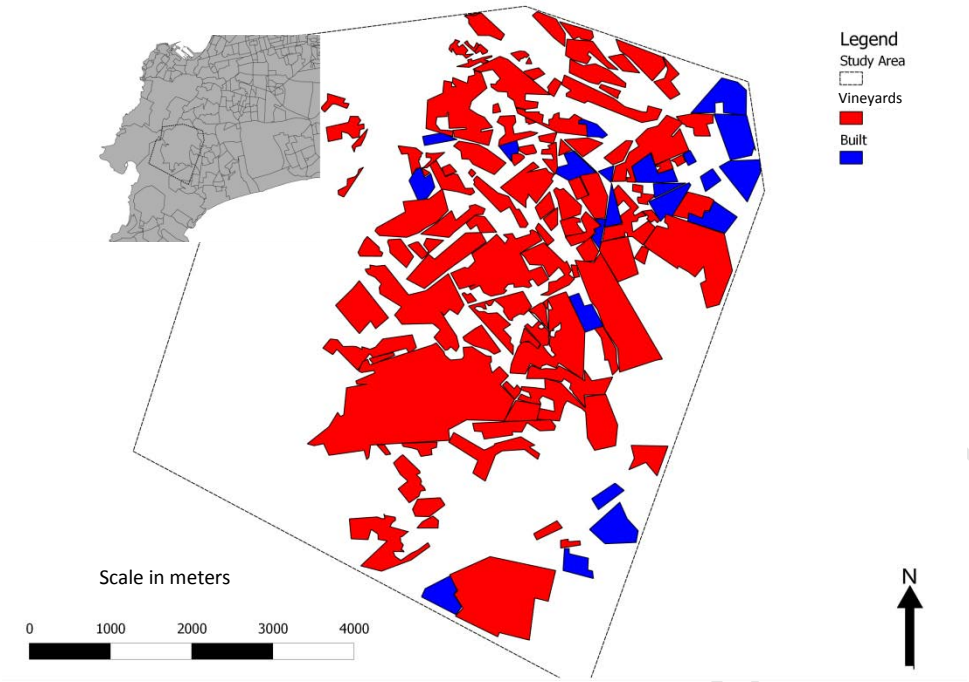

Figure 20 Built and vineyards coverage 1958

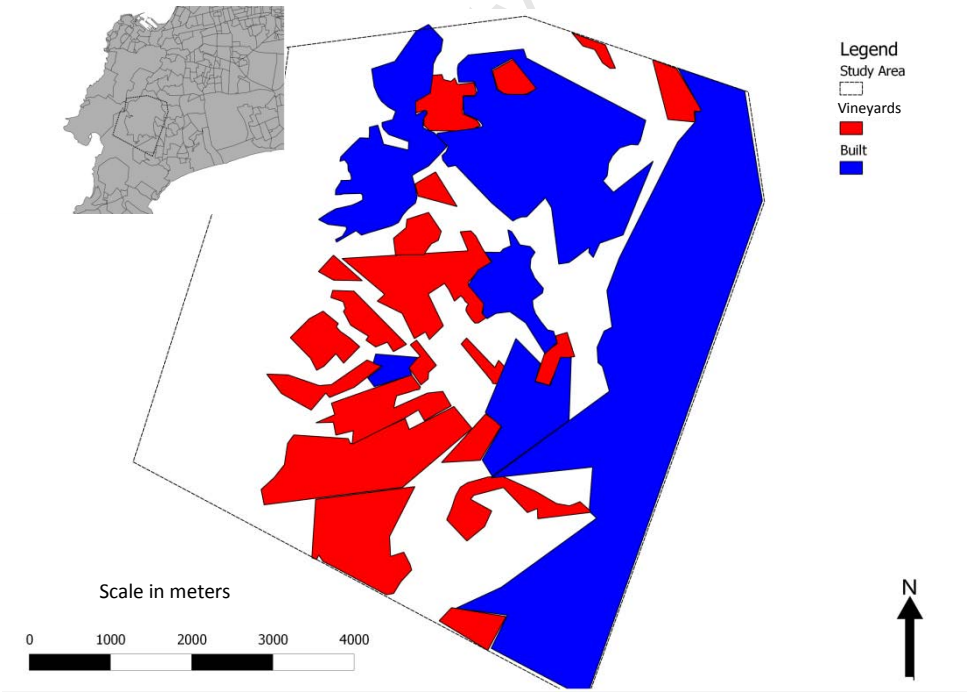

Figure 21 Built and vineyards coverage in 1977

Following a trend of vineyard loss from 1958 to 1988, between 2002 and 2009 the amount of vineyards expanded slightly in Constantia, attributable to the development of vineyards at Constantia Nek, in the north east of the study area. Figure 22 illustrates the changes at Constantia Nek. Vineyards were developed in an area previously infested by alien vegetation with little history of farming.

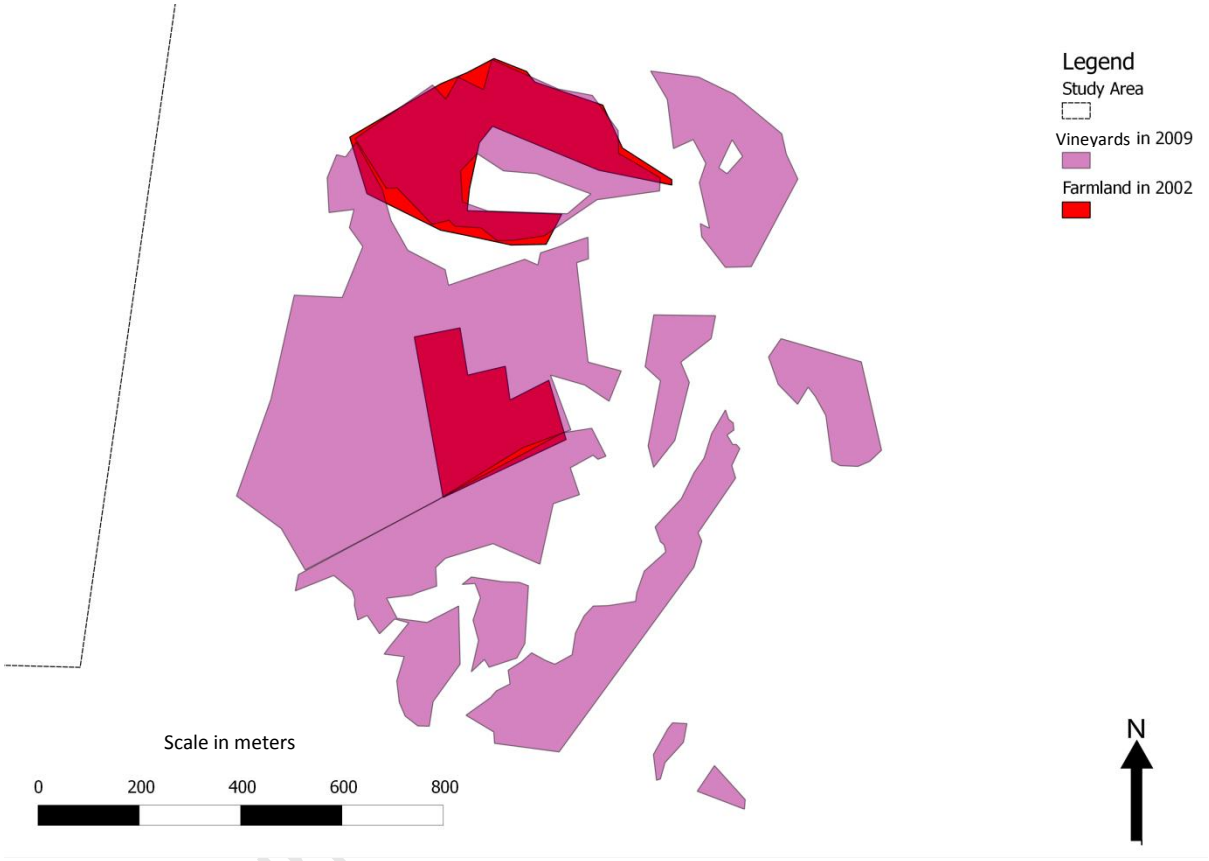

Figure 22 A comparison of the vineyards at Constantia Nek between 2002 and 2009

4.2.3 Indigenous Vegetation

Indigenous vegetation decreased by 2.823 km² between 1958 and 1977, as shown in Figure 23. This decrease can be attributed to the development of buildable land that was occupied by indigenous vegetation. Since 1977, the amount of indigenous vegetation has increased by 375% and is now 0.9 km² larger than it was in 1958.

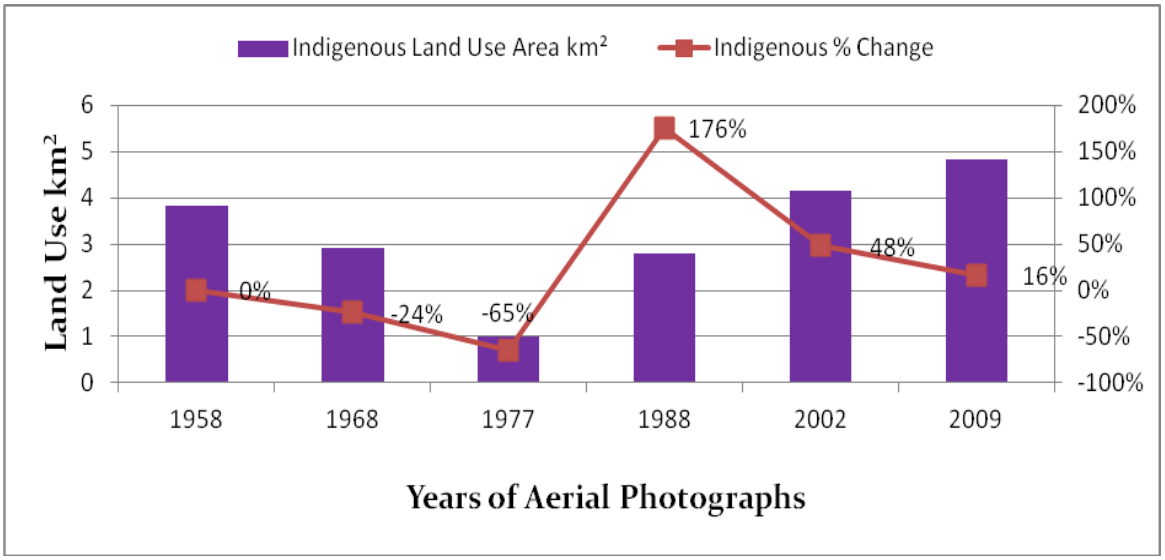

Figure 23 Changes in indigenous coverage

Coverage of indigenous vegetation is similar between 1958 and 2009 as demonstrated in Figure 24 and Figure 25. Furthermore, it shows that all of the indigenous vegetation in the Constantia Valley is found in the western part of the study area, on the slopes of Table Mountain.

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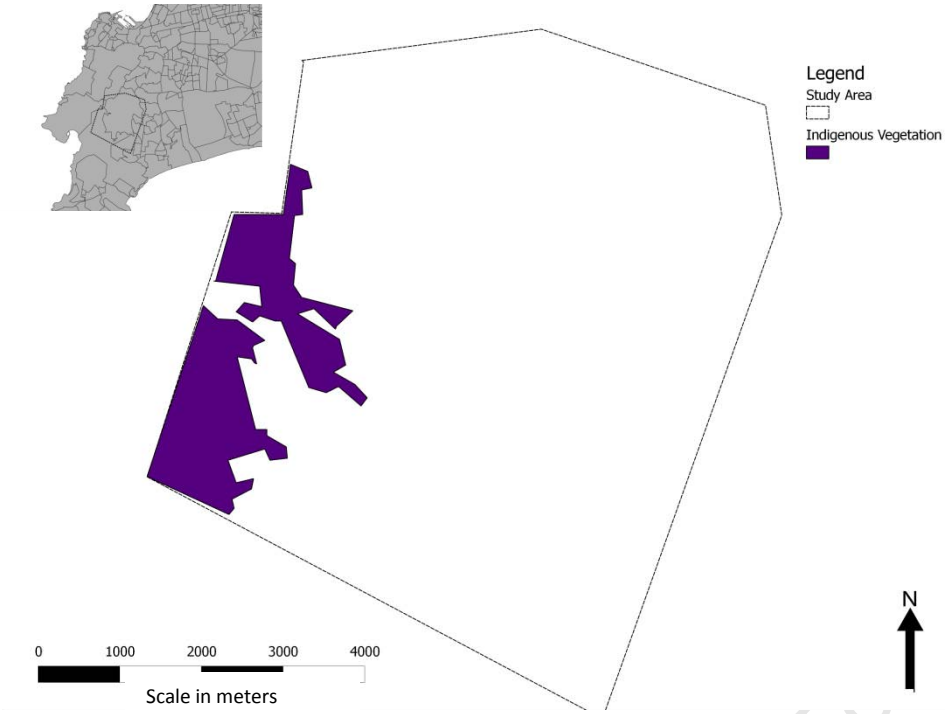

Figure 24 Indigenous coverage in 1958

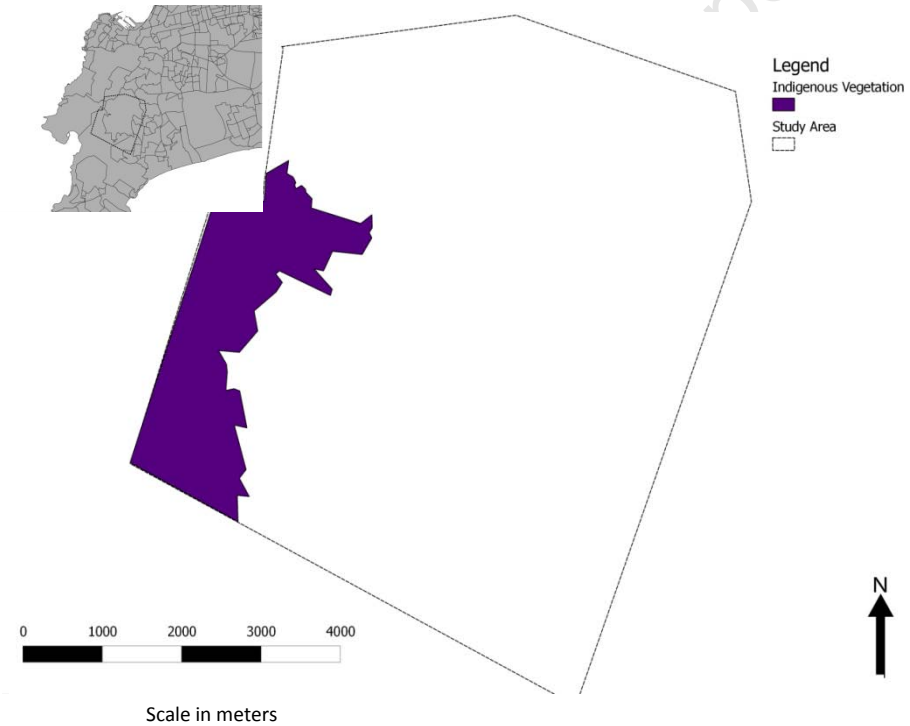

Figure 25 Indigenous coverage in 2009

4.2.4 Forestry

Land under forestry has decreased by 5.8 km² between 1958 and 2009, this is a decrease of 61%, as demonstrated in Figure 26. The amount of land under forestry drops in 1968 to 7.7 km² but then rises again in 1977 by 2.2 km².

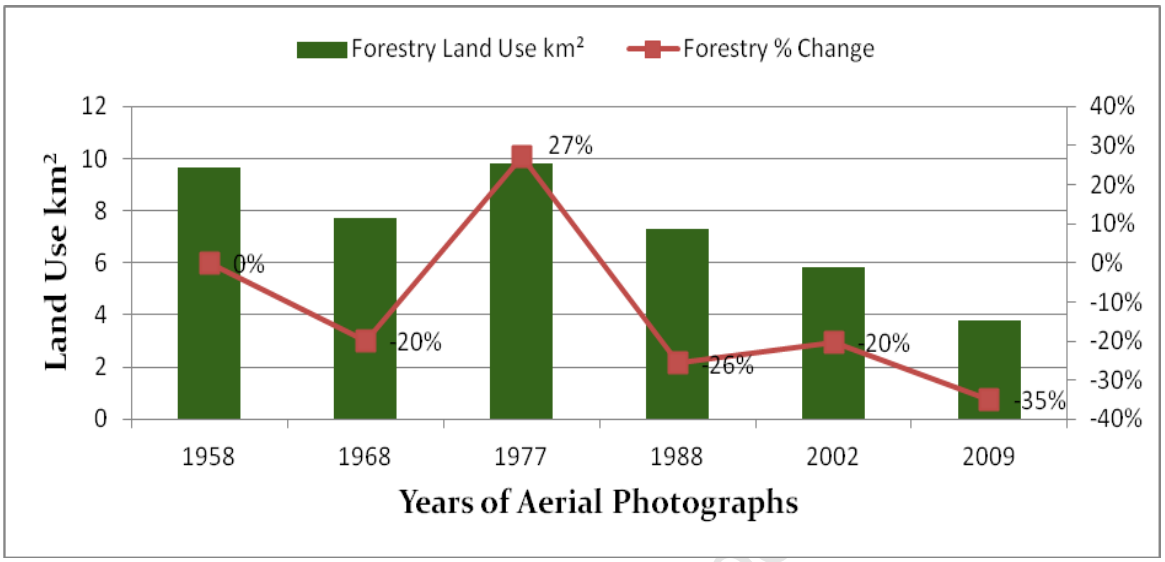

Figure 26 Changes in forestry

There is a 26% drop in amount of land covered by forestry between 1977 and 1988. Much of the land under forestry has been replaced by indigenous vegetation. This is demonstrated in Figure 27 and Figure 28.

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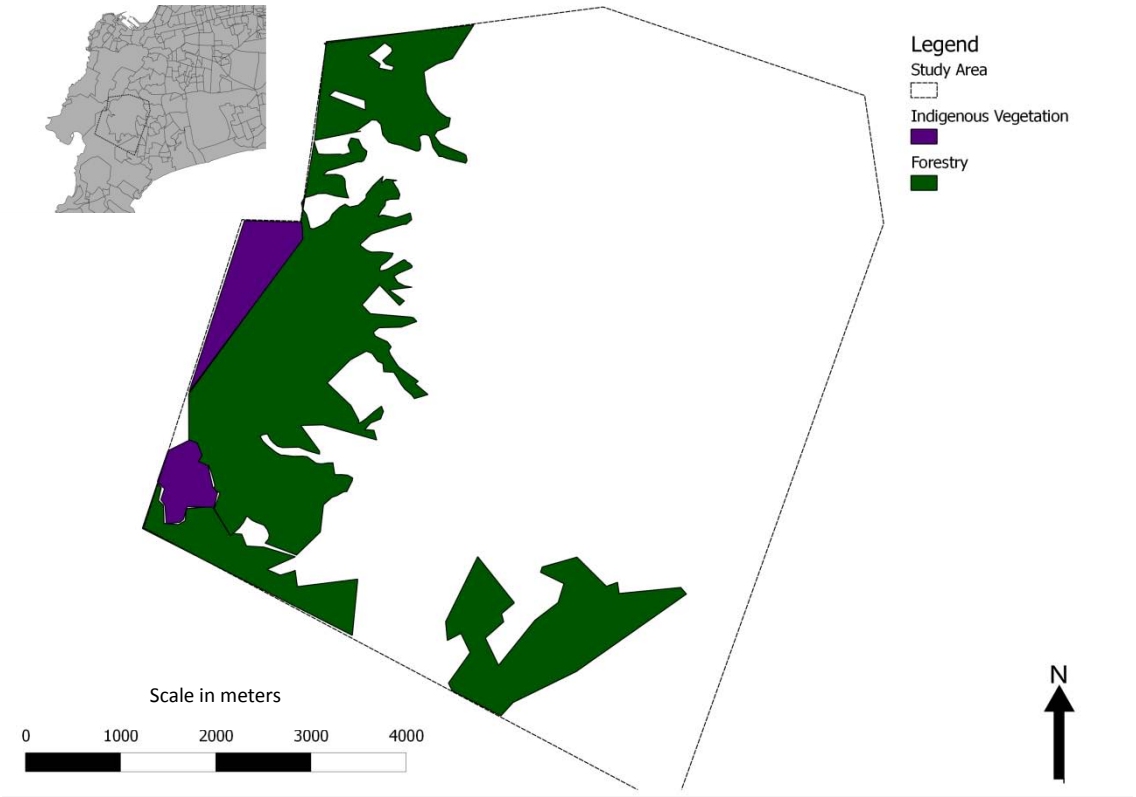

Figure 27 Indigenous and forestry coverage in 1977

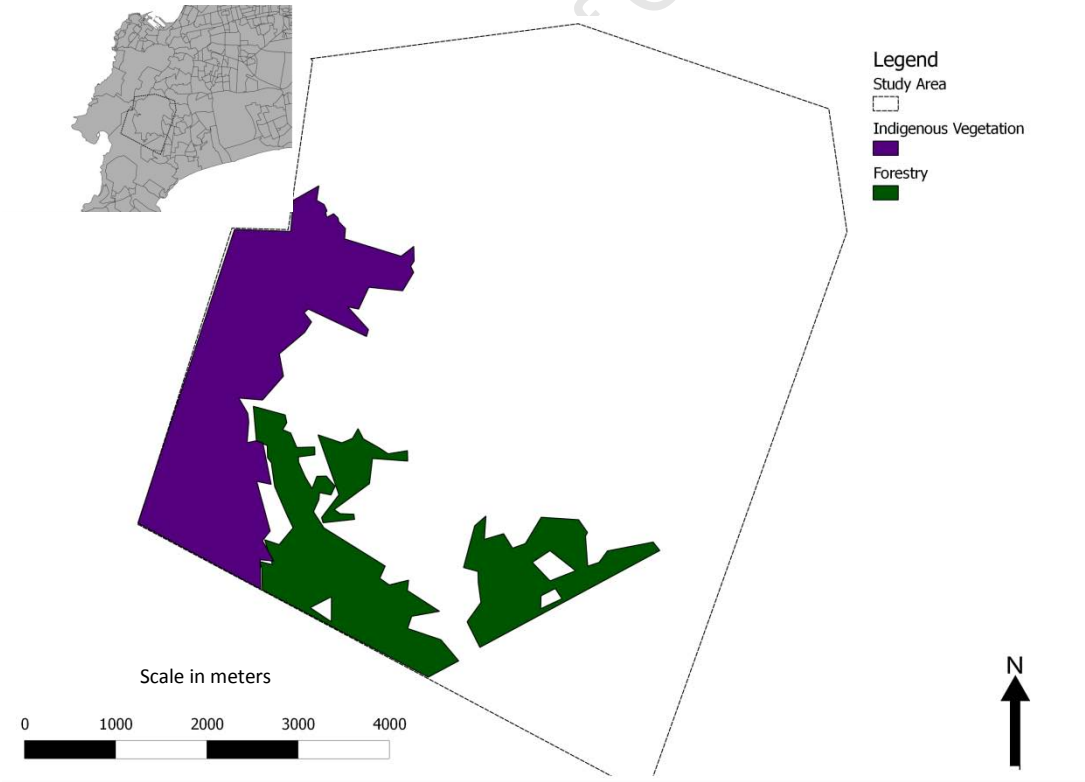

Figure 28 Indigenous and forestry coverage in 2009

Since 2002 the Tokai forest, in the southern portion of the study area, has been gradually felled and replaced by indigenous vegetation as can be seen in Figure 29.

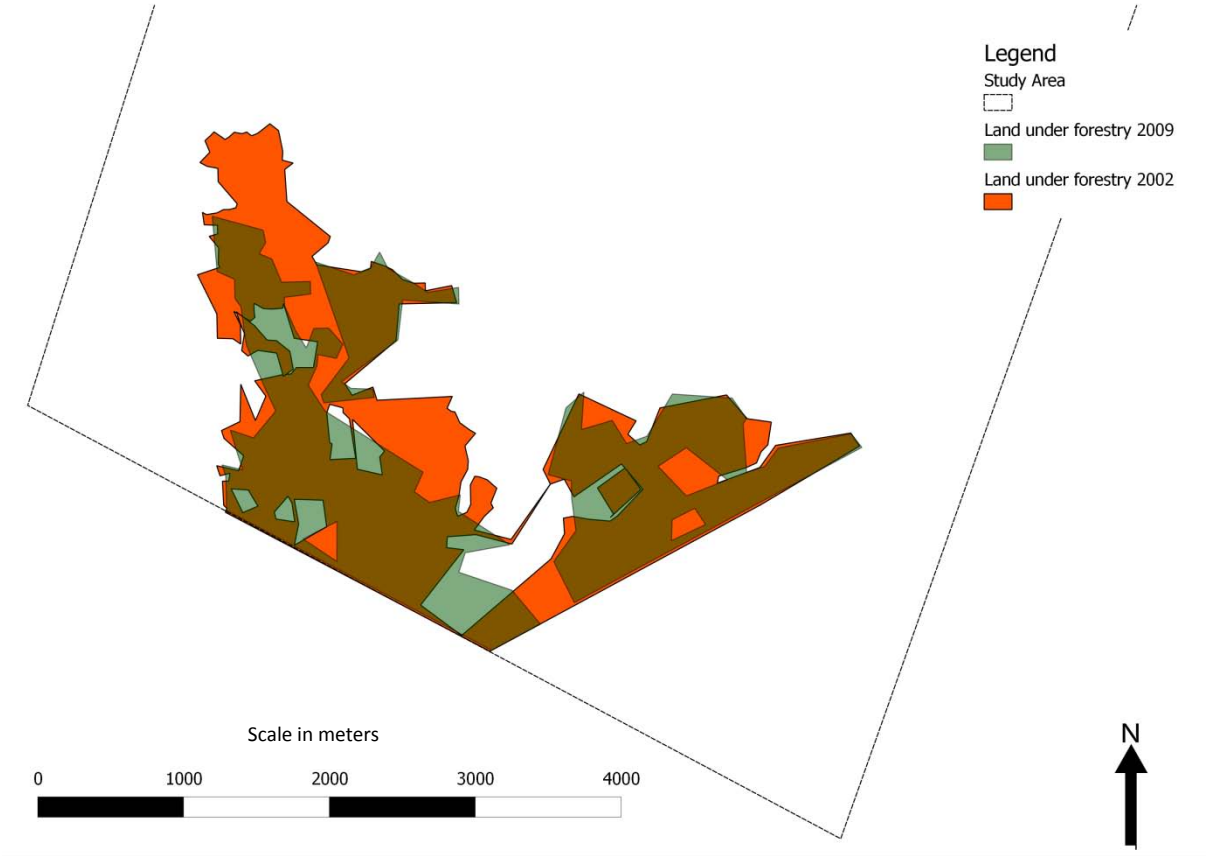

Figure 29 Changes in land covered in forestry in the Tokai Forest

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4.3 Interview Results

This section provides an overview of the key findings and perceptions from the interview phase. Stakeholders were interviewed who have had a long standing presence in Constantia with strong views on land use change and an influence over it. Historical maps and aerial photographs reveal that vineyards have suffered enormous loses, they have gone from covering 47 % of the study area to less than 5% of it in the space of 51 years. As a result a representative from every vineyard in the study area was interviewed. Three broad findings of land use change have been drawn out from the interviews. Table 4 shows these findings and which interviews covered each finding. Following on from this the interview results are presented in accordance with these three main findings.

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Table 4 Overview of themes discussed with interviewees

Interviewee	Organisation	Themes discussed		
		Drivers of urbanisation and loss of farmland	Sense of place: conservation & heritage	Community engagement
Peter Reynolds, Farm Manager	Buitenverwachting Vineyard			
Andre Roussouw, Farm Manager	Constantia Uitsig Vineyard			
Alan Cockroft, Farm Manager	Constantia Glen Vineyard			
Jean Naude, CEO	Groot Constantia Vineyard			
John Van Niekerk, Former Owner & Coucillor for Constantia	High Constantia Vineyard & Coucil of Constantia			
Peter Stewart, CEO	Eagle's Nest Vineyard			
Kobus Jordaan, Farm Manager	Klein Constantia Vineyard & Eagle's Nest Vineyard			
Stuart Botha, Winemaker	Eagle's Nest Vineyard			
Brian Radcliffe, Former Head	Friends of Constantia Greenbelts			
Carly Cowel, Chief Ecologist	SANParks			
Fabio Todeschini, Built Environment Consultant	City Planner			
Alan Dolby, Head	CPOA			

4.3.1 The Rapid Urbanisation of the 1960s and 1970s

The consensus amongst all interviewees was that towards the end of the 1950s, the agricultural industry in Constantia began to decline. The interviewees attributed this to a variety of factors. John Van Niekerk, councillor for Constantia from 1964 to 1973, saw the damage that sub-division and development caused to the heritage landscape of Constantia. In an attempt to 'stop the rot' Van Niekerk, as councillor, oversaw the creation of a greenbelt around Constantia's vineyards and froze subdivision. This generated considerable resistance from the farmers who said they were struggling to remain profitable and wanted the option to sell their land. They resisted the greenbelt 'belligerently' and it was something that they were 'very bitter about.' Farmers successfully appealed against the greenbelt and a year later the legislation was repealed. This resulted in sub-division and urbanisation (John Van Niekerk, Pers. Comm., 9 March 2012).

Fabio Todeschini, a built environment consultant, who has worked extensively in Constantia, and Van Niekerk saw this as the beginning of mass sub-division in the Valley. Additionally, they both identified the construction of the Simon Van Der Stel freeway through Constantia in 1963 as one of the factors that caused the rapid urbanisation of the Constantia Valley (Fabio Todeschini, Pers. Comm., 5 March 2012; John Van Niekerk, Pers. Comm., 9 March 2012).

Stuart Botha, of Eagle's Nest Vineyard, said that the decline of vineyards in Constantia was a result of increasing land values, 'In the 1950s the land in Constantia was still very much rural, but since then the city has expanded and the land has increased in value' (Stuart Botha, Pers. Comm., 7 March 2012). For farmers in the 1960s, selling land became significantly more profitable than continuing to farm. He added that this is a trend that continues today (Stuart Botha, Pers. Comm., 7 March 2012).

Peter Stewart, CEO of Eagle's Nest, said that the loss of vineyards was a result of changes in farming practices. In the early 20th century, Constantia was full of orchards and vineyards but, in the second half of the century, farming practices changed and vineyards were lost and replaced with urban land uses. Larger commercial fruit and wine farms, outside of Cape Town, in areas such as Elgin, Ceres and Worcester had more space and could mass produce fruit and wine on a larger commercial scale than Constantia. As a result, Constantia was no longer considered 'the place to farm' (Peter Stewart, Pers. Comm., 12 March 2012). Additionally, Stewart saw the control that KWV as contributing to the decline of the vineyards. The KWV cooperative encouraged mass production and lower quality wine. Stewart said that Constantia could not mass produce grapes because the Constantia farms were too small (Peter Stewart, Pers. Comm., 12 March 2012).

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Jean Naude, CEO of Groot Constantia, said that the 1970's were a painful time for the vineyards because international sanctions against the apartheid regime. This severely curtailed exports. It caused a decline in the quality of wine that was produced in South Africa (Jean Naude, Pers. Comm., 21 February 2012).

The consensus was that the wine farms fell into a general period of decline in the 1970s. Van Niekerk talked specifically about how Buitenverwachting and Klein Constantia had become run-down. The owner of Klein Constantia, Ian Austin, was doing anything he could to remain profitable. He had moved away from wine farming and had turned to turkey farming and the production of top soil (John Van Niekerk, Pers. Comm., 9 March 2012).

The end of economic sanctions in 1992, stronger planning legislation and the dissolution of the KWV cooperative were identified by the respondents as having reinvigorated the wine farms of Constantia and the South African wine farming industry in general. This resulted in vineyards loss being halted and reversed. Since 1994 tourist numbers have increased exponentially and the late 1990s and early 2000s were good times for the wine industry (Jean Naude, Pers. Comm., 21 February 2012; Fabio Todeschini, Pers. Comm., 5 March 2012).

Vineyards were developed at Constantia Nek in the early 2000s. This was for three reasons: there was a change in ownership of the farms there, the South African wine industry was booming and the landowners wanted to secure the future of the land from residential development by making it profitable. This meant that the wine farms could utilise 'brand Constantia', which derives from the historic local wine industry, to develop their own brand at their vineyards (Alan Cockcroft, Pers. Comm., 7 March 2012; Peter Stewart, Pers. Comm., 12 March 2012).

Despite the recent growth, the Constantia vineyards face an uncertain future. Botha said that he thought that, 'owners were getting jittery about government legislation and community pressure. They questioned whether to cede the farm to offspring or do they cash in [sic]' (Stuart Botha, Pers. Comm., 7 March 2012). Cockcroft thought that in the future there will be some vineyards but that there should be a review of the restrictive legislation and a relaxation of restrictive titles to enable some development (Alan Cockcroft, Pers. Comm., 7 March 2012).

Van Niekerk said he saw further sub-division occurring despite the strength of the regulations. But he thought that because the farms form a band on the middle of the mountain that they would remain for the foreseeable future. He saw the tax rebate of 80% to 90% as giving the wine farmers a huge helping hand and was one of the main reasons that they remained in Constantia. He also saw

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the community spirit that had developed between the bigger and smaller vineyards as contributing to their strength (John Van Niekerk, Pers. Comm., 9 March 2012).

4.3.2 Community Engagement

Interviewees reported that it in the 1980s the community began to worry that the vineyards and the rural feel of the area would be lost permanently and became actively involved in protecting it from development. Alan Dolby, head of the Constantia Property Owners Association (CPOA), said that his organisation had fought hard over the last thirty years to keep urbanisation out of Constantia,' and to retain the 'status-quo.' He went on to discuss how the organisation has always had a large and active membership base in the community who supported there goals (Pers. Comm. 22 February 2012).

Since the 1980s the vineyards have been redeveloped to an international standard much to the delight of the community. Alan Dolby of the CPOA thought that his organisation had been fighting a 'largely, a winning battle' against the loss of open space and urbanisation. He said that they will 'fight tooth and nail to prevent sub-division and development of vineyards and open space.' He said that if it wasn't for the CPOA and for the council, who he believes 'accept that Constantia is a special place,' the heritage of Constantia would no longer exist. He went on to explain that the policies and decisions of the council show that they understand that 'Constantia is a gem worth preserving.' He said that the association cooperated on many issues with the council. Dolby saw 'commercialisation, sub-division and the protection of the green belts' as the three big issues that Constantia will continue to face (Pers. Comm. 22 February 2012).

4.3.3 Sense of Place: Conservation and Heritage

Brian Radcliffe, former head of the Friends of the Constantia Greenbelts (FCGB), reported that, despite the importance placed on preventing the urbanisation of the Constantia Valley by the CPOA, little attention was focused on the preservation of its green environment. Radcliffe labelled the CPOA as having been interested only in 'bricks and mortar development and not the green environment of Constantia.' Radcliffe founded the FCGB out of a desire to protect 'the general ambience of the area… in the face of development.' (Brian Radcliffe, Pers. Comm., 27 February 2012).

The FCGB was founded in 1996 and it is associated with the Wildlife Society of South Africa. This partnership has given the greenbelts additional prominence and enabled them to raise funds for some of their projects. The organisation sees the preservation of the 'five remaining heritage farms in the Constantia Valley and the conservation of the greenbelts' as its two highest priorities (Brian

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Radcliffe, Pers. Comm., 27 February 2012). Radcliffe said that he was encouraged when the FCGB was started because there was a lot of interest from the community in securing the open spaces in the Constantia Valley (Brian Radcliffe, Pers. Comm. 27 February 2012).

Radcliffe said that alien vegetation, including pines and eucalyptus trees, were reducing the flow of the rivers through the greenbelts. He stated that they could not clear the entire area surrounding the river of alien vegetation as this would be unrealistic given their budget and the limited resources of the municipality. However, they aim to clear the vegetation out of the river to increase the biodiversity in the stream and to maintain a good surface flow of the river (Brian Radcliffe, Pers. Comm., 27 February 2012).

Despite sustained efforts to preserve the cultural landscape of Constantia the conservation of indigenous vegetation has been largely overlooked by the community with the exception of SANParks. It was evident in numerous interviews with stakeholders that alien vegetation is perceived as part of the heritage of Constantia. The alien vegetation that occurs in the greenbelts of Constantia is viewed as important for providing shade for recreationalists and would take too much time to remove (Brian Radcliffe, Pers. Comm., 27 February 2012).

The South African National Parks (SANParks) provide the conservation of indigenous vegetation agenda for Constantia. Carly Cowell, chief ecologist for SANParks, said that they are currently working on rehabilitating the Tokai forest back to its natural state and restoring highly endangered vegetation types, such as Cape Flats Sand Fynbos. The gradual removal of nearly all of the pines has resulted in strong community opposition who feel that they form a crucial part of Constantia's cultural landscape and provide shade for recreation. Furthermore, she spoke of problems in restoring effective fire regimes in the area because of the local community's fear of fires (Carly Cowell, Pers. Comm., 27 February 2012).

Increases in concern for the preservation of Constantia's cultural landscape led to the CPOA and the FCGB to employ Todeschini to evaluate the heritage status of the Constantia Valley. Todeschini produced the *Tangible Heritage Resources in the Constantia – Tokai Valley* (2007) and this resulted in the Grade 1 heritage landscape listing, making development on vineyards near impossible. Many farmers have been opposed to the grading. Stewart has fought hard against the blanket grading of the Constantia vineyardss as a heritage site and said that neither he nor any other farmer was consulted on it. Along with the other farmers at Constantia Nek he commissioned a study that countered the claims of Todeschini and stated that there was no heritage of wine farming at Constantia Nek and therefore should not be subject to the same restrictions as the historic vineyards

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in other parts of Constantia. He saw the Grade 1 heritage listing as restrictive and said it would result in vineyards having to seek permission 'to change cultivars, amend road layouts and make changes to land they owned' (Peter Stewart, Pers. Comm. 12 March 2012). They opposed the listing by arguing that due process had not been followed but they found themselves in a 'bureaucratic quagmire' because the board responsible for making a decision on the matter still needed to be appointed (Peter Stewart, Pers. Comm. 12 March 2012). Kobus Jordaan and Stuart Botha opposed the heritage grading with Stewart and expressed similar sentiments. They saw Constantia returning to a state of decline similar to the 1970s if it became a national heritage site (Kobus Jordaan, Pers. Comm. 7 March 2012; Stuart Botha, Pers. Comm. 7 March 2012).

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5 Discussion

Having presented the results in the previous chapter, this chapter applies academic theory to land use change in the Constantia Valley.

The main finding of this study is that Constantia's pattern of urbanisation changed course in the 1980s. The rapid urbanisation of the Valley slowed significantly in the 1980s and has remained limited since. As a result it has remained semi-rural and semi-suburban because of opposition to development from the community and the CPOA.

The interviews revealed that there are many complex factors influencing land use change in the Constantia Valley. However, the dominant factor in regulating land use change is the community itself. The residents have acted as 'gatekeepers' since the 1980s (and before), successfully limiting development to preserve a heritage landscape in Constantia for their own enjoyment. Increased accessibility, advancements in agricultural technology and the expansion of Cape Town have also been influential in shaping the urban form of Constantia.

5.1 Urbanisation

Between the 1960s and the 1980s the urban landscape changed in Constantia because of rapid urbanisation and vineyard loss. The loss of vineyards to make way for urbanisation in the second half of the twentieth century is a well-documented trend (Kline and Wichelns, 1996; Ready et al., 1997; Geoghegan, 2002; Tan et al., 2005). In the United States between 1982 and 1992 6.2 million acres of agricultural land were converted to urban land uses (Geoghegan, 2002). More recently in China the same trend has been noted. Between 1990 and 2000, in the Beijing-Tianjin-Hebei region, urban land uses increased by 71%. Almost three quarters of the land was converted from arable land uses (Tan et al., 2005). In the 1950s and 1960s the prevailing public opinion in the United States was that the supply of farmland was unlimited and the expansion of cities was a sign of progress. It was not until the 1970s, after rapid urban sprawl and the conversion of vast tracts of farmland, that people began to worry about the future of America's farmland (Bunce, 1998). This analysis of land use change fits well with the findings in this study. It was not until the 1980s that urbanisation slowed, predominantly because of a growing awareness amongst the community that the landscape of Constantia was under threat. The CPOA have been actively fighting development in the Constantia Valley since the 1980s (Dolby, Alan. Pers. Comm. 22 February 2012).

The factors that caused the urbanisation between the 1950s and 1980s are discussed below.

5.1.1 The Simon Van Der Stel Freeway

Urbanisation is strongly determined by accessibility (Antrop, 2005). Furthermore, the construction of roads through rural landscapes promotes economic development (Chomitz and Gray, 1996; Wheeler

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et al. 2005). The construction of the Simon Van Der Stel freeway in 1963 is one of the main factors influencing the growth of built land in the Constantia Valley. Five years after the freeway was built there was little built land in the study area. But by 1977 built land use had spread rapidly along the length of the freeway.

Todeschini has carried out two prominent studies on the Constantia Valley, *the Constantia – Tokai Valley Local Area Growth management and development plan* (1992) and *Tangible Heritage Resources in the Constantia Valley* (2007). Todeschini believes that the construction of the freeway opened the area up to development (Fabio Todeschini, Pers. Comm., 5 March 2012). Van Niekerk, a former lawyer, was heavily involved in a legal fight to re-direct the freeway, as he believed it would open up Constantia to development (John Van Niekerk. Pers. Comm. 9 March 2012). It was built through a flat area near buildable land that provided the ideal location for the construction of suburban housing. The freeway increased the accessibility of the Constantia Valley to the centre of Cape Town.

5.1.2 Legislation

The idea of Constantia as a heritage landscape is a recent one that was not realised by planners and the community members in the 1960s. The re-zoning of land in the same period as the construction of the freeway encouraged the urbanisation of Constantia. Aerial photography shows that rapid urbanisation started in the 1960s. In 1960 the CPOA inserted clauses in the spatial development plan for Constantia which allowed for farms to be sub-divided. In 1960 Plan A 20 D/2G and in 1964 Plan 1 B brought in minimum plot sizes as small as 350m². Todeschini noted that this was because '…there was not the awareness then of the threat of vineyards loss' (Pers. Comm., 5 March 2012). After rapid urbanisation in the 1970s, the minimum farm size of 21 hectares was re-instated in an attempt to prevent the sub-division of farms. As in the examples from the United States, it was only after rapid urbanisation had taken place that the residents of Constantia and local government became concerned about the loss of vineyards (Todeschini et al. 1992 and Todeschini, Fabio. Pers. Comm. 5 March 2012).

5.1.3 Group Areas Act

Before the implementation of the Group Areas Act of 1950 (as amended), Constantia was a mixed community consisting of Cape Coloureds and Whites. In 1961 non-whites who did not own land in Constantia started to be relocatedto the Cape Flats (Pape, 2002). This population group predominantly consisted of tenant farmers who worked on market gardens. But as the effects of the apartheid regime increased in severity, all non-white property owners were removed and relocated east of the recently constructed Simon Van Der Stel freeway into the Cape Flats (Pape 2002). The

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role of the Group Areas Act (as amended) was not discussed by any of the all-white interviewees. However, their removal opened up land for suburban housing and the creation of Constantia's greenbelts, areas of parkland that aim to protect the riverine landscape. The Group Areas Act (as amended) secured Constantia as an all-white middle class domain throughout the apartheid era. The end of apartheid brought the potential for change to South Africa's urban form. However, the changes that the urban form has experienced since the fall of apartheid have only stratified society further (Harrison et al., 2003).

5.2 The Wine Industry in the 1970s

It was a common sentiment amongst interviewees that the Constantia vineyards fell into a poor condition at the end of the 1970s. Farmers were encouraged to sell their land because of rising land values that were being driven up by residential development (Peter Stewart, Pers. Comm., 12 March 2012 and John Van Niekerk, Pers. Comm., 9 March 2012). The continued loss of vineyards in the late 1970s and early 1980s was predominantly because of the near collapse of the wine farming industry in Constantia. It emerges from this study that this was a result of changes in the agricultural industry in South Africa broadly, the role of the KWV and continued urbanisation.

As a result of advancements in the agricultural industry 'Constantia was no longer the place to farm.' The Constantia vineyards could not produce a large enough volume of wine to meet demand (Peter Stewart, Pers. Comm., 12 March 2012). From the 1960s onwards farms moved towards becoming massive operations, of a commercial scale that spread across many hectares. Areas outside of Cape Town, such as Ceres and Worcester, were much better suited to this type of agriculture than Constantia and thrived as a result (Peter Stewart, Pers. Comm., 12 March 2012). Sixty years ago space for agricultural expansion was at a premium in Constantia. Aerial photographs from 1958 demonstrate that farms in Constantia could not expand. They were surrounded by Table Mountain and an urban area in Bishopscourt in the north, the urbanised Cape Flats to the east and the Constantiaberg and Steenberg ridges to the west and south.

Farmers did not think the KWV regulatory structure suited the small vineyards of Constantia. Stewart saw the control of the KWV as reducing the quality and the pride that farmers had over the grapes they produced. This was because they were guaranteed a set price for the grapes and the cooperative gave anonymity to farmers (Peter Stewart, Pers. Comm., 12 March 2012).

Despite a growing awareness of the consequences of vineyard loss and community support for measures to limit its loss, legislation was ineffective. The 1958 Plan TPR 2400 put in place a residential density gradient across the Constantia Valley (Todeschini et al. 1992). Various changes to

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this plan in the 1960s and 1970s reduced the minimum plot size, thus allowing for densification of small holdings (Todeschini et al. 1992 and Alan Dolby, Pers. Comm., 22 February 2012).

5.3 Stabilisation of land use change

After the rapid changes that occurred in the 1950s, 60s and 70s land use change stabilised in the Valley in the 1980s. This was for a number of reasons, the recovery of vineyards, the end of apartheid and South Africa entering into new world market. However, the dominant factor that curtailed land use change in the study area was the role of the community.

5.3.1 Vineyard Recovery

The near loss of the vineyards generated a desire to preserve them in the mid-1970s. Wealthy individuals and families who made their money outside of the wine industry renovated Constantia Uitsig, Klein Constantia and Buitenverwachting. The vineyards were upgraded to an international standard and this encouraged the redevelopment of other farms in the Constantia Valley (John Van Niekerk, Pers. Comm., 9 March 2012 and Kobus Jordaan, Pers. Comm., 7 March 2012).

5.3.2 Internal Globalisation

For the rest of southern Africa, globalisation was imposed by organisations such as the World Bank, the International Monetary Fund and various structural adjustment programs. At the end of apartheid, South Africa adopted orthodox economic reform measures, namely through the Growth, Employment and Redistribution Program. It abandoned the more socialist Reconstruction and Development Program. The government was free to adopt a neo-liberal model of economic reform because of its low level of external debt. This placed national authorities and a small number of large corporations in charge of globalisation in the country (Carmody, 2002). South Africa's economy strengthened and foreigners began investing into the South African wine industry. As a result the Constantia vineyards became financially strong and less likely to be lost to urbanisation (Peter Stewart, Pers. Comm., 12 March 2012).

5.3.3 New World Markets

The end of apartheid in 1994, paired with the end of the KWV regulatory control over the wine industry in 1997, represented a massive boost for the South African wine industry (Ewert and du Toit, 1997 and Fairbanks et al., 2004). Since 1994, South Africa has aggressively marketed itself as a new world wine producer. The winelands of Constantia and Stellenbosch are close to Cape Town, a major attraction for tourists. Although these factors are not unique to a new world wine making destination it still makes Cape Town an attractive destination for tourists (Bruwer, 2003).

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A study on viticulture expansion completed in 2004 states that the wine industry was the fastest growing and most lucrative form of agriculture in the Western Cape (Fairbanks et al., 2004). Furthermore, a boost in international trade in the early 2000s encouraged an increase in the production of premium grapes which suited the small farms of Constantia who were already producing premium quality wine (Platter, 2011; Stewart, Peter. Pers. Comm., 12 March 2012). The strengthening of the wine industry in Constantia lowered the threat of the vineyards being lost to development. The promotion of the Constantia Valley as an international tourist destination helps forward the agenda of those in the community who want to limit urbanisation and preserve Constantia's heritage landscape because it further legitimises it.

5.4 The Residents' Heritage Landscape

The final and most significant factor that contributed to the relatively stable land use since the 1980s is the local community itself. The role of the Constantia community in limiting development is the main finding of this dissertation. The open space that remained in Constantia in the 1980s was protected by formal conservation laws in an attempt to preserve a carefully constructed heritage landscape (Pape, 2002; Alan Dolby. Pers. Comm., 22 February 2012; Brian Radcliffe. Pers. Comm., 27 February 2012).

Constantia is marked by a long history of human influence and this can be seen in the landscape that is made up of a mosaic of varying units of distinctiveness. The landscape of Constantia is a continuously evolving record of human activity. Over hundreds of years new activities have adapted and replaced old activities, but each activity has left a mark to a varying degree (Davies, 1981). A tour of Constantia reveals that it contains a variety of buildings and monuments from many different periods of its history as well as indigenous and alien vegetation. This all contributes to Constantia's diverse landscape and cultural and natural heritage (UNESCO Convention, 1982). Thoreau recognised the importance of conserving the history of human influence on a landscape (Foster, 2002). However, Constantia residents have used the heritage landscape and moulded it to support their goal of freezing development (Davies, 1981; Spinks, 2001; Foster, 2002; Whitehand, 2009). Additionally, the heritage landscape attracts tourists, who contribute to the economy of Constantia. Tourism legitimises the heritage landscape and thus further protects it from development.

The CPOA has worked hard to maintain the 'status-quo' of Constantia, which is the maintenance of an upmarket suburb (Davies, 1981; Alan Dolby, Pers. Comm., 22 February 2012). The CPOA has a strong support base in the community with 1200 members. There is a well-attended annual meeting and a widely circulated monthly newsletter that is produced by Dolby, the head of the organisation (Pape, 2002; Alan Dolby, Pers. Comm., 22 February 2012). Urbanisation is opposed by the

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community funded CPOA who employed private consultants to write reports opposing development and ensuring that their version of the heritage of Constantia is maintained.

5.4.1 The Heritage Grading

The CPOA sponsored a study that proposed the farms of Constantia as a grade 1 heritage sites to further the heritage landscape agenda (Todeschini and Blackenberg, 2007). This was a blanket grading for all the wine farms of Constantia. The report and the final decision currently sits with South African Heritage Resources (SAHRA) (Todeschini and Blackenberg, 2007; Fabio Todeschini, Pers. Comm., 5 March 2012). The grading will mean that farmers will have to seek the permission of SAHRA, Heritage Western Cape and the City of Cape Town to conduct hard engineering on their farms however the everyday management of the farms will not be affected (Todeschini and Blackenberg, 2007; Peter Stewart, Pers. Comm., 12 March 2012; Fabio Todeschini, Pers. Comm., 5 March 2012).

Todeschini failed to consult wine farmers when carrying out the heritage study and this has created anger amongst the farming community at Constantia Nek. The lack of consultation has resulted in a poor understanding, amongst the farmers, of what the Grade 1 listing will mean for their farms. The farmers of Constantia Nek have mounted a legal opposition because they feel they should not be constrained by the same regulations as other wine farms in Constantia owing to the fact that there is little history of farming in this part of the study area (Peter Stewart, Pers. Comm., 12 March 2012; Kobus Jordaan, Pers. Comm., 7 March 2012; Alan Cockroft, Pers. Comm., 7 March 2012).

The construction of new vineyards at Constantia Nek further contributes to the agrarian landscape of the Constantia Valley. The creation of new vineyards after a long trend of vineyard loss enhances the heritage landscape and the CPOA would not want to see them lost to development (Lowenthal, 1985; Peter Stewart, Pers. Comm., 12 March 2012).

5.4.2 The Role of Open Space for the Community

Residents interpretation of how nature should be in Constantia shows that they have been heavily influenced by the society they are surrounded by (Dermeritt, 2002; Ernston, 2008). Similar to white Zimbabweans they have Europeanised the environment (McDermott Hughes, 2010). Indigenous vegetation is on the increase in Constantia only because of the role of SANParks in restoring the Tokai forest, an area largely outside of the influence of the CPOA and the residents of Constantia at large. However, the rehabilitation was heavily contested by the Shout for Shade Campaign, who argued that the forest provided many benefits (Rattle, 2011). There was a general lack of concern and awareness amongst residents and farmers in Constantia about the importance of the

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conservation of indigenous vegetation and biodiversity. The community of Constantia preserve alien vegetation through the protection of the greenbelts and vineyards from development. They believe that alien vegetation contributes to the beauty of Constantia and its heritage. This is reflected in the many exotic trees that are labelled as protected species (COCT, 2005). The planting of alien vegetation tames the rugged beauty of the Cape Peninsula and Europeanises the landscape. This can be a likened to the way that white Zimbabweans recreated the beauty of the English Lake Districtss through the construction of the Kariba Dam to enable them to feel a sense of belonging (McDermott Hughes, 2010).

Ecological diminishment in Constantia forms part of a wider historical trend in Cape Town. Since the 1800s, there has been rapid population growth and an increase in the urban footprint. Provisioning services have been heavily used to supply the city. This has caused the collapse of many natural regulatory services. The management of the environment, particularly through afforestation and the introduction of alien species have had 'cataclysmic consequences for the globally important biodiversity of the region' (Anderson and O'Farrell, 2012, no page number).

The protection of alien vegetation shows that there are many different interpretations of what forms the natural environment. The recent Shout for Shade Campaign contesting the land use changes in Tokai forest and the continued protection of greenbelts and vineyards by residents demonstrates the different ways different people define what the natural environment should be (Rattle, 2011).

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5.4.3 Legislation and the Constantia Property Owners' Association

The CPOA have used legislation to support their efforts to protect their version of the heritage landscape and limit development. The Spatial Development Plan and the Southern District Plan, which will govern the planning of the region for the foreseeable future, ensures the preservation of Constantia's heritage landscape as the CPOA envisage it. The CPOA provided extensive comment on drafts of these plans and thus helped form them. Heritage legislation has also been used by the CPOA's to address their concerns of protecting the area from development. A series of reports by Todeschini, which the CPOA funded, have recommended a blanket grading of the Constantia vineyards. Planning and heritage concerns have been used to overlook environmental concerns to promote the CPOA's heritage landscape. Important pieces of legislation such as CARA (South Africa, 1983), the National Environmental Management Act suite of legislation and the National Water Act (South Africa, 1988) have been overlooked. This is to the detriment of the environment as Constantia represents important conservation opportunities.

5.4.4 A Case for Integration

Census data shows that Constantia remains as an overwhelmingly white suburb. The segregation of race has been and remains a central characteristic of social, economic and spatial organisation of the South African city. It continues to pervade all aspects of urban living. The economic system underpinned by political and ideological forces has served as a space forming mechanism within the city since the colonial era (Harrison et al., 2003). Still today, much of Cape Town's urban form is reflected in its natural environment. There are parts with beautiful mountain and coastal settings, such as Constantia, and others which are flood prone, windswept and sandy (Turok, 2001). The contrasting geography's of Cape Town means that 'there can be little confusion around the fact that apartheid spatial planning took an informed view and disadvantaged certain people by placing them in uncontrollable, untamed and difficult ecologies' (Anderson and O'Farrel, 2012, no page number). Currently, the city has a wide income inequality. Cape Townians are therefore sorted according to their ability to buy into different neighbourhoods and lifestyles through the housing market (Turok, 2001). This has created a city that is spatially divided along lines of class and wealth.

The legacy of apartheid is embedded in conservative institutional and social practices meaning that changes to the urban form are slow (Turok, 2001). As a result Constantia retains some of the characteristics of Western's (1981) model of an apartheid suburb. Constantia is located near a major road, the M3, which runs through the white southern suburbs giving it quick and easy access to the central business district, national highways and the international airport. It is separated from non-white areas by buffer zones such as, railroads, main roads and other suburbs. It is located on the gentle slopes of Table Mountain overlooking False Bay and the Cape Flats, where non-whites had been forcibly removed to. This gives residents a feeling of psychological domination. Constantia has beautiful views, large plot sizes, fertile soil and is sheltered from the strong south-easterly winds giving it good amenity.

It can be argued that the landscape of Constantia perpetuates and exacerbates socio-spatial distance. Since the end of apartheid a new type of city has developed in South Africa: the crime city (Spinks, 2001). Wealthy white South Africans have used fear of crime to justify the exclusion of the poor. The poor have been excluded through opposing mixed residential developments and land claims. Furthermore, distance between the rich and the poor has been created through the development of malls, gated communities and streets, and the movement of business from an increasingly integrated city centre to the safety of the white suburbs. This perpetuates apartheid values and creates fortified societies (Spinks, 2001).

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5.4.5 The American Comparison

Massey and Denton (1989) argued that in America the black population still occupied a unique and disadvantaged position in society and still have not achieved the freedom to choose where they want to live. The isolated black population in America has created an underclass which is culturally different from that of mainstream America. Standards of English spoken and literacy are much lower in these areas, unemployment is significantly higher and rates of teenage pregnancy are disproportionately higher. Socio-spatial isolation continues decades after the end of segregation. This perpetuates poverty and racism.

Atlanta, Georgia, had legally enforced residential segregation until 1963. Desegregation has been slow in much of America, particularly in the South. In 1990 54% of neighbourhoods in Atlanta were still either 90% black or white (Harrison, 2003). Similar to South Africa with the end of apartheid, the US government failed to make housing, education, healthcare and employment equal for all. De facto racial segregation has continued for many decades (Aronson, 1991). Floyd Hunter's 1953 study of Atlanta, Georgia, uncovered a tightly interlocking and cohesive network of the business elite of the city who ran the local government largely in their own interest. This resulted in the propagation of racism and segregation (Harrison, 2003). Young (1990: 242) labels this 'the coincidence of corporate and city power.' This occurs in Constantia with the CPOA who have close ties with the city planning authorities. Any proposed development needs their approval for it to be granted planning permission (Pape, 2002; Alan Dolby Pers. Comm., 22 February 2012).

In South Africa a form of apartheid will continue without 'vigorous political action on the national level and social transformation that stretches beyond affirmative action. [If not] South Africa's black majority will follow the pattern of the American black minority' (Aronson, 1991: 18-19). There is a need to create an integrated city, which celebrates diversity and draws people out of their fortified society and into the public space. Groups such as the CPOA and the city planning authorities need to open themselves up to a variety of discourses and come to a compromise that benefits all - not just the wealthiest members of the society.

5.5 Creating a Safe Liveable and Sustainable Urban Environment

Constantia has largely avoided the urbanisation that has occurred in other parts of the city since the end of apartheid because of its heritage landscape. However, urbanisation has not led to integration in other parts of the city. There has been rapid urbanisation in the northern suburbs, which has been accompanied by increased socio-spatial distance (Turok, 2001). Turok (2001) labels this 'northern drift' and argues that it has resulted in the promulgation of malls and gated communities. A renewed understanding of the problems associated with urbanisation in post-apartheid Cape Town means

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that an opportunity to fully re-integrate Constantia is being missed. One of the factors prevents re-integration is the heritage landscape.

Segregated residential areas go against the democratic values that South Africa needs to aspire to. However, the government show few signs of moving away from their neo-liberal approach. It can be argued that the rise of the competitive city under the leadership of the ruling Democratic Alliance continues to spatially stratify South African society (Harrison et al., 2003). The philosophy behind the competitive city approach is that the state must position the city in the best place to gain maximum benefit from globalisation. Therefore the city government carry out actions which big investors want to see and not action that would be for the best for overcoming the apartheid urban form. In its extreme form this can lead to squatter removals. Peter Marais, former Mayor of Cape Town, proposed squatter removals in 2000 along the main highway that leads from the airport to the city centre (Harrison et al., 2003).

Similarly the Cape Town City Improvement District (CID) initiative perpetuates vast inequalities and creates socio-spatial distance between groups. The CID was based on the urban revitalisation model of New York City, USA. The CID's serve the ideal of a world class city integrated into a global economy. This is at the cost of the city's social and spatial integration. CID's marketise public space and socially sanitise it to make it more marketable. Road side hawkers have been made illegal and must stay within a designated yellow marked zone. Car guards have been replaced by traffic officers - government employees who make drivers pay for parking. This is all in an attempt to create orderly city that is attractive for investment and social and spatially unequal (Miraftab, 2007). It is evident that change is needed from the top down in order for Constantia to become an integrated part of the city that supports all who live and work in it. Otherwise, patterns of urbanisation will continue to spatially stratify the society in a similar way to the recent patterns of urbanisation in the Northern Suburbs.

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6 Conclusion

This dissertation has explored the changing landscape of the Constantia Valley through the last one hundred years. It is found that it is a unique suburb on the outskirts of Cape Town that remains peri-urban and retains many rural characteristics, such as open space and vineyards, and a variety of indigenous and alien vegetation. The changes in land use have been mapped. Reasons for the changes have been explored through interviews. Findings have then been linked to academic theory.

The main findings of this study are as follows:

- The GIS analysis found that the biggest change in land use in the Constantia Valley was an increase in built land and a decrease in vineyards. Most of the urbanisation occurred in the 1960s and 1970s. The rate of urbanisation gradually decreased after that period.
- Interviewees attributed the urbanisation that Constantia had experienced over the last fifty years to both local factors, such as increased accessibility, and global factors, such as changes in the economy.
- The main finding to have emerged through the course of this study is that the residential community of Constantia has acted as gatekeepers in limiting urbanisation since the realisation of Constantia as a heritage landscape in the late 1970s. Urbanisation plateaued in the 1980s following increased community awareness regarding its consequences for the rural atmosphere of the Constantia Valley.

Land use change in Constantia has been limited by its residents, who, since urbanisation threatened to transform the character of the area in the late 1970s have actively and successfully opposed it. Furthermore, since the end of apartheid change has been left to market choices. The justification for this is that these choices are rational, objective and reflect individual preference but have merely continued the status quo (Turok, 2001). This has meant that it remains a predominantly white middle class community and a semi-rural preserve that does not cater for poorer individuals.

Nature is used in Constantia to protect it from development. This shows that it is created and constructed by the societies who experience it (Demeritt, 2002). Residents have limited urbanisation to maintain Constantia as an upmarket, somewhat natural space, with large plots, big houses, alien vegetation and vineyards. Residents have controlled which ecosystems services have been conserved through the conservation of greenbelts that contain alien vegetation and vineyards over the conservation of indigenous vegetation. Indigenous vegetation arguably provides more important regulatory services that benefit the wider community of the city than the aesthetic and recreational services that alien vegetation provides. Additionally, the ecosystem services preserved in Constantia are only available to those who can afford to access them.

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The three most important structural elements to a city are employment, housing and transportation between the two. These elements determine how efficient and equitable a city is. Furthermore, access to these elements strongly determines quality of life. For the poor in Cape Town access to these elements in Constantia remains severely limited (Turok, 2001). Robinson said that 're-mapping the apartheid city is fraught with conflict' (1998: 546). Cape Town is becoming increasingly urbanised and evidence from this study has shown that no amount of resistance from the community will be able to stop it completely in Constantia. The future urbanisation of Constantia represents an opportunity to re-map it.

Resident's quest to freeze the development of Constantia is largely incompatible with Cape Town's long term social and ecological interests. Whilst it is important to acknowledge the historical significance of Constantia, and the many signs of this that still exist in the landscape today, there are pressing social concerns that need to be addressed. The need for social justice in Constantia cannot be blocked by heritage concerns. In future Cape Town planners need to be proactive in developing a landscape that reflects the wider community's needs whilst preserving the heritage of Constantia in a limited way. The development of Constantia does not have to result in the loss of the grand wine estates which attract tourists, remind South Africa of a troubled colonial past and make an important contribution to the economy. Furthermore, densification will not endanger the ecologically sensitive areas of Constantia as they are protected as part of Table Mountain National Park. Instead densification of existing plots, sub-division and the introduction of low cost housing in some of the open space presents an opportunity to renew Constantia without the wholesale loss of its heritage. Furthermore, the greenbelts provide an opportunity to restore indigenous vegetation and space for the limited development of low cost housing. These changes, although dramatic, would not result in the total loss of Constantia's heritage. Instead, it would bring sustainability and social justice to this part of the city.

This thesis has shown that both local and global trends influence land use change. Globalisation means that that landscape of Constantia will be increasingly influenced by global trends. This will decrease the power of the local community. Whether, it continues to be prioritised as a tourist destination and wine making area over concerns for desegregation and biodiversity will be decided just as much by the local community as it will be by global forces. The rising international concern surrounding the consequences of climate change, a renewed understanding of the importance of indigenous vegetation as a tool for mitigating against it, and the rapidly growing urban population in Africa may threaten the present landscape of Constantia (O'Farrell et al., 2012). Furthermore, the continued failure of the government to redress the inequalities of apartheid through market forces

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is leading to increased pressure on the government to radically restructure the urban form of South Africa (Harrison et al., 2003). A recent spate of service delivery protests in the townships of Cape Town acts as evidence of this. It is obvious that change is desperately needed.

South African cities need to create a multitude of discourses to find solutions because this is intrinsic to the country's new democracy (Young, 1990). Plan making in Constantia needs to become a process of dialogue in search of consensus (Healey, 1992). Currently, in Constantia, the largely non-white population who support the middle-class residents, such as the maids, shop assistants and farm labourers, have no say in the planning of the area. Discourse in planning was missing during the apartheid era and now it is missing because of the power of market forces (Harrison et al., 2003). There, clearly, is a disconnect in the spatial make up of Constantia which needs to be reversed.

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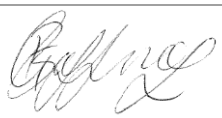
Signature		***Date:***	14 November 2012

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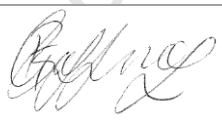
Signature		***Date:***	14 November 2012

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UNDERSTANDING LAND USE CHANGE IN THE CONSTANTIA VALLEY

University of Cape Town

Land Use Change:

'The conversion of natural land cover into human-dominated cover types.'[1]

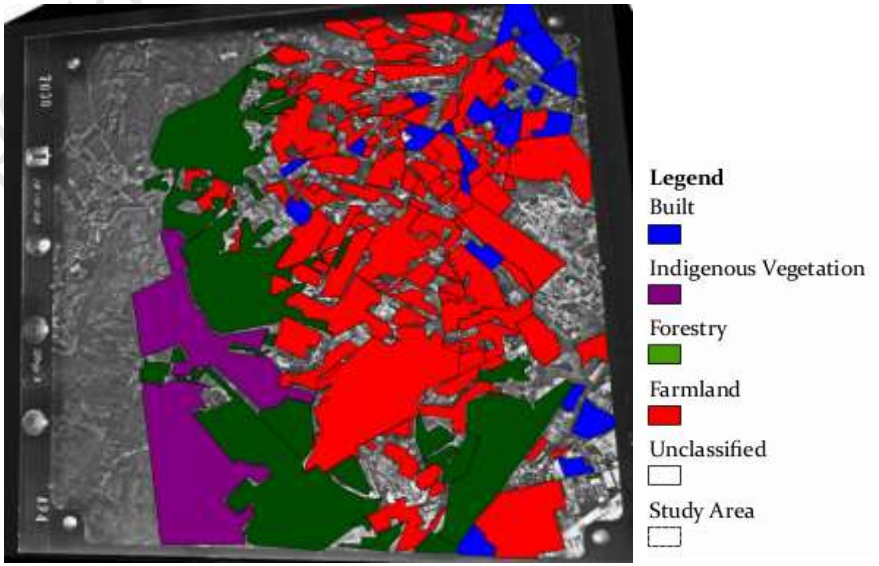
Project Aim:

To develop an understanding of how land use has, and is, changing in the Constantia Valley; what drives this change; and how sustainable development practices can mitigate its effects so that the heritage of the Constantia Valley can be conserved.

Method:

Six sets of aerial photographs from, 1958, 1968, 1977, 1988, 2002 and 2009 were obtained from Land Affairs of my study area (see figure2). Using computer software I was able to categorise and measure the size of farmland, forestry, built land and indigenous vegetation in each photo. I then charted how land use changed between 1958 and 2009. The results of the study can be found below.

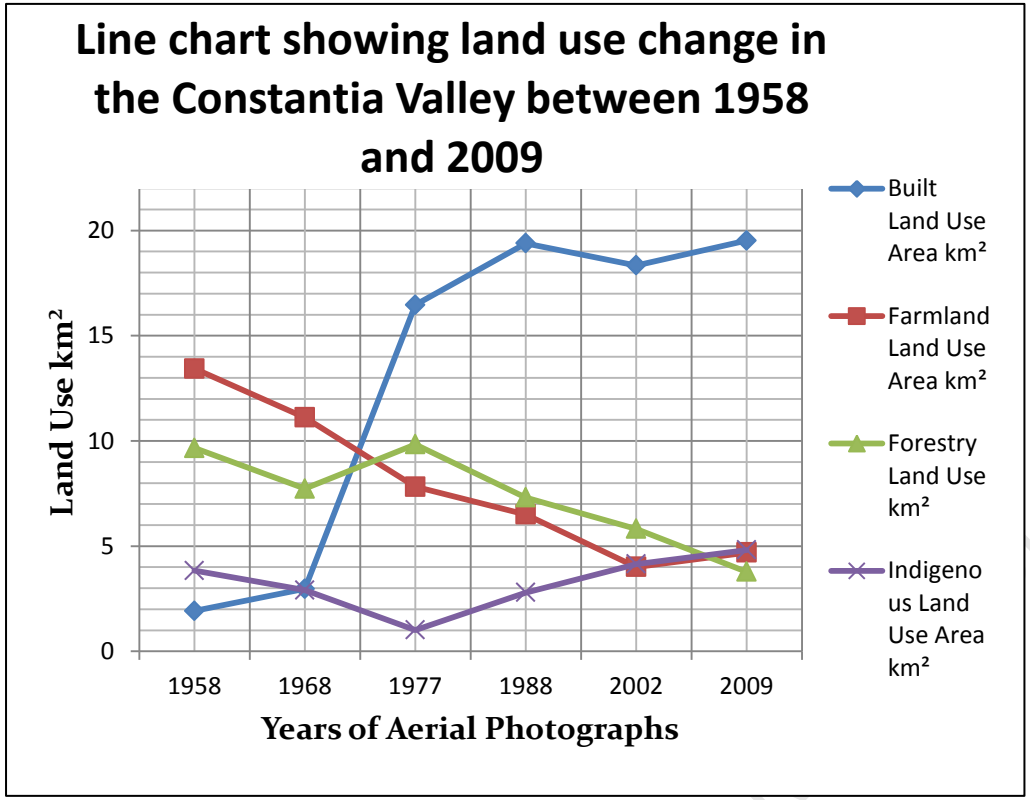
Figure 1 Categorised Aerial Photograph from 1968



[1] Potter, C. Genovese. V. Gross. P. Boriah. S. Steinback. M. Kumar. V. 2007. Revealing Land Cover Change in California With Satellite Data. *EOS, Transactions, American Geophysical Union*, 88(26), pp.272-73.

Figure 2 Study Area

Figure 3 Overview of findings from aerial photographs



Summary of results

The key findings of the results are summarised below:

- There has been a 65% decrease in the amount of farmland in the study area between 1958 and 2002. Despite the steady decline in the amount of farmland over the course of the study period there was a 17% increase between 2002 and 2009.
- Over the study period there was a 916% growth in built land. The majority of this increase occurred between 1968 and 1977.
- Indigenous vegetation increased by 26% over the study period. Notably it declined by 74% between 1958 and 1977 but recovered after 1977, growing by 176% in the ten year period after 1977.
- Forestry declined by 60% over the study period. It reached highs in 1958 and 1977, covering just under 10km² of the study area, before steadily declining afterwards. Much of the land formerly under forestry has now been replaced by indigenous vegetation.

Interview phase

In the interview phase of my study I want to interview you to gain an understanding of the factors behind these changes. Please contact me to set up a meeting.

Contact details:

Mobile: 082 506 6749

Email: btgaffney@gmail.com

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Interview Questions

1. Would you like to remain anonymous in this study? If yes, a pseudonym will be used and the details of where you work or have worked will remain anonymous.
2. How long have you been living / working in Constantia?
3. Describe your role in your organisation?
4. Could you please give an account of the history of land use change in Constantia?
5. What is the heritage of Constantia and in your opinion what aspects of its heritage need to be preserved (e.g. fynbos architecture, green spaces etc.)?
6. Does your organisation place an importance on conserving the biodiversity and heritage of Constantia, and why?
7. How has government legislation affected the way you manage your organisation; does it encourage or hinder you to preserve the biodiversity and heritage of Constantia?
8. What social, ecological and economic factors have driven the reduction in farmland and loss of land under forestry in the Constantia Valley in the second half of the twentieth century? And why do you think farmland and indigenous vegetation has increased more recently? (Factors to consider: International demand for South African wine, economic isolation during apartheid, the strength of the South African Rand, the creation of Table Mountain National Park in 1998, climate change and tourism).
9. In your opinion, do you think that farmland in Constantia will expand even further in the future? If yes / no, why?
10. Please could you explain what you think Constantia will you like in the future?
11. How have you reacted to the pressure on your vineyard from competing land uses since the 1950s?
12. What constraints are there to viticulture cultivation in the Constantia Valley and specifically on your vineyard? (e.g. Soil type, slope direction, zoinign, urbanisation etc.).
13. On what criteria do you decide to expand / contract the vineyards? And have you or previous owners of the farm expanded / contracted the area under viticulture cultivation since the 1950s? If yes, what were the reasons? And did you have a permit to do so according to CARA or, currently NEMA?

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